

**Turning the Tide:
Exploitation, Trade and Management
of Marine Turtles in
the Lesser Antilles, Central America,
Colombia and Venezuela**

AMIE BRÄUTIGAM AND KAREN L. ECKERT

A TRAFFIC REPORT

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Front cover photograph: A female
Hawksbill Turtle *Eretmochelys imbricata*
heads back to the sea after laying eggs.

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TURNING THE TIDE:

EXPLOITATION, TRADE AND MANAGEMENT OF MARINE TURTLES IN THE LESSER ANTILLES, CENTRAL AMERICA, COLOMBIA AND VENEZUELA

by Amie Bräutigam¹ and Karen L. Eckert²

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Credit: Nature Foundation of Sint Maarten



Children in Sint Maarten, Netherlands Antilles, play a game designed to foster appreciation of marine turtle conservation; since November 2004, an educational coordinator for the three Windward Islands of the Netherlands Antilles (Sint Maarten, Saba and Sint Eustatius) has focused on promoting awareness of the issue through school visits, puppet shows, songs and other grass roots activities.

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FOREWORD

When TRAFFIC completed a review of the exploitation, trade, and management of marine turtles in 11 countries and territories in the Northern Caribbean in 2001, the overall picture revealed was a patchwork of national management regimes. Some countries had allocated significant resources to manage and conserve marine turtles, while next to nothing has been done in others. Relevant regulations were rigidly enforced in some territories; in others, for a variety of reasons, enforcement was virtually absent. Legislation was comprehensive in some countries while incomplete and outdated in others. The review re-emphasised the challenges facing management and conservation strategies for marine turtles that were formulated and implemented on a country-by-country basis.

The impetus for the present study was a call for assistance made by the First CITES Wider Caribbean Hawksbill Turtle Dialogue Meeting, held in Mexico City in May 2001. Noting the findings of TRAFFIC's research in the Northern Caribbean, participants requested an extended analysis of the situation in the rest of the Wider Caribbean Region to be used as a basis for better regional co-operation. In December 2001, the CITES Secretariat commissioned TRAFFIC International to undertake this work, and the result is this new report on exploitation, trade and management of marine turtles in the 26 political jurisdictions of the Lesser Antilles, Central America, Colombia and Venezuela. Its comprehensiveness and authority are testament to the incredible persistence and dedication of the authors and the much-valued participation of so many expert contributors working in the region.

This report illustrates, perhaps unsurprisingly, that the management patchwork found in the earlier study extends throughout the wider Caribbean. It highlights enormous variation from country to country in the quality of management regimes, data collection, population monitoring and controls on exploitation. It clearly demonstrates the co-dependency between national management regimes and documents a range of examples of innovative and effective actions by governments, NGOs and communities that have potential for expansion and adaptation across the region.

A clear message of this body of work is that greater co-operation between the countries of the Caribbean is urgently needed to benefit marine turtle populations and the people who benefit from them. Significant progress has already been made in the area of regional co-operation, particularly with the coming into force in 2000 and 2001, respectively, of the Protocol to the Cartagena Convention concerning Specially Protected Areas and Wildlife (SPAW) and the Inter-American Convention for the Protection and Conservation of Sea Turtles, as well as two CITES Hawksbill Range State dialogue meetings. However, much more needs to be done.

Only with concerted effort and better co-operation can we hope to turn the tide in favour of marine turtle populations in the Wider Caribbean Region. TRAFFIC will continue its contribution to meeting this goal and remains committed to collaborating with the many dedicated organizations and individuals who are determined to succeed in addressing this important conservation challenge.

Steven Broad
Executive Director
TRAFFIC International

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EXECUTIVE SUMMARY

This comprehensive review of exploitation, trade and management of marine turtles in the Wider Caribbean Region (WCR) highlights findings related to the legal framework for marine turtle management, patterns of domestic exploitation and use and international trade, and a variety of core management issues, including population monitoring, fishery controls and law enforcement. While there have been many advancements over the past half-century in our understanding of marine turtle biology and of the management needs of these species, the review concludes that actual management of marine turtles, and of marine turtle exploitation in particular, has in many ways not kept pace with this understanding nor with the contemporary scope of threats to their survival. The report documents the implications of management shortcomings in one country for the management and conservation efforts being made in others and, finally, calls attention to a range of activities that are being undertaken at the national level to address these problems and which could be expanded or adapted across the region.

Although all fall within the WCR, the 26 jurisdictions that have been reviewed for this analysis—the overseas territories and Small Island States of the Lesser Antilles, six Central American countries, Colombia and Venezuela—are widely diverse geographically, ecologically, culturally and economically. They also vary considerably as regards the status of marine turtles and the context for their conservation and management: the legal frameworks, management regimes, and type and degree of constraints on effective marine turtle management. The differences between jurisdictions and regions with respect to key elements of this study are discussed in the **Regional Overview** and presented in the tables in that section. The major findings are set forth below and followed by a short-list of priorities for immediate action at the national level.

1. The legal framework for marine turtle management is inadequate in large and small ways in the majority of the jurisdictions covered in this study. Not only is there often confusion as to the rules that apply and, in some instances, direct conflict between laws, but exploitation in those countries where it is permitted by law is, with few exceptions, not controlled in accordance with the principles of sustainability. In some instances, competing or overlapping management authorities create confusion—and consequent lapses—in the exercise of these authorities. In addition to shortcomings in the laws governing exploitation, there are shortcomings with respect to the laws governing marine turtle trade, internal and international.

In most of the eight Latin American countries reviewed and in at least two of the insular States, there is a need to rationalize the body of legislation pertaining to marine turtles and to revise it as necessary so that there are clear rules and authorities in relation to marine turtle exploitation and trade and the broader range of marine turtle management and conservation needs. Similarly, in most of the Latin American countries examined, there is a particular need for effective controls on exploitation that is currently exempt from these laws, specifically exploitation of turtles and eggs that continues under the aegis of “subsistence” or “indigenous” use but in the absence of any legal or operational definition of these terms.

2. There are many encouraging signs that governments are seeking to strengthen the legal framework for marine turtle management. In Belize, the framework has evolved, taking full note of biological principles, through maximum size limits, to a legally permitted take for traditional use only of species other than the Hawksbill Turtle *Eretmochelys imbricata*. In several other jurisdictions—including Montserrat, Nevis (Federation of Saint Kitts and Nevis), Antigua and Barbuda, Dominica, Trinidad and Tobago, Colombia and Guatemala—

marine turtle management measures and broader conservation needs have been or are being reviewed; in several, regulations are pending that would establish maximum *versus* the prevailing minimum size limits and/or lengthen closures to embrace peak nesting periods. The governments of two jurisdictions, Anguilla and Saint Lucia, implemented moratoria in the mid-1990s so as to review management measures prior to prospective reinstatement of a turtle fishery (the moratorium in Saint Lucia lapsed before revised measures could be established; the moratorium in Anguilla was renewed in 2005).

3. Marine turtles are completely protected by law from exploitation in fewer than half of the 26 jurisdictions reviewed. In the remaining jurisdictions, marine turtles benefit from varying degrees of legal protection. With few exceptions (namely, Costa Rica [in relation to a programme at Ostional on the Pacific coast] and Belize, which clearly define, regulate and control the exemptions for exploitation of marine turtles within an otherwise protective legal regime), and regardless of these differences, the legal norms in place do not limit exploitation in such a way as to contribute to the sustainability of marine turtle populations. In effect, they do not serve management that would be consistent with the standards and practice of sustainable use. Thus, for many jurisdictions, a suite of both national and international commitments to ensure the survival of these threatened species remains largely unfulfilled.
4. In some countries, turtle fisheries operate on an occasional and opportunistic basis, while in others they continue to be the focus of dedicated effort and generate significant income through the marketing of the animals and their products. Official statistics on levels of exploitation of marine turtles at the national level do not exist for any jurisdiction in which such exploitation is permitted, as monitoring is either non-existent, sporadic, or fragmentary, being based on voluntary reporting or only conducted at some of the sites where marine turtles are landed. Consequently, levels of exploitation of marine turtles are largely unknown at the national level and it is, therefore, impossible to derive any credible estimate of the numbers of marine turtles taken at the regional level.

In some instances, information on exploitation is available from non-government sources. The most comprehensive dataset comprises the results of monitoring efforts by researchers working with the Wildlife Conservation Society (WCS); these have documented the region's largest legal marine turtle fishery, as part of which ca. 300 to 500 fishers have landed ca. 11 000 Green Turtles *Chelonia mydas* per year over the past decade. In the insular Caribbean, research conducted by a graduate student at the University of the West Indies has documented aspects of exploitation in several Eastern Caribbean countries and, for example, estimated an annual take of 782 turtles in Grenada and almost 600 turtles in Saint Vincent and the Grenadines.

Fewer data exist on levels of exploitation of marine turtle eggs, which are more extensively protected by law in the WCR than are marine turtles. The marketing of eggs is open and widespread in several of the Central American countries and, while in Costa Rica most of the eggs in trade are considered to derive from a specific sustainable-use programme at Ostional on the Pacific Coast, in Guatemala there is concern that virtually every egg laid in the country is collected for human consumption.

Finally, the numbers of marine turtles taken incidentally in industrial and artisanal fisheries are largely unknown and, thus, impossible to factor into any overall estimates of marine turtle mortality. Losses to incidental take have been documented to be high in some reviewed jurisdictions (e.g. Trinidad and Tobago, Guadeloupe) and are believed to be high in others and, thus, warrant further investigation and, as necessary, mitigation.

5. Information relating to international trade in marine turtles is mixed. There is little evidence, based on official statistics, of large commercial trade; most of the trade reported to the Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in recent years consists of seizures of personal items or scientific specimens, with only a small number of (illegal) commercial shipments. Notwithstanding, an extensive and clandestine regional trade persists, mainly in Central America. Most international trade from the insular jurisdictions consists of personal items and curios purchased by tourists; there are few statistics on tourist-mediated trade and often no official knowledge that such export has occurred. There is little concrete evidence of significant stockpiling of marine turtle products (Nicaragua and Costa Rica are the only two countries in which stockpiles were reported). Existing levels of international trade are described as a “problem for management” only for the mainland countries of the Americas.
6. Enforcement of marine turtle legislation is generally considered to be inadequate. In some instances, this arises from a lack of clarity in the legal provisions that apply and the authorities charged with enforcement. In addition, logistical and other constraints, including socio-cultural dynamics, complicate enforcement. Concerns are noted as to the low level of attention often afforded infractions of this type of legislation by law enforcement officials and the judiciary. Some participants in this study cited the low priority given to these issues as evidence of political apathy towards natural resource law in general and noted, as well, the social complexities of enforcing natural resource law in rural coastal communities where much (in some instances most) illegal activity occurs. The data suggest an increase in arrests and prosecutions in very recent years and also underscore the positive contribution of community-based beach patrols—sometimes under specific co-management agreements with government agencies—in reducing or eliminating illegal activity, especially on nesting beaches.
7. Management of marine turtles in the region covered in this study varies greatly but in most cases must be considered inadequate not only for the recovery of populations but for the prevention of further population declines. The following points should be especially noted:
 - no stock assessment in the usual sense has been conducted at the national level for any jurisdiction in this study; the countries that come closest to meeting this standard are Barbados, which, uniquely, supports continual monitoring of both nesting and foraging stocks, and Nicaragua, where the Green Turtle fishery has recently been the focus of an intensive evaluation through the efforts of scientists working with WCS;
 - legal exploitation has not been based on any scientific evaluation of the resource;
 - legal exploitation continues with no consideration of effects on population levels, i.e. without taking into account the status or trend of local populations or shared stocks throughout their biological range;
 - controls on exploitation are not consistent with current understanding of marine turtle biology and marine turtle management best practice; in the insular Caribbean, for example, closures rarely encompass the reproductive season, and minimum-size limits target the age classes that should most be protected;
 - there is very little monitoring of legal exploitation and only sporadic or fragmentary monitoring where it is conducted, with the result that overall levels of exploitation and trends in those are unknown virtually throughout the region;
 - there is very little sustained population monitoring, such that data-based marine turtle population trends are largely unknown;

- some degree of illegal take occurs in every jurisdiction but is largely unquantified (although suspected levels of illegal take were characterized as not a problem for management in several of these);
 - the take of eggs, particularly in Central America, is intensive and pervasive;
 - levels of incidental take in fisheries are, with a few exceptions, unknown and largely unaddressed in existing management regimes, despite compelling evidence that they constitute the single largest source of mortality in some jurisdictions; and
 - habitats, both terrestrial and marine, critical to marine turtle survival have not been identified in most jurisdictions and, where known, often fall outside the boundaries of parks, reserves or other actively managed areas, thus suggesting that the safeguarding of critical habitat for marine turtles has generally not been well integrated into coastal zone planning processes.
8. A growing body of data from flipper-tagging, satellite-tracking and genetic analyses is documenting transboundary movements of marine turtles and delineating individual marine turtle stocks. These data unequivocally point to the need for co-ordinated effort in managing marine turtles that, for example, nest or forage in Bonaire, Barbados, or Costa Rica, where they are protected by law, and travel to, for example, Dominica, Honduras, Nicaragua, Saint Vincent and the Grenadines, or another country where they are legally exploited. In some instances, these contradictory management regimes impinge on non-extractive marine turtle projects, such as at Tortuguero and Gandoca in Costa Rica or at Matura and Grande Riviere in Trinidad, that are generating significant economic benefits to local communities.
9. The complexity of marine turtle management is clearly a challenge for many governments in the region, who face many constraints in improving their effectiveness. The limited capacity of many of the governments of Small Island Developing States of the insular Caribbean to discharge increasing environmental mandates is one such constraint. The extreme poverty of coastal communities in Central America, who have few economic alternatives to the marine turtle resource, is as serious a challenge as any government can face and has not only regional but hemispheric implications. As inadequate marine turtle management is the result of many economic, cultural and political factors, improvements must be devised that, if not fully address, at least take into account, these many factors. While, in many jurisdictions, marine turtle management is by law already cross-sectoral, it is not adequately integrated at the operational level. Although migratory marine turtles offer the best example of the need for an integrated approach to ensure effective management, this need also applies to other marine resources (e.g. Queen Conch *Strombus gigas*, Spiny Lobster *Panulirus argus* and reef fishes) that are depleted or at risk of depletion.
10. The complexity of marine turtle management across the WCR suggests not only a need for a more concerted, co-ordinated, cross-sectoral approach at the operational level, within governments and among other actors, but also at the diagnostic level. Social scientists, rural development specialists and development assistance donor agencies should engage in assessing the dynamics that dictate marine turtle exploitation and in developing solutions to the factors that underlie over-exploitation. The same attention should be paid to identifying more sustainable patterns of coastal development, as habitat loss—both terrestrial and marine—is identified as a major threat to marine turtle recovery in many jurisdictions.
11. A major finding of this study is that non-governmental organizations (NGOs), including community-based organizations (CBOs), are making large contributions to marine turtle conservation and basic research in the region; in some countries, they are also making large contributions to marine turtle management, including

strategic planning, monitoring of legal fisheries and of nesting and other populations, record-keeping, poaching deterrence, training and capacity-building, and public outreach. While this non-governmental investment is generally viewed as positive, there is a need to recognize the essential, fundamental role of government in marine turtle conservation and management and, thus, the need for governments to engage—politically, logistically and financially—in this work. The need for sustainability in management, which is complicated by the fact that NGOs and CBOs generally rely for their operations on funds raised from external sources, should be given serious consideration by governments and the donor community.

12. Existing and growing partnerships between government, NGOs, CBOs and local communities, built on shared priorities, pooled resources and equal credit/benefit, offer particular promise in addressing the management challenges facing marine turtles. As one of many examples, in Nicaragua, WCS is working with local communities and relevant government agencies to monitor the fishery for Green Turtles along the Caribbean coast and develop a management and conservation plan for marine turtles in that region. Many locally-based NGOs, such as Nature Seekers in Trinidad, have also been pioneers in this field.

A particularly positive development in recent years has been the increase in “co-management” arrangements between governments and local communities, whereby sustainable-use projects are implemented on the basis of mutually agreed conditions and procedures. In cases where governments have come to terms with the fact that they cannot fulfill their management or enforcement mandates without reliable help from those much closer to the resource, they may grant the community (which generally seeks enhanced economic opportunity) exclusive extraction, eco-tourism or other rights. In return for needed assistance in fulfilling its public mandate to manage the resource, the government provides opportunities for local communities to benefit from the resource. This is the case in Saint Lucia (in a partnership with the Desbarras community), Trinidad (in a partnership with the Matura community and others), Costa Rica (with the [Pacific] programme in Ostional) and elsewhere in the region. These agreements, when thoughtfully constructed, produce real benefits for conservation and sustainable management because stakeholders have a true stake in the health of the affected resource.

13. There are numerous examples documented in this study of innovative approaches to addressing over-exploitation of marine turtles and enhancing their management and conservation. Many of them focus on information-sharing and direct, sustained engagement of local communities and other stakeholder groups and, in doing so, have generated significant interest in and support for marine turtle conservation. Supporting and supplementing these are several dozen field projects sponsored by governments and NGOs in the Wider Caribbean Sea Turtle Conservation Network (WIDECASST), a scientific network affiliated with the Caribbean Environment Programme of the United Nations Environment Programme (UNEP) and providing an operational mechanism for training, communication, collaborative research and the replication of successful programmes across more than 40 participating WCR States and territories.

In Costa Rica, such efforts include an NGO-run certification programme for retail establishments that undertake not to sell marine turtle products and a turtle tourism scheme at Gandoca, whereby, through an arrangement between an NGO (*Asociación ANAI*) and the local community, lodging is provided to turtle researchers, thus generating alternative income for the community and leading to a reduction in egg poaching; in Nicaragua, community meetings and radio spots aimed at informing local communities about marine turtle conservation issues and the results of conservation projects under way have lowered the incidence of

Hawksbill Turtle poaching; in Bonaire, a local newspaper has dedicated space for regular updates of the international movements of marine turtles locally fitted with satellite-transmitters; in Antigua, a home-owners association sponsors the hemisphere's most comprehensive Hawksbill Turtle demographic study; in Dominica, the hiring of former marine turtle poachers as beach patrollers has dramatically reduced the killing of nesting turtles in Rosalie Bay; in Trinidad, co-management agreements between the government and coastal communities have eliminated marine turtle poaching while creating new capacity in rural areas for entrepreneurial activity ranging from reforestation programmes to literacy campaigns and youth employment; in Barbados, the University of the West Indies hosts a regional tagging centre, providing training, field equipment and record-keeping software to small-scale marine turtle field projects throughout the region. These examples are drawn from countries examined for this review and, with numerous other initiatives in the WCR, offer an insight into what might be achieved; they also hold promise that developing partnerships between governments, private and corporate interests, NGOs and other sectors may meet with enduring success.

Particularly worthy of note is a multi-institutional, multi-stakeholder effort in Colombia to develop a sustainable-use regime to alleviate heavy, largely illegal commercial exploitation of over 1000 marine turtles per year in Guajira Department. Bringing together indigenous Wayúu fishers, economists, biologists, and management agencies, a programme has been developed that includes a system of transferable capture quotas for certain size classes of turtles; these would decline in number over time and apply only to local use of meat, thus excluding other marine turtle products and marketing and sale beyond these points. Although this programme has not yet been implemented, the process of its development and analyses undertaken thus far offer numerous suggestions for similar efforts to contain illegal and/or unsustainable marine turtle exploitation in the region.

14. Further improvements in marine turtle management at the national level will clearly involve operationalizing management at the regional level in the WCR. The differing legal protection afforded marine turtles at the national level results in an incoherent regional scenario whereby the same turtles are fully protected in some jurisdictions and legally hunted in others, and investments in management and conservation in one jurisdiction are undermined by inadequate management measures in others. Designing and implementing an integrated, unified, collaborative management strategy for marine turtle stocks using the entire Caribbean basin, under the aegis of regional bodies with relevant mandates, such as the Protocol Concerning Specially Protected Areas and Wildlife (SPAW Protocol) and/or the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC), is essential. Priority first steps at the national level that can serve as a basis for such a strategy are set out below.

Priorities for immediate action

The **Recommendations** section of this report contains comprehensive guidance for improving the management and conservation of marine turtles in the WCR. Recognizing, however, that addressing the full management needs of marine turtles necessitates a long-term commitment, the setting of priorities for implementation, and consultation with other governments sharing turtle stocks, **immediate, first-step priorities for action by governments and their collaborators**, based on the elements specifically evaluated in this review, are to:

1. **Establish scientifically based limits on the exploitation of marine turtles.** If marine turtle populations are not to be further depleted owing to inappropriate and inadequate restrictions on legal exploitation (including in cases where legal exemptions to marine turtle protections exist, such as for subsistence and indigenous uses), measures must urgently be taken to protect the large juvenile and adult turtles that are the most important marine turtle age classes to conserve. Particularly important measures are:
 - legal protection for all turtles on land, in order to protect nesting females;
 - maximum size limits in order to protect large juveniles and breeding-age animals (the life stages known to have the highest reproductive value); and
 - limits on access and codification of use rights, such as specific licences and exploitation quotas for marine turtle fishers and egg collectors.
2. **Organize and conduct a comprehensive frame survey (marine turtle catch and use assessment)** to quantify and characterize marine turtle exploitation at the national level, including the landing of turtles at sea or hunting on nesting beaches, the exchange and marketing of turtles and turtle products, numbers and types of fishers (and gears) involved, processing and marketing patterns, and the importance to livelihoods of the income derived from marine turtle exploitation. This survey should also aim to assess the role of incidental take of marine turtles in other fishing operations, including the extent to which this constitutes the primary means of capturing marine turtles, the parameters that dictate whether a turtle is landed or killed, and how significant this take might be for marine turtle management.
3. **Establish a systematic monitoring programme,** including national and regional networks of Index monitoring sites¹ (to document population size and trend *in situ*) and recording requirements for all fishers landing marine turtles. The involvement of fishers should be considered integral to the development and implementation of effective monitoring programmes, which should be designed to offer reliable indications of the numbers of marine turtles captured, the species and sizes, as well as catch-per-unit effort (CPUE), and the importance of the marine turtle exploitation to subsistence and livelihoods. In addition, it should be designed to enable these data to be managed over time so as to serve as a basis for analysis of trends and what these might mean for marine turtle populations and their management needs.
4. **Prepare and implement an outreach strategy** to increase awareness of and appreciation for marine turtle conservation and management and their relation to the broader national agenda as regards land use and development patterns, biodiversity conservation, economic priorities and cultural norms. Such a strategy should seek to engage multiple sectors—fishers and coastal communities, the tourism industry, and residents and visitors, especially in high-tourism areas.

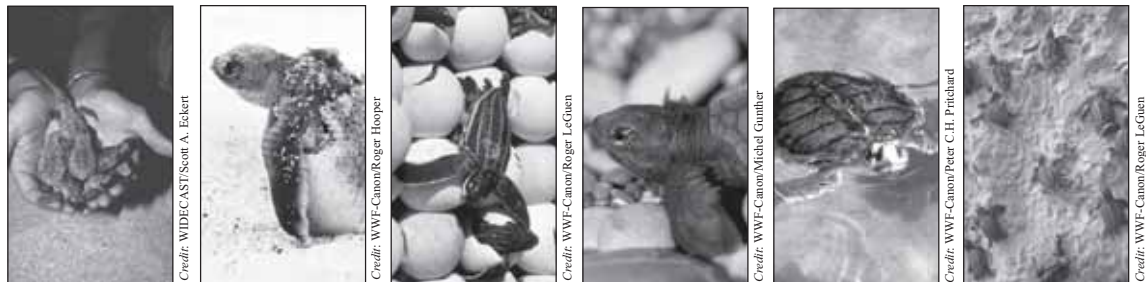
¹ Characterizing a site, whether foraging or nesting, as an 'Index' site implies the consistent and long-term application of standardized population monitoring protocols to ensure the data are suitable for trend analysis. Survey boundaries are specifically set and adhered to from year to year, and the survey area is representative (i.e. it should attempt to represent a range of threat and protection levels, a variety of turtle life stages, and a range of turtle population densities). The emphasis of this protocol is on establishing index methods for measuring trends in relative abundance at fixed locations; therefore, the sampling strategies at each Index site should ideally be structured in a manner that allows inference to a larger area of interest.

- 5. Develop and implement a compliance strategy**, including stakeholder workshops; periodic patrols of landing sites and markets and other points of sale, as well as beaches and foraging areas at times of heightened marine turtle activity; and training for members of the law enforcement community and the judiciary. Such a strategy should recognize the deterrent effect of an enforcement presence, which could be made possible through the deputizing of members of the community (cf. Trinidad and Tobago’s Honorary Game Warden programme) to support marine turtle enforcement. Proactive, non-punitive judgments—such as those mandating that offenders participate in conservation-related activities, including habitat clean-ups or supervised beach patrols—have been described as successful in some jurisdictions, as have been the operation of marine turtle “hotlines” for reporting and seeking a response to marine turtle infractions and other activities. Greater awareness of and support for the legal norms applying to marine turtles, including the prohibitions in place and penalties that apply, are needed throughout the WCR. Similarly helpful would be the development and dissemination of protocols to follow in cases of specific marine turtle interactions, such as when a turtle is taken incidentally in a net or reported to be injured.

- 6. Increase government participation in regional agreements** that provide an operational basis for a unified, science-based and multilateral response to the management, recovery and sustainable use—whether extractive or non-extractive—of marine turtles in the WCR. The most prominent of these agreements are the SPAW Protocol to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, or Cartagena Convention, and IAC. Sub-regional agreements, such as the trilateral *Acuerdo de Cooperación para la Conservación de las Tortugas Marinas en la Costa Caribeña de Costa Rica, Nicaragua y Panamá (Acuerdo Tripartito)*, provide additional possibilities for co-operation in management efforts for these species.

INTRODUCTION

Marine turtles enjoy iconic status in many parts of the world, in many cultures and many sectors (Frazier, 2005a and b), including in the Caribbean (Eckert and Hemphill, 2005). Being among the first reptiles—and marine species—to have been identified as threatened with extinction, marine turtles have been largely protected from international commercial trade under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) since the late 1970s and have benefited from several decades of conservation investment. While there have been many advancements over the past half-century in our understanding of marine turtle biology and management needs, the actual management of marine turtles, and of marine turtle exploitation in particular, has in many ways not kept pace with this understanding nor with the contemporary scope of threats to their survival. The consequence of this has been continued high levels of mortality in legal target fisheries, as fisheries by-catch, among adult females on nesting beaches, and through widespread collection of eggs, as well as losses from habitat and other factors. Until the Japanese Government disallowed the import of Hawksbill Turtle *Eretmochelys imbricata* shell (or *bekko*) on 1 January 1993, exploitation included large numbers of this species killed around the world, including the Caribbean Sea, to supply this international market.



Hatchlings, from left to right: Hawksbill Turtle, Green Turtle, Leatherback, Loggerhead, Kemp's Ridley and Olive Ridley.

There is long-standing concern, as expressed by governments and civil society alike, that continuing exploitation in many marine turtle range States is compromising management and conservation efforts in other range States and inhibiting the recovery of depleted populations at regional and global levels. Much of this concern arises from increasing understanding and appreciation of the shared nature of marine turtle stocks. Marine turtles benefiting from legal protection or active, science-based management in certain range States invariably travel through or to countries where they are—or risk being—subject to exploitation that is legal and, in many instances, subject to few controls. Effective management and conservation of these species clearly requires a co-ordinated approach amongst countries harbouring the same turtle stocks.

A number of multilateral initiatives aimed at providing a basis for collaboration and co-ordination on marine turtle management have been undertaken in recent years. In the Wider Caribbean, these include the Protocol Concerning Specially Protected Areas and Wildlife (SPA Protocol) to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, or Cartagena Convention, which entered into effect in 2000, and the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC), which entered into force in 2001. In addition, region-wide inter-governmental meetings devoted to addressing shared marine turtle management have been convening in the region for more than two decades (e.g.

Bacon *et al.*, 1984; Ogren, 1989; Eckert and Abreu Grobois, 2001; IUCN, 2002), as have innumerable technical workshops and consultations.

Recognizing that identifying and implementing concrete steps to co-ordinate management efforts for marine turtles at the regional level must be grounded in the management efforts and capacities of constituent States, TRAFFIC North America undertook a review of exploitation, trade and management of marine turtles in 11 countries and territories in the northern Caribbean (Fleming, 2001). The review documented a patchwork of national management regimes for marine turtles ranging from complete protection and active investment in conservation and management to very few restrictions on exploitation and little to no investment in management and conservation. In so doing, the review re-emphasized the fundamental challenges of attempting to manage and conserve solely on a country-by-country basis species that use the totality of the Caribbean basin and, in the case of the Loggerhead *Caretta caretta* and Leatherback *Dermochelys coriacea*, much of the North Atlantic Ocean, at different stages and times of their lives.

Participants in the First CITES Wider Caribbean Hawksbill Turtle Dialogue Meeting, held in Mexico City in May 2001, noting the TRAFFIC report and its implications for marine turtle management throughout the Caribbean, called on the CITES Secretariat to undertake a similar analysis for the rest of the Wider Caribbean Region (WCR). It was clear at that time that, only once a full picture could be made of the situation in each country, could the participants and other stakeholders begin to formulate a strategy for a more co-ordinated approach to management of these species. To this end, the Secretariat commissioned TRAFFIC International to conduct an assessment of the exploitation, trade and management of marine turtles in the 26 political jurisdictions of the Lesser Antilles, Central America, Colombia and Venezuela.

The findings presented in the pages that follow are the result of consultation, research, analysis and synthesis conducted by the authors over a period of nearly three years, drawing on their own decades of experience and expertise and those of many others in the region. The report highlights the persistence of largely outdated management regimes in many countries, including the minimum size limits that prevail in many insular States, a lack of systematically collected data on marine turtle landings, the near-absence of credible (data-based) estimates of population trends and, particularly in the continental States, widespread exploitation under blanket legal protection or poorly defined and largely uncontrolled exemptions to such protection. In addition, it documents the implications of management shortcomings in one country for the management and conservation efforts being made in another. Equally importantly, it documents a range of activities that are being undertaken at the national level to address these problems and which could be expanded or adapted across the region.

It is within this context that this report aims to form the basis of an open, deliberate, constructive dialogue between governments and other stakeholders in the WCR regarding shared needs and responsibilities for marine turtle management. The commitment of the authors and that of their institutions, as well as of the many contributors, to the analysis presented here stands as testament both to the gravity ascribed to the marine turtle management failings that are revealed and to the hope that, in documenting both these failings and the many innovative—and pioneering—approaches to marine turtle conservation in the region, with a well-co-ordinated effort, it will be possible to build a future where marine turtles might once again fill a varied panoply of ecological, socio-cultural, and economic roles.

MARINE TURTLES OF THE CARIBBEAN

The WCR (**Figure 1**) includes nesting and foraging grounds, as well as important migration corridors, for six of seven extant marine turtle species. All six of these species are included in the *IUCN Red List of Threatened Species*: the Kemp's Ridley *Lepidochelys kempii*, Hawksbill Turtle *Eretmochelys imbricata* and Leatherback *Dermochelys coriacea* are classified as Critically Endangered, and the Loggerhead *Caretta caretta*, Green Turtle *Chelonia mydas* and Olive Ridley *Lepidochelys olivacea* are classified as Endangered (see **Appendix I**) (IUCN, 2004). These classifications reflect the species' global status. Extinction risk is assessed on the basis of quantitative criteria in relation to past or projected future population declines, population size and trends, and the size and trend of area of occupancy within the overall geographic range. (Fuller details of the IUCN Red List and its Categories and Criteria can be accessed at www.iucnredlist.org.)

Causal factors contributing to the threatened status of the marine turtles of the WCR include legal and illegal targeted fisheries, as well as incidental capture in fishing gear; killing of gravid females on nesting beaches; egg collection and national and international trade; pollution and other degradation to foraging grounds; and loss of nesting habitat to coastal development (e.g. NRC, 1990; Eckert, 1995a; Meylan and Donnelly, 1999; Witherington and Martin, 2000; Eckert and Abreu Grobois, 2001; Seminoff, 2004). Threats accumulate over long periods of time and can occur anywhere in a population's range; thus, declines typically result from a combination of factors, both domestic and foreign. In general, and notwithstanding documented examples of apparently rising or recovering populations (Leatherback: Dutton *et al.*, 2005; Green Turtle: Troëng and Rankin, 2005; Hawksbill Turtle: Krueger *et al.*, 2003a; Richardson *et al.*, 2004; Diez and van Dam, Chelonia Inc., unpubl. data; Kemp's Ridley: Márquez *et al.*, 1999), marine turtle populations throughout the WCR are so severely reduced from historical levels (Carr 1955; Parsons, 1962; Rebel, 1974; King, 1982; Groombridge and Luxmoore, 1989; Ross *et al.*, 1989; Reichart, 1993; Jackson, 1997; Meylan and Donnelly, 1999; Bjorndal and Bolten, 2003) as to be considered by Bjorndal and Jackson (2003) "virtually extinct" from the standpoint of their role in Caribbean marine ecosystems.

Some of the largest marine turtle breeding colonies that the world has ever known, including those of Green Turtles in the Cayman Islands (Lewis, 1940; Aiken *et al.*, 2001), have all but vanished. Nesting trends for Green Turtles elsewhere in the WCR are mixed, with rising trends at Tortuguero (Costa Rica), currently the region's largest colony, as well as in the USA and Mexico, but long-term declines at Aves Island (Isla de Aves, Venezuela), once a globally significant site (Seminoff, 2004). According to León and Bjorndal (2002), "current hawksbill populations in the Caribbean represent at most 10% of pre-Columbian levels", while Meylan (1999a) reported Hawksbill Turtle populations to be "declining or depleted in 22 of the 26 political units in the Caribbean for which status and trend information [was] available". Hawksbill Turtle nesting in the Yucatán Peninsula (Mexico), estimated to have comprised ca. 40% of all known Hawksbill nesting in the WCR (Meylan, 1999a; IUCN, 2002), is steadily declining: nests counted in 2004 amounted to a mere 37% of those counted in 1999 (Abreu Grobois *et al.*, 2005). Importantly, several countries examined in the present review cited anecdotal reports of increasing numbers of juvenile Green and Hawksbill Turtles, a finding worthy of focused investigation.

The largest nesting colony of Leatherbacks in the WCR (Ya:lima:po, French Guiana), recently reported as having declined by more than 50% from 1987 to 1998 (Chevalier and Girondot, 2000), has now been re-evaluated from a broader perspective, incorporating nesting data from throughout the Guianas (recognizing that the annual nesting effort tends to migrate seasonally, tracking the ever-shifting coastline). A reconstructed time-series of

Figure 1

Map to show the Wider Caribbean Region (WCR), including the Lesser Antilles, Central America, Colombia and Venezuela—the geographical focus of this report.



Leatherback nesting activity along the 600-km coastline of Suriname and French Guiana, corrected for capture effort, shows that nesting activity has been “stable or slightly increasing in this region since 1967” (M. Girondot, Université de Paris, *in litt.*, 23 November 2005). Similarly, there is no evidence of contemporary decline in nearby Trinidad, the world’s largest insular nesting Leatherback colony (S. Eckert, WIDECAS, pers. comm., 2005), and some small, long-protected colonies are growing in size (Dutton *et al.*, 2005). In contrast, there is considerable anecdotal evidence that Leatherback nesting has “dramatically declined” throughout much of the Eastern Caribbean (Eckert, 2001). Reviews are inconclusive for this species in Central America (Troëng *et al.*, 2004), indicating that longer periods of data collection are necessary.

Dramatic reductions during the second half of the 20th century at the region’s largest nesting colonies of both the Olive Ridley and Kemp’s Ridley are well documented (Ross *et al.*, 1989; Reichart, 1993; Márquez, 1994; Marcovaldi, 2001), presently rising numbers of nesting Kemp’s Ridley (Márquez *et al.*, 1999) notwithstanding. Finally, the Loggerhead nesting colonies of eastern Florida (USA), the largest in the WCR, have been steadily declining since 1998 (FFWCC, 2004), following more than a decade of rising trends (Witherington and Koepfel, 2000) and despite more than three decades of federal protection.

Marine turtles have provided nutrition, wealth and in other ways been useful to humans for more than 2500 years (Peterson, 1997; Versteeg *et al.*, 1990). They fed indigenous tribes (Frazier, 2003) and helped make foreign colonization possible; Carr (1955) observed that, “all early activity in the New World tropics—exploration, colonization, buccaneering, and even the manoeuvrings of naval squadrons—was in some way or degree dependent on turtle.” Green Turtles, exclusively herbivorous (Bjørndal, 1982), were savoured for their mild flesh and historically traded in enormous volumes (Parsons, 1962; King, 1982; Groombridge and Luxmoore, 1989; Jackson, 1997). Similarly, the colourful carapace scutes of the Hawksbill Turtle once featured prominently in the region’s foreign export earnings, historically in trade with Europe but more recently (increasingly dramatically in the early 1970s) in trade to Asian markets, primarily Japan (Parsons, 1972; Mack *et al.*, 1982; Milliken and Tokunaga, 1987; Groombridge and Luxmoore, 1989; Meylan and Donnelly, 1999).

Often overlooked have been the ecological services that these species deliver. Marine turtles, once numbering in the inestimable tens of millions (Jackson, 1997) and not atypically described by early writers as a “never failing resource” (e.g. Long, 1774, cited in King, 1982), are becoming known to science as having contributed significantly to nutrient cycling on sandy beaches (Bouchard and Bjørndal, 2000), as well as productivity in seagrass beds and diversity in coral reefs (León and Bjørndal, 2002; Bjørndal and Jackson, 2003). Hatchlings entered the food chain by the millions, month after month during the nesting season, with, by current estimates, only one egg in a thousand surviving to become an adult turtle (Frazer, 1986). More recently, marine turtles have become popular subjects for dive and nature tourism and, in this context, are increasingly becoming a source of revenue for coastal communities in the region, such as in Costa Rica, Grenada, Saint Lucia and Trinidad and Tobago (e.g. Troëng and Drews, 2004).

Life history and life cycle

Marine turtle life-history strategies, complex but largely known, have not changed over time. These animals are slow-growing, late-maturing (age at sexual maturity in the WCR ranges from 11 to 16 years [Kemp’s Ridley: Zug *et al.*, 1997] to three decades or more [Green Turtle: Frazer and Ladner, 1986], depending on the species) and long-lived, with naturally high rates of egg and young juvenile mortality and low rates of adult mortality. These

attributes, coupled with an overlapping iteroparous life cycle—long life-expectancy coupled with discrete multiple breeding seasons and overlapping generations (Chaloupka and Musick, 1997)—mean that long-term data collection is vital for the estimation of key demographic parameters and for informing management decisions.

Early attempts to incorporate Western Atlantic Loggerhead life-history data into population model simulations revealed that even 100% survival in the first year of life would not reverse population decline, suggesting that protection limited to the egg/hatchling stage was unlikely to be effective and that only by reducing large juvenile and adult mortality could extinction be averted (Crouse *et al.*, 1987). Frazer (1989) used the concept of reproductive value—a measure of the value to the population of an individual female turtle of a particular age—to emphasize the critical importance of ensuring that large turtles be protected. On this basis, and noting that the regulatory framework in the WCR had been focusing marine turtle fisheries “incorrectly for over 350 years”, he recommended to Caribbean fishery managers at the Second Western Atlantic Turtle Symposium in 1987 that any exploitation of marine turtle populations must be restricted on the basis of maximum—not minimum—size limits. More contemporary mathematical treatments (e.g. Crowder *et al.*, 1994; Heppell *et al.*, 1999, 2000 and 2004) have only reinforced the conclusion that protecting large juvenile and adult turtles from exploitation is an essential component of any sustainable marine turtle management regime. While Caribbean fishery managers recognize that “understanding these [life-history] aspects is fundamental to the development of management programs” (*Santo Domingo Declaration*—Eckert and Abreu Grobois, 2001), the regulatory framework has been slow to respond.

Compounding the management challenges posed by life-history traits are those arising from an elaborate life cycle defined by a broadly predictable but often poorly understood series of changes—so-called *ontogenetic shifts* in location and habitat (Frazier, 2001; Heppell *et al.*, 2003)—that occur over the course of a marine turtle’s life and often incorporate long-distance migration. At any point in time, a genetically distinct population of marine turtles is spread across several, and perhaps several dozen, geo-political units. This complicates significantly the delivery of management and conservation and evidences the need for active co-operation and collaboration among range States in the management of shared stocks.

Research indicates that individual marine turtles are unlikely to remain in natal habitats throughout their lives. Hatchlings emerge from the sand, orient to the sea, and engage in a swim frenzy, well known to science, that ultimately leads them into oceanic convergence zones that offer food and shelter during the early years. Young juveniles (with the exception of the elusive giant Leatherback) eventually return to coastal waters, assuming their characteristic diets, and may travel significant distances through multiple political jurisdictions during the estimated one to four decades required to reach sexual maturity. At maturity, adult females return to the general area where they were born, sometimes undertaking trans-oceanic journeys, to engage in egg-laying. Seasonal nesting populations and nearshore foraging aggregations exhibit varying degrees of genetic relation; thus, conservation measures directed at local nesting colonies will not necessarily benefit local foraging stocks and *vice versa*. Foraging assemblages are typically a mixed assortment of (primarily) juveniles and (fewer) adults drawn from nesting rookeries near and far. Nesting assemblages, on the other hand, comprise females drawn to the beach by the gravity of instinct, the signature of their natal coastline indelibly marked in their genetic code (e.g. Bowen and Witzell, 1996; Bowen and Karl, 1997; Bass, 1999; Díaz-Fernández *et al.*, 1999; Dutton *et al.*, 1999; Bowen, 2003). Adult females pass the code to their daughters, who will repeat the cycle as long as the natal beach provides suitable habitat.

Species overview and general trends

The smallest and most localized marine turtle species in the WCR are the Ridentles. The Kemp's Ridley, largely confined to the Gulf of Mexico, nests primarily in Tamaulipas, Mexico, with foraging grounds extending northwards along the eastern seaboard of the USA (Márquez, 1994). Its range is not considered to extend to any of the countries examined in this review. An active bilateral conservation and research partnership between



Credit: WWF-Canon/Urs Woy



Credit: Scott A. Eckert/WIDECAST

Kemp's Ridley *Lepidochelys kempii* (top)
and Olive Ridley *Lepidochelys olivacea*

Mexico and the USA has successfully brought this species back from the brink of extinction (Márquez *et al.*, 1999); while the population is still depleted, there are an estimated 6000 adults (male and female), and the population is growing (D. Shaver, US National Park Service, pers. comm., 2005). In contrast, the Olive Ridley is largely confined to the southern Caribbean, predominantly the Guianas. The largest colony in the region was until recently located at Elianti Beach, Suriname, where egg collection (Reichart, 1989) and incidental capture in commercial fisheries (Laurent *et al.*, 1999) are implicated in the loss of nearly 95% of this population since 1968: the number of nests declined from over 3000 per year in the late 1960s, to fewer than 500 in the early 1990s (Reichart, 1993), to fewer than 200 today (Hilterman *et al.*, 2001). Today, the most significant colony appears to be located in eastern French Guiana, where ca. 2000 nests were laid (by perhaps 1500 females) in 2004; lower-density nesting is recorded in western French Guiana where, in 2004, ca. 600 nests were laid within the Amana Nature Reserve (B. de Thoisy, Association Kwata, unpubl. data).

In addition to hosting remnant populations of Kemp's and Olive Ridentles, the WCR harbours remnant populations of four other marine turtle species that today comprise some of the world's largest remaining stocks. In Tortuguero, Costa Rica, Green Turtles typically nest in the tens of thousands per year in a widely fluctuating pattern that shows a clearly increasing trend (Troëng and Rankin, 2005). A rookery of similar size is found at Raine Island, Australia, but no other rookery in the world approaches these numbers (Seminoff, 2004). Historically, the largest Green Turtle rookery in the Caribbean is credited to the Cayman Islands, but the population was all but extinguished by commercial exploitation two centuries ago (Aiken *et al.*, 2001). Exploitation pressure has remained high on this, the most edible of marine turtle species, with the apparent result that nesting is reported at low densities or greatly depleted in most of the countries examined in this study. Based on the data available, the heaviest exploitation in a single country in the region occurs in Nicaragua, the primary foraging ground for the Tortuguero nesting colony and possibly the most important foraging ground for this species in the entire Atlantic system (Carr *et al.*, 1978), where an estimated 11 000 Green Turtles have been killed annually during the past decade (Lagueux, 1998).

Hawksbill Turtles, providers of tortoiseshell (the colourfully patterned scutes that cover the carapace) have, like Green Turtles, been exploited for centuries. The tortoiseshell from hundreds of thousands of turtles in the WCR

was imported into the UK and France during the 19th and early 20th centuries (Parsons, 1972) and additional hundreds of thousands of turtles contributed to the region's trade with Japan prior to the imposition of a zero quota on Hawksbill shell imports to Japan in 1993 (Milliken and Tokunaga, 1987; Groombridge and Luxmoore, 1989; Canin, 1991; Donnelly, 1991). What is believed to have been, historically, the largest nesting colony in the WCR—Playa Chiriquí in Bocas del Toro Province, Panama—reported only 465 nests in 2004 (Ordoñez *et al.*, 2005). Today, the largest nesting colony in the WCR is located on the shores of the Yucatán Peninsula, Mexico, where long-term monitoring indicates a persistent decline in recent years: ca. 2400 nests were laid in the States of Campeche and Yucatán (including Isla Holbox) in 2004, a 63% drop in numbers since 1999, when ca. 6400 nests were laid there (A. Abreu Grobois, UNAM, pers. comm., 2005). For most of the countries in the region, nesting is characterized as depleted and occurring at low densities, with the important exception of rising trends at a handful of small but well-studied colonies (Krueger *et al.*, 2003a; Richardson *et al.*, 2004) and anecdotal observations of increases in foraging juveniles at selected sites (e.g. Puerto Rico, Barbados).

The spongivorous Hawksbill Turtle (Meylan, 1988) is confined to tropical latitudes and is believed to complete its life cycle within the confines of the Caribbean Sea; notwithstanding, intriguing tag returns, such as that from a juvenile tagged in Brazil and later killed in Dakar, Sénégal (Marcovaldi and Filippini, 1991), hint at life-history behaviours that are still poorly understood.

Leatherbacks are the largest and most migratory of the marine turtles; lacking a hard bony shell, they are also the most visually distinctive. Gravid females arrive seasonally at preferred nesting grounds, but adults spend most of their time in temperate and even sub-arctic latitudes where they prey on oceanic jellyfish and other soft-bodied invertebrates (WCR summaries by Eckert, 1995b and 2001; Dutton *et al.*, 1999); little is known of the biology or distribution of juveniles (Eckert, 2002). Satellite-tracking of post-nesting females has confirmed that they depart the Caribbean after egg-laying and navigate along trans-oceanic corridors to western African coasts and the high seas of the North Atlantic (Eckert, 1998 and 2006; Hays *et al.*, 2004a). The largest nesting colonies in the region are located in Trinidad and the Guianas (primarily French Guiana and Suriname), where several thousand adult females converge annually with no indication of declining trends, and along the Costa Rica-Panama coast, where 3000 nests were recorded at Playa Chiriquí (Panama) alone in 2004 (Ordoñez *et al.*, 2005). Leatherbacks prefer high-energy shorelines and deep, unobstructed access (Eckert, 1987). They are often referred to as colonizers, being the first to exploit newly emerging habitat along the ever-shifting coastlines of the Guianas (Pritchard and Trebbau, 1984; Giron-dot and Frétey, 1996). They exhibit less site-fidelity than the other species and, while the majority of females will return repeatedly to the same nesting ground, it is not unusual for individuals tagged at one nesting beach to be reported nesting elsewhere (Pritchard, 1973; Eckert *et al.*, 1989). Nesting by Leatherbacks has been documented in most of the insular Caribbean countries examined in this study, in several—e.g. Aruba, Dominica, Grenada, Saint Lucia, Trinidad and Tobago—at greater densities than other marine turtle species.



Credit: WWF-Canon/Urs Woy



Credit: WWF-Canon/Urs Woy

Hawksbill Turtle *Eretmochelys imbricata* (top) and Green Turtle *Chelonia mydas*

Finally, the omnivorous Loggerhead, described as the most ecologically generalized marine turtle (Bolten, 2003), is found nesting in both tropical and temperate latitudes. Hatchlings from nesting beaches in the WCR, and particularly those in the south-eastern USA, enter the North Atlantic Gyre where they remain for 7–12 years before returning to the Western Atlantic to settle in coastal benthic feeding grounds at a size of ca. 40–60 cm (straight carapace length) (Bjorndal *et al.*, 2000). There are at least four genetically distinct Loggerhead nesting sub-populations in the western North Atlantic, based on mitochondrial DNA (Encalada *et al.*, 1998). Only South Florida (USA) is described as a “major” nesting ground in the WCR, while nesting in Cuba, Mexico, Belize, Guatemala, Honduras, Colombia and Venezuela is described as “minor [fewer than 1000 nests per year] or relatively poorly known” (Ehrhart *et al.*, 2003). The South Florida colony has been declining for several years: fewer than 50 000 nests were laid in 2004 (State-wide), the equivalent of some 12 000 females (based on 4.1 nests per female—TEWG, 2000), the lowest nest count since 1988 (FFWCC, 2004).



Credit: WWF-Canon/Urs Woy



Credit: WWF-Canon/Urs Woy

Leatherback *Dermochelys coriacea* (top) and Loggerhead *Caretta caretta*

Transboundary movements

Marine turtles are migratory at all life-history stages (Lohmann *et al.*, 1997), a reality well-known to science but as yet poorly translated into national and regional management norms. As with any shared resource, coordination among range States with regard to management is an unavoidable prerequisite for success at local and national levels. Transboundary movements of marine turtles among range States in the WCR are documented through the return of flipper tags that have been fitted to marine turtles for more than five decades (Carr, 1967) and, more recently, by satellite-tracking. In addition to identifying markers, an address on the flipper tag enables fishers and others to return the tag (sometimes for a small monetary or other reward, which serves as an incentive). A satellite transmitter fitted to a turtle’s carapace enables the animal’s movements and a range of additional data to be collected on an almost-constant basis, for more than two years in some cases (S. Eckert, WIDECAS, pers. comm., 2005).

The largest bodies of data on international movements have been collected through the recovery of tags in the Nicaraguan Green Turtle fishery and from females nesting at Tortuguero, Costa Rica. Carr *et al.* (1978) tabulated international tag returns from Green Turtles tagged at Tortuguero during the period 1956–1977, which indicated that the waters of Nicaragua, in particular the Miskito Bank area, are the principal feeding grounds for the Tortuguero nesting colony. Carr *et al.* (1982) reported that the recovery in Nicaragua of two tags that had been put on Green Turtles at Aves Island was the first evidence that the Miskito Bank may be a feeding habitat for two different major breeding populations of Western Atlantic Green Turtle stocks. Green Turtles caught in the waters of Nicaragua had been tagged in the Bahamas, Bermuda, Brazil, Cuba, Florida (USA), Grand Cayman, Yucatán (Mexico) and Panama, as well as in Costa Rica and Venezuela. Similarly, two Loggerheads taken in Nicaragua had been tagged in Panama and the Azores (Portugal) (Lagueux, 1998). According to sources cited in Meylan

(1999b), Hawksbill Turtles captured in Nicaragua had been tagged at Tortuguero (Costa Rica), in the US Virgin Islands, and the Yucatán (Mexico); such tags have been recovered there in recent years from elsewhere in the region (C. Lagueux, WCS, *in litt.*, 13 June 2005).

Evidence from flipper-tagging, satellite-tracking programmes and genetic analyses has shown that the marine turtles nesting in Costa Rica migrate through, forage and breed in various other countries and that, for example, Green and Hawksbill Turtles travel through Costa Rican waters between the reefs of Bocas del Toro, Panama and the Miskito Cays, Nicaragua. The analysis of Carr *et al.* (1978) of over 1100 international tag returns over the period 1956–1977 from Green Turtles tagged at Tortuguero indicated that this nesting population is drawn from turtles that feed throughout the western Caribbean. Although the great majority of tag recoveries were from Nicaragua, more than 10 returns were from Colombia, Panama, Mexico, Venezuela and Cuba. Carr *et al.* (1982) reported that a Green Turtle tagged at Tortuguero was later captured in the Gulf of Paria on the west coast of Trinidad. Movements of Hawksbill Turtles tagged nesting at Tortuguero show a similar pattern: they have been recaptured at various sites in Nicaragua, Panama and Honduras (Bjorndal *et al.*, 1985, cited in Meylan 1999b). Recent genetic analyses point to nesting female Hawksbill Turtles from Tortuguero foraging in Cuba, Mexico and Puerto Rico (Troëng *et al.*, 2005).

Similar patterns are evident in other large datasets. For example, tagging of Green Turtles nesting on Aves Island has provided evidence of long-distance movement into other jurisdictions; tags from this programme have been returned from: Barbados, Bonaire, Brazil, Colombia, Cuba, Dominica, the Dominican Republic, Grenada, Guadeloupe, Guyana, Haiti, Martinique, Mexico, Nicaragua, Puerto Rico, Saint Kitts, Saint Lucia, Saint Vincent and the Grenadines and Venezuela (Vera, 2004).

International movements are also increasingly being documented through satellite telemetry and, in many instances, made available on the Internet (e.g. at www.seaturtle.org/tracking; www.bonaireturtles.org; www.cccturtle.org and www.hawksbillwwf.org/). For example:

- a Hawksbill Turtle satellite-tagged in Antigua migrated into Belizean waters (Searle, 2001);
- a number of turtles (several Hawksbill Turtles, one Green Turtle and one Loggerhead) satellite-tagged in Bonaire have travelled through and to at least seven countries in the region: Venezuela, Colombia, Dominican Republic, Honduras, Nicaragua, Panama, Puerto Rico (USA) and the Virgin Islands (Sea Turtle Conservation Bonaire, unpublished data);
- four post-nesting Hawksbill Turtles satellite-tagged in Barbados in 1998 stayed in the country's waters for only a few months before travelling to Grenada, Dominica, Trinidad and Venezuela, respectively, where some foraged at the same sites for up to 1.5 years (Horrocks *et al.*, 2001);
- three of four adult female Hawksbill Turtles satellite-tracked after nesting at Playa Chiriquí, Panama, travelled to distant countries, including Nicaragua and Jamaica, where they stayed for extended periods (the fourth was killed shortly after her release from the nesting beach) (A. Meylan, *in litt.*, 15 March 2005);
- a female Hawksbill Turtle satellite-tagged after nesting in the Zapatilla Cays, Panama, travelled to Honduras and remained there for several months, after which the battery failed, but the turtle was recorded again on the same nesting beach two years later (Meylan and Meylan, unpubl. data); and
- a male Green Turtle satellite-tagged at Bocas del Toro, Panama, travelled to the San Bernardo Archipelago in Colombia (A. Meylan, *in litt.*, 15 March 2005).

Flipper-tagging of Leatherbacks is documenting a pattern of behaviour somewhat less precise in nesting beach fidelity. Recent, largely unpublished examples documented in this review corroborate an existing body of WCR-related literature (Pritchard, 1973; Eckert *et al.*, 1989; Boulon *et al.*, 1996). For example:

- a Leatherback tagged during nesting in Saint Lucia in 2003 later nested in Barbados (J. Horrocks, Barbados Sea Turtle Project, pers. comm., 2004);
- a Leatherback tagged while nesting in the US Virgin Islands in April 2004 nested twice on Rosalie Beach, Dominica, in May of that year (Byrne, 2004), while a Leatherback tagged while nesting on Rosalie Beach in April 2004 later nested twice on Cipara Beach, Peninsula de Paria, Venezuela (H. Guada, CICTMAR, pers. comm., 2004), and another tagged on Rosalie Beach in 2004 nested some weeks later in Martinique (R. Byrne, RoSTI, pers. comm., 2005);
- two Leatherbacks nested in Tobago in 2004 after having nested (and been tagged) in Grenada earlier in the season (W. Herron, SOS Tobago, *in litt.*, 8 August 2004);
- a Leatherback that nested in Grenada in 2004 had originally been tagged in Panama (Ocean Spirits, *in litt.*, 24 October 2004); and
- data from the tagging of marine turtles in the Paria Peninsula and Isla de Margarita (Venezuela) have recently begun to indicate migrations of these nesting animals back and forth between Venezuela and Trinidad, as has been recorded in 1999 and during the period 2001-2004 (CICTMAR, 2002; J. Horrocks, pers. comm., cited in H. Guada, *in litt.*, 19 September 2004; Rondón *et al.*, 2004).

Equally important for management is that satellite-tracking of Leatherbacks is providing unique insight into the extraordinary long-distance movements of these animals around and across entire ocean basins. Recent examples of the WCR-related trajectories include those of:

- nine Leatherbacks satellite-tagged in Trinidad between 1995 and 2004: the three longest records documented post-nesting females returning to high-latitude Atlantic foraging grounds (as far north as the Flemish Cap) and continuing on to foraging grounds associated with the Mauritania Upwelling off the west coast of Africa (Eckert, 1998 and 2006);
- 10 Leatherbacks satellite-tracked from two Atlantic Florida rookeries during the period 2000-2002: most of these animals exploited continental shelf foraging grounds along the eastern seaboard of the USA, and as far north as Cape Breton (March-October), moving off the continental shelf during winter months; one female journeyed to foraging grounds associated with the Mauritania Upwelling (Eckert *et al.*, 2006);
- eight post-nesting female Leatherbacks satellite-tagged in Grenada in 2003: two travelled north-west, arriving within a few hundred kilometres of Cape Cod and Nova Scotia before turning southwards, while the remaining five that left the Caribbean travelled north-east, reaching latitudes between the Azores and the UK before some turned south (Hays *et al.*, 2004a and 2004b); and
- Leatherbacks that have been satellite-tracked from Trinidad to Cape Breton, Nova Scotia and in the reverse direction: an adult male Leatherback was tracked from Nova Scotia to Galera Point, Trinidad, where it resided for 96 days before returning to Nova Scotia (James *et al.*, 2005).

In summary, while marine turtles have clearly evolved to be faithful to a preferred nesting ground (widely believed, based on several lines of evidence, to be their natal nesting ground), there is ample evidence that some individuals, and Leatherbacks in particular, are more flexible in their nest-placement strategies. Leatherbacks may nest in multiple political jurisdictions, even over the course of a single reproductive season. In the case of

the Guianas, where sand deposits suitable for nesting may shift with each passing year, Leatherbacks are able to locate new deposits and exploit them successfully for nesting, despite the passage of an intervening two years or more. In other cases, the cues that motivate a turtle to relocate outside preferred nesting ground can be deadly, such as when a female leaves a protected rookery and enters the waters of a jurisdiction where she is not protected.

In all cases, the implication for management is that a unified regulatory regime would greatly assist in the regional conservation and sustainable use of shared stocks. The situation of turtles protected on their nesting grounds returning to foraging grounds in other jurisdictions where some type of legal exploitation (for commercial or subsistence purposes or indigenous use) is permitted extends across the WCR; less documented but known also to occur is the scenario whereby turtles protected on their foraging grounds return to nest in jurisdictions where they are partially protected or unprotected. For example, legally protected Hawksbill and Green Turtles tagged in Barbados have been captured in Saint Vincent and the Grenadines, Grenada, Cuba, Saint Lucia, Nicaragua, Trinidad and Venezuela (J.A. Horrocks, University of the West Indies, pers. comm., cited in Meylan, 1999; Krueger *et al.*, 2003b; Luke *et al.*, 2004; J.A. Horrocks, pers. comm., 2006). Post-nesting Hawksbill Turtles from the Jumby Bay Hawksbill Project in Long Island, Antigua, have been captured in Dominica (Fuller *et al.*, 1992) and Saint Kitts (Meylan, 1999). Marine turtles protected in Bonaire have travelled to several countries where exploitation is permitted, including Colombia, the Dominican Republic, Honduras and Nicaragua. In Central America, post-nesting Green Turtles leave the protection of Tortuguero National Park and return to foraging pastures characterized by high levels of exploitation in Nicaragua (Campbell, 2003).

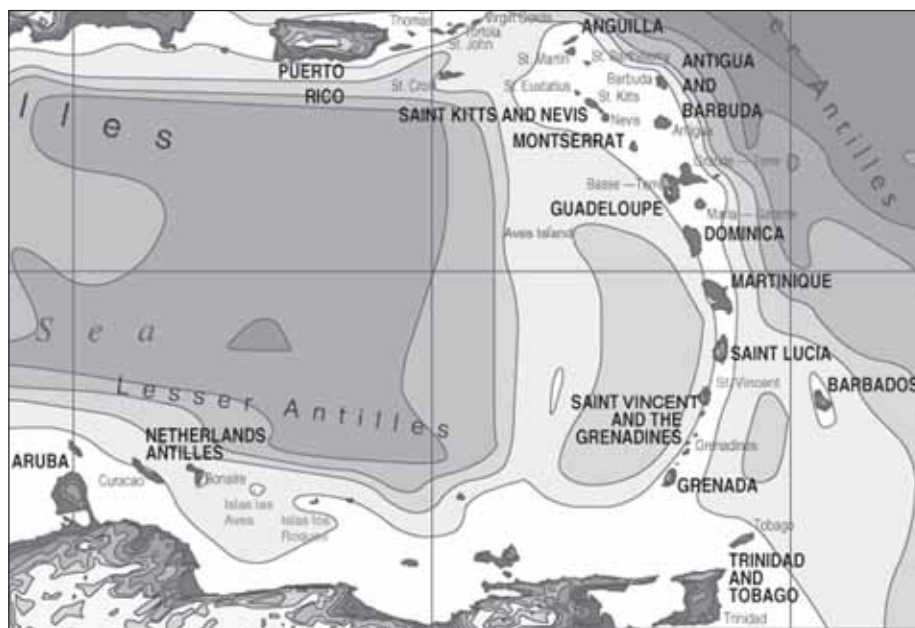
METHODS AND DEFINITIONS

As mandated by the CITES Secretariat, this study reviewed marine turtle exploitation, trade and management in 26 political jurisdictions in the WCR: Anguilla and Montserrat, two UK overseas territories; Guadeloupe (comprising Saint Martin and Saint Barthélemy) and Martinique, two overseas departments of France; the five islands comprising the Netherlands Antilles (Saba, Sint Eustatius, Sint Maarten, Bonaire, Curaçao); Aruba, Antigua and Barbuda, Barbados, Dominica, Grenada, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, and Trinidad and Tobago; Belize, Guatemala, Honduras, Nicaragua, Costa Rica, Panama, Colombia and Venezuela. For each of these jurisdictions, the study aimed to:

- document current legislation governing exploitation, trade and management of marine turtles;
- document—and quantify where possible—levels of legal and illegal exploitation and trade in marine turtles and their products;
- document the existence and status of stockpiles of marine turtle products;
- document management initiatives being undertaken and the constraints to conservation and management of marine turtles; and
- provide recommendations for improving the management of exploitation and trade in marine turtles at the local, national and regional levels, in order to maintain the availability of the marine turtle resource, focus management planning, strengthen conservation initiatives and enhance law enforcement efforts.

Funding constraints dictated that this be largely a desk study, a compilation of information obtained from government and non-government sources in the region and a review of available statistics and relevant literature. As a first step, a questionnaire was designed to gather relevant information and available data from within the

Figure 2 Map showing islands of the Lesser Antilles included in this study



different jurisdictions. This questionnaire was produced in three languages and individualized to each jurisdiction through the inclusion of information on the legal framework, as available from existing sources, and of international trade information from the CITES database (up to and including 2000) and from Japanese Customs statistics on Hawksbill shell imports up to and including 1992. The questionnaire was circulated to all CITES Management and Scientific Authorities, to the agencies responsible for fisheries (including marine turtles) in the target region, to country co-ordinators of the Wider Caribbean Sea Turtle Conservation Network (WIDECAST), and other agencies and individuals known to be involved in marine turtle management and conservation. Questionnaires were completed for all but two of the 26 jurisdictions reviewed, and for many both government and non-government responses were returned. The authors were persistent in seeking direct input from stakeholders in all jurisdictions, including the two for which no questionnaire was returned. An English version of the questionnaire is included in **Appendix III**.

Although a specific request was made in the questionnaires for available statistics on exploitation and trade, few data on this aspect of the study were returned by respondents; a major effort was, thus, directed at the compilation and review of information from other sources. All marine turtle species with the exception of the Australian population of the Green Turtle have been included in CITES Appendix I since 1977, and the Caribbean population of the Hawksbill Turtle has been listed in CITES Appendix I since 1975. A review was undertaken of all trade in marine turtles reported to CITES for the countries concerned during the years from 1975, when CITES entered into force, to 2004, inclusive. Statistics on CITES trade derive from annual reports filed by CITES member States in fulfillment of their obligations under Article VIII of the Convention and are maintained in the CITES Trade Database, which is managed by the UNEP World Conservation Monitoring Centre (UNEP-WCMC), based in Cambridge, UK. The Centre provided a comparative tabulation, reports of trade in marine turtles made by exporting and importing countries, for this purpose.

Because CITES trade data were not expected to provide much more than a glimpse into a trade that has been largely illegal under the terms of the Convention for the past 30 years, and because the largest documented international trade in marine turtles during this time involved Hawksbill shell, or *bekko*, imported into Japan

under the terms of that country's CITES reservation (which exempted it from CITES Appendix-I commitments for this species until it was formally withdrawn in July 1994), Japanese Customs statistics for the years up to and including 1992, the last year that Japan permitted Hawksbill shell imports, were compiled by TRAFFIC East Asia-Japan. An important source of information on international, regional trade in Central America—as well as internal trade in those countries—was the assessment of trade in marine turtles and their products in Central America undertaken by the *Red Regional para la Conservación de las Tortugas Marinas en Centroamérica* (Central American Marine Turtle Conservation Network) (Chacón, 2002).

A central focus of this review has been the national legal framework for management of exploitation and trade in marine turtles. For the insular Caribbean, it has generally been possible to review directly the legal instruments governing exploitation of marine turtles. For most of the mainland Americas, however, where there is an enormous body of legislation of different types—and numerous, sometimes conflicting, legal analyses on the subject—it has, at times, only been possible to consult secondary sources. It should be noted that access to national environmental, including fisheries, legislation is increasingly available through the Internet, such as through the websites of national legislative assemblies (e.g. those of Costa Rica and Guatemala) or individual government agencies that have responsibilities for wildlife and environmental management (e.g. the *Corporación Hondureña de Desarrollo Forestal* (COHDEFOR) and the *Secretaría de Agricultura y Ganadería* (SAG) in Honduras and the *Ministerio de Fomento, Industria y Comercio* (MIFIC), in Nicaragua) and the on-line legislation database maintained by the Food and Agriculture Organization of the United Nations (FAO) at faolex.fao.org/faolex/. However, the available documentation generally does not include the agency resolutions and decrees and supporting regulations that form part of the full body of legal measures relevant to marine turtles. Information on the adequacy of CITES-implementing legislation is largely derived from reports on the CITES National Legislation Project, which has been under way since 1992.

Although in some instances the information has been readily available, it was impossible under the terms of reference for this review to address systematically the legal measures in place to deal with the other pressures that marine turtles face, which themselves are numerous and diverse, such as protected area designation and management and coastal zone management; these are in many instances directly relevant to overall marine turtle management. It has likewise been impossible to investigate the full range of socio-economic aspects of marine turtle exploitation, which are varied and variably important across the region and merit further analysis.

An essential source of information has been the national marine turtle strategies that have been compiled for most of the jurisdictions examined in this study. For seven countries in the insular Caribbean, as well as Belize and Venezuela, these have been the national Sea Turtle Recovery Action Plans (STRAPs) prepared by WIDECAS and published under the auspices of the United Nations Caribbean Environment Programme (CEP). (A complete list of CEP Technical Reports, including all STRAPs, is available at www.cep.unep.org/pubs/Techreports/techreports/) For three additional countries (Anguilla, Trinidad and Tobago, and Panama), draft STRAPs, currently in review, have been used. National marine turtle strategies have been prepared through government-led processes in Colombia (MMA, 2002), Guatemala (Sánchez Castañeda *et al.*, 2002) and the French Antilles (overseas departments of Guadeloupe and Martinique), the last of which is a draft recovery plan still in review (Chevalier, 2003), and these have been equally useful. The final report on the status and exploitation of marine turtles in the UK overseas territories in the Wider Caribbean (Godley *et al.*, 2004), prepared under the auspices of the UK Department of Environment, Food and Rural Affairs and the UK Foreign and Commonwealth Office, has been an essential source of information for Anguilla and Montserrat. It should

be noted that for only five of the 26 jurisdictions reviewed for this study—Dominica and Grenada in the insular Caribbean and Costa Rica, Honduras and Nicaragua—is there currently no national strategy for marine turtle conservation and/or management; a WIDECAST-led national strategy is currently in process for Dominica, Grenada and Costa Rica, as is a management plan for marine turtle conservation in the Nicaraguan Caribbean (Lagueux *et al.*, 2002).

Additional foundational documents were the national reports submitted to the First and Second Western Atlantic Turtle Symposia (in 1983 and 1987, respectively), the National Biodiversity Strategy and Action Plans and national reports (including those on protected areas) prepared under the auspices of the Convention on Biological Diversity (CBD), and the national reports and supporting documents submitted to the First and Second CITES Wider Caribbean Hawksbill Turtle Dialogue Meetings (in 2001 and 2002, respectively), available from the CITES Secretariat, the CITES website, or other sources.

While for a few of the jurisdictions, the relative lack of recent information and in-country input, especially from government sources, has created difficulties, the major challenge in compiling this report has been the opposite problem—an enormous body of information from a range of stakeholder processes, field studies, legal analyses, scientific literature, website postings and other activities, as well as reports to CITES and other inter-governmental fora, including the CEP and FAO. Persistent effort was directed, particularly through the Internet and WIDECAST country co-ordinators, to identifying and locating primary sources of information and as much as is known to be readily available is reflected here. All documentation—primary and synthesis sources, legislation, unpublished data—was reviewed in the original language of publication, whether English, Spanish or French or, in the case of the Netherlands Antilles, in official English translations.

A point of geography should be noted. With the exception of Belize, which borders only the Caribbean Sea, and El Salvador, which borders only the Pacific Ocean, the Central American countries and Colombia harbour marine turtle populations on both their Caribbean and Pacific coasts. Because the focus of this study has been on the marine turtles of the Caribbean, the status of and management programmes for marine turtles on the Pacific coasts of these countries have generally been excluded from the review. In some instances, however, it has been impossible to separate out issues relating to marine turtles on the Pacific coasts from those in the Caribbean sector of these countries.

In order to assess fully the importance and implications of the present situation with respect to the parameters examined, it was considered essential to review the historical context, including, where possible, the evolution of national legislation, historical information on exploitation and trade, and other relevant information. This is particularly important in the case of marine turtles, which are documented as being severely depleted in the Caribbean Sea after centuries of exploitation and are still subject to exploitation throughout the region.

The assessment incorporated several rounds of multi-sectoral in-country review and required nearly three years to complete. While some jurisdictions may be mildly outdated by the time of publication, the review comprises the most up-to-date information available from published and non-published sources (English, Spanish, French). A concerted effort was made, in conjunction with TRAFFIC, to provide the responsible government agencies with an opportunity to review their national summary prior to publication and to incorporate the comments received.

A few points are necessary with respect to definitions. The operative definitions are those associated with exploitation, trade and management. We have defined “exploitation” as the direct take of marine turtles and their eggs, excluding indirect exploitation, such as by fisheries by-catch or mortality associated with habitat degradation (e.g. hatchling death associated with beach-front lighting), and non-extractive uses, such as eco-tourism associated with marine turtles. “Trade” refers to international movement of marine turtles, eggs and/or marine turtle products, except where specifically described as domestic or internal.

The review is predicated on the assumption, encoded in various international treaties and agreements and often explicit in national law, that living marine resources are to be managed in a sustainable fashion for the benefit and enjoyment of present and future generations and, furthermore, that use, if sustainable, can serve human needs on a continual basis while fulfilling ecological roles and contributing to the conservation of biological diversity. Therefore, in documenting marine turtle “management” in the jurisdictions under review, the focus has not been simply on the legal measures in place to control exploitation but on whether those measures were and are sufficient to ensure that exploitation is sustainable, namely that it is not causing or exacerbating population declines in marine turtle populations.

In recognition of the fact that the legal measures are only a framework for management, an analysis was undertaken of the operational measures taken by governments, in many instances supported by NGOs or CBOs, to ensure that exploitation is not causing population declines. Most important among these measures is the monitoring of marine turtle exploitation through the recording of the number of animals killed or eggs collected and the biometrics of that exploitation, including catch-per-unit effort and other parameters that would enable an assessment of trends over time; and the monitoring of wild populations so as to discern trends and inform assessments of the affects of exploitation on marine turtle populations and whether any adjustments in controls on that exploitation may be necessary to prevent population declines.

Along a similar vein, in recognition of differing interpretations of the terms “conservation” and “management”, this study took a broader view of management to embrace what many would consider “conservation” measures, including the establishment of protected areas, to protect marine turtle habitats and/or marine turtles from direct fishing or incidental mortality in fishing operations; education and awareness aimed at promoting compliance with the law and engaging stakeholders in management efforts; species research and conservation, including population surveys and nest protection programmes; as well as a wide variety of training and capacity-building initiatives. Awaiting a similarly comprehensive assessment are a number of foundational issues—including development priorities (especially pertaining to the coastal zone), access and use rights, regulatory capacity, trade controls, and the cultural and socio-economic dimensions of marine turtle use—which, along with a working knowledge of biological factors and constraints, help define a modern management regime. These issues are presented in context, but not treated in-depth.

Final mention should be made of the fact that, although governments are the major actors in deciding on management policy and practice affecting marine turtles and thus their action (and inaction) is of primary relevance in this study, the contribution of NGOs and CBOs is also of major importance. Not only are such organizations undertaking many of the actions relating to marine turtle management in the WCR, they are often doing so in close co-ordination with government agencies, typically under a government permit, and in some instances through formal agreements. Hence, an effort has been made to document the key contributions that are being made by these organizations to marine turtle conservation and management in individual countries.

Monetary values in this text are, in most instances, given in local currencies, using ISO codes, and weights expressed variously in imperial and metric units, as originally reported: one kilogramme = 2.2046 lb; t = metric tonne.

REGIONAL OVERVIEW

As would be expected of a region as geographically, ecologically, culturally and economically diverse as the Lesser Antilles, Central America, Colombia and Venezuela, there is considerable variability in the status of marine turtles and the context for their management: the legal frameworks, management regimes and types and degrees of constraints to effective marine turtle management. The differences between jurisdictions and regions with respect to key elements of this study are discussed below and summarized in the three tables in this section.

Legal framework for marine turtle management

Variability in legal frameworks

The variability of the legal frameworks in place for marine turtle management in the 26 jurisdictions reviewed is illustrated in **Table 1**. The situation of a patchwork of different and often conflicting legislation was a key finding of the TRAFFIC review of marine turtle management in the northern Caribbean and Mexico (Fleming, 2001) and it is not surprising that the pattern extends throughout the WCR. Some jurisdictions have completely protected marine turtles for over a decade; others have few controls on the exploitation and trade in these species. These differences affect individual marine turtles travelling short and long distances from one jurisdiction to another; they also affect fishers, in some instances travelling a very short distance from one site to another. This variability has obvious implications for the efficacy of the legal controls that a country has put into place with the ostensible purpose of managing marine turtles. Because marine turtles are migratory at all life-history stages (Lohmann *et al.*, 1997), as with any shared resource, a co-ordinated region-wide approach to management is an unavoidable prerequisite for success at local and national levels.

Perhaps the most extreme example of the implications of the difference in legal frameworks is the situation of the Tortuguero nesting population of Green Turtles in Costa Rica, the largest in the Western Hemisphere and one of the two largest remaining in the world. A large (but unknown) proportion of this nesting population forages off the coast of Nicaragua, where these turtles are subject to heavy fishing pressure. Although scientists in the past decade have discerned promising signs that the Tortuguero nesting population is increasing, there is concern that the Green Turtle fishery in Nicaragua, renewed in the 1990s after operating at much lower levels during the previous decade as a result of the country's civil war, has been depleting the next breeding cohort, such that this population may suffer a sudden and severe decline.

The region is replete with examples of marine turtles tagged at protected nesting grounds, only to be killed in foraging grounds during open seasons in other jurisdictions. Contacts in at least two insular Caribbean jurisdictions indicated that the existence of a legal fishery for marine turtles in a neighbouring jurisdiction was a factor cited by fishers responding negatively to proposals for stricter limits on the exploitation of marine turtles. Hence, there are political as well as management consequences of the difference in legal regimes.

There is particular variability in the legal frameworks in place among—and within—the eight Latin American countries examined. Marine turtles are fully protected in Venezuela (although the extent to which legal protection applies operationally to indigenous take requires clarification); in Belize and Costa Rica (in relation to the Pacific coast), there are clearly defined, regulated and controlled exemptions for certain forms of exploitation within an otherwise protective legal regime. In Guatemala, Honduras and Colombia, important exemptions to otherwise complete legal protection allow for the extraction of eggs (Guatemala), of turtles for indigenous use (Honduras), and turtles for subsistence use (Colombia), but these exemptions are not clearly defined, specifically regulated, or limited on a scientific basis, nor are they effectively enforced. These exemptions effectively negate protection. In the Nicaraguan Caribbean, marine turtles are legally protected with the exception of Green Turtles, the fishery for which is, as of 2005, limited to subsistence use but not restricted on any scientific basis. In Panama, the legal situation appears confused, in that marine turtles are conferred full protection under certain legal instruments, while exemptions for subsistence and indigenous use (of wildlife and natural resources, not specifically marine turtles) are set forth in other pieces of legislation.

Within this variability is an unfortunate common thread, as discussed below: with the exception of Belize and Costa Rica, no jurisdiction in which exploitation is legally permitted has established a scientific basis for that exploitation and/or manages it in accordance with the principles of sustainability. This is a major shortcoming in the management of marine turtles at both the national and regional level.

Adequacy of the frameworks

In many of the jurisdictions under review, the legal framework is weak by nature, or there are major gaps in the law. In some instances, the framework is largely composed of administrative law *versus* decrees or other “higher” instruments, thus meaning that (in addition to being less well known) they carry less weight and are more difficult to enforce. The converse is also a problem: laws are not supported with regulations detailing how and by whom they should be implemented or enforced. Shortcomings that are particularly noteworthy for this study are:

- **Lack of clarity.** In many countries, there is a relatively long history and a large body of laws and legal measures adopted on behalf of marine turtles. Consequently, there is often confusion as to what laws and regulations apply. This problem is particularly acute in the mainland American countries reviewed, which operate in a maze of laws, decrees, ministerial resolutions, departmental resolutions, interim memoranda, etc. Not only is it difficult to discern what legal provisions take precedence over what others, this situation also leads to differing interpretations of the law. This confusion extends in many instances to protections—or exemptions—afforded marine turtle eggs as opposed to marine turtles. The apparent high demand and extensive use of marine turtles, as well as varying levels of internal and international trade in marine turtle eggs and other products, in particular in these mainland American countries, underscore the need for a much clearer set of rules governing the exploitation and trade in marine turtles, their eggs, and products.
- **Lack of coherence.** In addition to confusion regarding the rules that apply there are, in many instances, conflicts within the legal framework. These result in large part from the way in which wildlife legislation, generally but not exclusively relating to terrestrial species, and fisheries legislation, applying to aquatic, including marine species, have evolved. Marine turtles, largely but not exclusively marine species, have been variably interpreted as “wildlife” (e.g. in relation to hunting prohibitions and penalties set forth in wildlife legislation) but have most commonly fallen, legislatively speaking, under the fisheries framework which,

generally (several jurisdictions in the insular Caribbean being an exception), does not provide measures to control activities relating to marine turtle exploitation on land. As the legislation has evolved, so have the structures for implementation. Because marine turtles are listed under CITES, which generally translates automatically into national law in CITES Parties operating under civil law, and because they are also listed as threatened species on national Red Lists in most of the Latin American countries reviewed, they come under the mandate of wildlife departments and environment ministries; however, fisheries agencies often have a mandate that includes marine turtles, as exploited marine species, and have issued separate provisions relating to their exploitation. This has created jurisdictional conflict in several countries that has, in some instances, severely impeded management. In Belize, for example, full protection provided for marine turtles in the 1981 wildlife law was rescinded early in 1982 owing to provisions in the fisheries regulations that permitted exploitation of marine turtles. In Trinidad and Tobago, the conflict between the absolute protection afforded through the wildlife law and the five-month open season provided through the fisheries regulations has created a situation whereby few controls on marine turtle exploitation are exercised outside protected areas. In Costa Rica, a similar conflict was ultimately adjudicated by the country's Supreme Court (*Sala Cuarta*), which, in 1999, declared unconstitutional the issuance of permits for a Green Turtle fishery by the national fisheries agency.

Exacerbating the problems arising from overlapping or conflicting mandates amongst different government agencies is the situation whereby management responsibility has devolved to regional governments or municipalities or indigenous regions or communities (e.g. in Panama and Nicaragua) that have been conferred degrees of autonomy regarding natural resource use.

In several of the Latin American countries reviewed, marine turtles are an important resource for indigenous peoples and at least three countries explicitly permit the exploitation of marine turtles for subsistence and/or indigenous use. However, this exploitation is not regulated or controlled and is not monitored. In Nicaragua, levels of exploitation of Green Turtles by the indigenous Miskitu and others during an open season that, as of 2005, allows for subsistence use only have been estimated to be in the order of 11 000 per year. Virtually all of the turtles taken in the fishery over the past decade have been sold in commercial markets. In Venezuela, where there is no legal exemption for indigenous or subsistence take, exploitation by indigenous Wayúu and others is extensive, but there appears to be little effort to bring it under control. That several of the countries in the region (Colombia, Costa Rica, Dominica, Guatemala, Honduras, Venezuela) have ratified International Labour Organization (ILO) Convention N° 169 Concerning Indigenous and Tribal Peoples in Independent Countries, which gives autonomy to indigenous peoples to use natural resources in their natural habitat, appears to have created a constitutional conflict and a *de facto* exemption to prevailing marine turtle protective legislation in certain countries where exploitation continues in the absence of specific management measures and effective controls.

- **Obsolescence.** Wildlife legislation enacted several decades ago in many countries often did not take account of economic and/or cultural realities and has either not evolved to address these more fully or has evolved in a less-than-comprehensive manner. Blanket bans on the take and sale of wildlife, a standard for several decades in most (if not all) of the mainland American countries reviewed, have not been consistent with the true situation of wildlife use, with the result that such use—which in the case of marine turtles is extensive—has often been uncontrolled and unmanaged. As efforts are being made to bring wildlife and related legislation more in line with current principles and practice of sustainable-use and socio-cultural realities, the

Table 1

Summary findings on the legal status of marine turtles in the Lesser Antilles and Caribbean sector of Central America, Colombia and Venezuela

Jurisdiction	CITES Status (Entry into Force)	Current Legal Framework for Exploitation and Trade at National or Caribbean Level ¹			Exploitation Legal – Restrictions on Take						
		Exploitation Prohibited	Complete Protection (indefinite) – exemptions ²	Moratorium (fixed period)	Prohibition on take of: eggs (E), nests (N), nesting females (NF), or certain species	Closed season	Minimum Size Limits	Maximum Size Limits	Annual Quota	Permits/Licenses Required	Gear Restrictions
Anguilla (GB)	NP		√ (1995-2020)								
Sint Maarten (AN)	P (07.1999)	√									
Saba (AN)	P (07.1999)	√									
Sint Eustatius (AN)	P (07.1999)	√									
Saint Kitts & Nevis	P (05.1994)				E, N, NF	√					√
Antigua & Barbuda ²	P (10.1997)				E, N	√					√
Montserrat (GB)	P (10.1976)					√					
Guadeloupe (FR)	P (08.1978) ³	√									
Dominica	P (11.1995)				E, N, NF	√					
Martinique (FR)	P (08.1978) ³	√									
Saint Lucia	P (03.1983)				E, N, NF	√					√
Barbados	P (03.1993)	√									
Saint Vincent & the Grenadines	P (02.1989) ⁴				E, N	√					√
Grenada	P (11.1999)				E; Leatherback	√					√
Trinidad & Tobago	P (04.1984)				E	√					√
Bonaire (AN)	P (07.1999)	√		Legal situation confused							
Curaçao (AN)	P (07.1999)	√									
Aruba (NL)	P (03.1995)	√									
Venezuela	P (01.1978)	√									
Colombia	P (11.1981)	√ – subsistence take			Hawksbill Turtle						√
Panama	P (11.1978)	Legal situation confused									√
Costa Rica	P (09.1975)	√ ⁵									√
Nicaragua	P (11.1977)	√ – Green Turtle subsistence take				√					√
Honduras	P (06.1985)	√ – indigenous take									√
Guatemala	P (02.1980)	√ – eggs									√ (receipt)
Belize	P (09.1981)	√ – traditional use			Hawksbill Turtle						√

KEY: P = Party NP = Non-Party

√ = Yes

blank space = No ? = available information is unclear or contradictory

To emphasize the variability of legal regimes between adjacent range States, insular jurisdictions are listed in geographical order from Anguilla south to Aruba, and the mainland American countries are listed starting with Venezuela, the furthest south-east, and moving north through Colombia and Central America (see Figure 1).

Table I (continued)

Summary findings on the legal status of marine turtles in the Lesser Antilles and Caribbean sector of Central America, Colombia and Venezuela

<p>Notes:</p> <ol style="list-style-type: none">1 “Caribbean” refers to the Caribbean sector of those countries of the mainland Americas that have both Pacific and Caribbean coasts; it should be noted that the legal framework for marine turtle exploitation, particularly that of Olive Ridleys, on the Pacific coasts is excluded from this table as it has largely been from the overall analysis.2 The terms “subsistence”, “traditional” or “indigenous” use or take are those used in the relevant legislation.3 France acceded to CITES with reservations on the Appendix-I listing of both the Green Turtle and Hawksbill Turtle; these were withdrawn in 1984.4 Saint Vincent and the Grenadines maintains a CITES reservation on the Appendix-I listing of the Hawksbill Turtle.5 The sole exemption to total legal protection for marine turtles in Costa Rica exists for the collection of Olive Ridley eggs at Ostional on the Pacific coast of the country through a well documented sustainable-use programme.
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necessary provisions to ensure that the exemptions are well-defined, adequately controlled and monitored have generally not been included. There is also a need for greater flexibility in the evolving legal framework so as to enable management agencies to implement—and adapt in a timely as well as case-specific fashion—management strategies that may involve sustainable-use components.

Despite a body of scientific knowledge of marine turtles that has been rapidly growing over the past several decades, the legal controls on marine turtle exploitation in most cases do not reflect current understanding of marine turtle management requirements. It has been known for two decades that the most important size classes to protect (in almost any long-lived, late-maturing species) are the large juveniles and breeding-age adults, yet minimum size limits—which focus the take on large juveniles and adults—are, inexplicably, the standard throughout the insular Caribbean where legal fisheries operate. This is often coupled with a lack of coincidence between the annual closed season and the annual nesting season, again leaving breeding-age adults vulnerable to capture. The only jurisdiction to have implemented maximum size limits is Belize, which later prohibited all marine turtle exploitation with the exception of capture for traditional purposes, authorized on the basis of a specific permit.

- **Lack of enforceability.** In addition to the above-mentioned inadequacies, management of marine turtles is often hindered by the lack of implementing regulations or regulations that not only lack clarity, coherence and relevance, but can be unenforceable. Size limits based on weight *versus* length, for example, are difficult to adhere to if implemented at sea (where, appropriately, animals not within the limit can more easily be returned to the water), while restricting exploitation to males caught particular distances from shore—when neither condition is verifiable (pre-reproductive turtles cannot be visually distinguished as to sex; the site of capture often cannot be known)—only further reduces the potential effectiveness of the regulatory framework in promoting sustainable use.
- **Inadequate trade controls.** A number of the jurisdictions under review have been identified by the CITES National Legislation Project as having inadequate legislation to implement CITES and supporting wildlife trade controls. Particularly acute in Central America is the lack of legal provision for controlling internal and international trade in marine turtles and turtle products. In several countries, there appears to be a need for much more specific provisions regarding the marketing and sale of marine turtles and marine turtle products, as documented by Chacón (2002).
- **Inadequate penalties and judicial procedures.** Enforcement of management controls and protective legislation is impeded in some jurisdictions by inadequate penalties for offences and by the lack of either clear judicial procedures or a body of case law that supports vigorous prosecution and punishment for offences. Where seizures have been made and court cases filed, there have been problems of these not being taken forward by the courts or of court cases taking so long to proceed that they effectively serve as no deterrent to illegal activity. In the case of Costa Rica, the absence of penalties under the wildlife legislation for marine species had until recently made it difficult to prosecute marine turtle violations; this shortcoming has now been rectified through enactment of a specific marine turtle law that provides for such penalties.

Conversely, the question has been raised as to whether particularly severe penalties (very high fines and long prison terms) in two of the jurisdictions reviewed actually impede enforcement, in the sense that they are so punitive that no law enforcement or fisheries officer enforces them. In addition, they are also viewed by some

members of the public as ridiculous, thus suggesting that they may engender disrespect for the law—and marine turtle conservation—more generally. There appears to be a need for further effort to review and establish penalties that will serve as effective deterrents to marine turtle infractions and to encourage proactive and non-punitive options designed to enhance compliance.

- **Significant progress being made in some jurisdictions.** There are numerous examples of significant progress made in recent years in enhancing the legal frameworks for marine turtle conservation and management. Particularly notable are the jurisdictions that have recently enacted full or partial (e.g. species-specific, such as for Leatherbacks in Grenada) moratoria to safeguard depleted populations and assess future management options; have recently enacted legislation that both clarifies and enhances the norms that apply to marine turtles (e.g. a national marine turtle law and new fisheries law in Costa Rica that, *inter alia*, provide specific penalties for marine turtle infractions); or have recently enacted legislation that significantly enhances the basis for management and/or enforcement (e.g. a new fisheries law and implementing regulations in Nicaragua). Revisions to prevailing legal frameworks that are pending in several countries provide for more appropriate restrictions on exploitation, such as maximum size limits (e.g. in Antigua and Barbuda, and Dominica), while stakeholder processes are also under way in several countries (e.g. Grenada, Nicaragua, and Trinidad and Tobago) to review marine turtle management objectives and/or address specific marine turtle management problems. Finally, the institution of national moratoria on the capture, sale and possession of marine turtles is under discussion in several countries. In all these instances, and in order for such measures to be successful, they will require public support, as well as the capacity to follow through with monitoring programmes and other management measures, and in the case of moratoria, to use the period of the moratorium to conduct a marine turtle stock assessment aimed at defining current population trends and the feasibility of managing a truly sustainable take.

Also noteworthy are changes in the regulatory framework relative to habitat conservation, including lighting ordinances (e.g. in Belize) designed to minimize disorientation and mortality of egg-bearing females and their young while on the nesting beach; marine protected area designations that embrace critical marine turtle habitat (e.g. Belize, Costa Rica, Dominica, Netherlands Antilles, Nicaragua); and the establishment of marine reserves, where fishing is prohibited, or other time-area fisheries closures (e.g. Belize, Dominica, Guadeloupe, Martinique, Saint Vincent and the Grenadines).

Exploitation of marine turtles at the national level

- **Widespread exploitation of marine turtles.** Of the 26 jurisdictions covered in this study, fewer than half fully protect marine turtles. In the remaining jurisdictions, marine turtles benefit from varying degrees of legal protection. In at least four Latin American countries, legal exemptions for subsistence and indigenous take provide for significant levels of exploitation.

In the *insular Caribbean* jurisdictions reviewed, full protection is afforded marine turtles in: Aruba, Barbados, Guadeloupe, Martinique and the Netherlands Antilles. In Anguilla, a 10-year moratorium on marine turtle exploitation was renewed for a further 15 years in December 2005. In Saint Lucia, a moratorium on marine turtle exploitation instituted in 1996 lapsed in September 2004 and was not renewed. In Trinidad and Tobago, a decades-long conflict between the wildlife and fisheries legislation has created a degree of management confusion for marine turtles. The remaining jurisdictions, Antigua and Barbuda, Dominica,

Grenada, Montserrat, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines (seven of the nine members of the Organization of Eastern Caribbean States (OECS)) regulate marine turtle exploitation on the basis of an archaic framework that ignores the fundamentals of marine turtle biology and wildlife management, i.e. through: minimum size limits, which target exploitation on large juvenile and adult age classes critical to maintaining marine turtle populations; closed seasons that often do not cover the full breeding season; unenforceable mandates (e.g. restricting exploitation to males caught particular distances from shore); and few other restrictions, such as quotas and licences, on access or gear.

In the *mainland America* countries reviewed, full legal protection for marine turtles is afforded in only one country, Venezuela (where it appears to be unenforced in relation to indigenous take). In Honduras, the country's adherence to ILO Convention N° 169 provides an exemption for exploitation by indigenous peoples. In Panama, exploitation appears to be legal at least in some circumstances (subsistence, indigenous use). Legal exemptions to the full protection afforded marine turtles are narrow, clearly articulated and closely regulated in both Costa Rica (managed collection of Olive Ridley eggs in the Ostional Wildlife Refuge on the Pacific coast) and Belize (traditional take of marine turtles other than Hawksbill Turtles by permit only). In Guatemala, an exemption for the collection and marketing of eggs, the legality of which is subject to debate, has created a situation where well over 90% of marine turtle eggs laid in the country are believed to be collected for consumption. In Nicaragua, which during the past decade has harboured the region's largest legal marine turtle fishery, enactment of a new fisheries law and fisheries regulations in 2005 restrict the heretofore artisanal Green Turtle fishery to subsistence-use only but provide for no biologically based limits. In Colombia, an exemption to full protection permits subsistence fishing for marine turtles.

For every jurisdiction for which information has been obtained, illegal take is known to occur, but few statistics exist on the numbers involved. In some jurisdictions, illegal take is not considered to be at levels that impede management, and an objective assessment suggests that that is the case. In others, illegal take is recognized as a serious management challenge. Illegal exploitation of marine turtles includes the collection of eggs, killing of nesting females (e.g. of Leatherbacks in Tobago, Grenada, Saint Vincent and the Grenadines, and Dominica), and fishing with prohibited gear, during the closed season, or in violation of the minimum size limits.

- **Exploitation is largely undocumented.** With the possible exception of Nicaragua, where information is available through the monitoring efforts of individual researchers working with an NGO, there is no national jurisdiction covered in this study for which there is official documentation or estimates of the total number of turtles taken legally at the national (in the case of the mainland Americas, Caribbean) level. Similarly, and once again with the exception of Nicaragua, none of the countries in which a legal take of marine turtles (or eggs) exists has in place a systematic monitoring programme to document marine turtle exploitation, such that the numbers of animals taken, importance of marine turtles to subsistence and livelihoods and other parameters of exploitation are largely unknown.

Marine turtles are recorded at some landing sites (e.g. in Dominica, Grenada, Montserrat, Nevis, Saint Vincent and the Grenadines), but not all, and many fishers do not land turtles at these landing sites. There are no mandatory reporting requirements for marine turtles, and voluntary reporting is recognized as documenting only a portion of marine turtle landings statistics. Hence, an unknown proportion of marine turtles are not recorded in official landings statistics. In the mainland Americas, where exploitation occurs largely through

exemptions to legal protection, there is no official recording of the numbers of turtles that are landed or other aspects of the exploitation. In addition, there is little information available on exploitation for most of the jurisdictions in which legal fisheries operated but which now prohibit exploitation. Some of the most comprehensive information derives from non-government sources, such as research reports by NGOs (e.g. Chacón, 2002) and university students (Grazette, 2002), but is isolated in time or geographic scope.

There is a great range in the numbers of turtles estimated to be taken per year, and some level of take was reported from nearly all jurisdictions participating in this review. In the insular Caribbean these numbers can be very low, but, compared with the size of the nesting (which may number fewer than 10 reproductively active females per year) or foraging populations, may be significant. No fewer than 93 Green and Hawksbill Turtles were landed in January and February of 2002 around the tiny island of Nevis in the Lesser Antilles. A recent study estimated as many as 576 turtles, primarily Hawksbill and Green Turtles, landed annually in Saint Vincent and the Grenadines (Grazette, 2002) and 782 in Grenada (Grazette *et al.*, in press). In Colombia, where subsistence fishing is permitted by law but the number of turtles killed annually is unknown, a recent study in one region of the country (Instituto Alexander von Humboldt, 2000, cited in MMA, 2002) estimated the annual take to be more than 2000 turtles, an impressive number in light of these species' recognized threatened status in the country. As noted above, more than 11 000 Green Turtles are estimated to be taken annually in the legal Green Turtle fishery operating on the Caribbean coast of Nicaragua.

The collection of eggs—in both the insular Caribbean and mainland Americas—is even less reliably quantified and the take associated with incidental capture in artisanal and commercial fisheries is, with a few notable exceptions, essentially unknown.

- **Widespread collection and marketing of eggs.** Although marine turtle eggs are more widely protected by law in the WCR than marine turtles, the collection of marine turtle eggs is intensive and pervasive throughout the region and is especially viewed as problematic in Central America. Although this exploitation is considered more intensive in relation to Olive Ridleys along the Pacific coast of the isthmus, it appears to be important in some areas on the Caribbean coast as well. This exploitation and the resulting trade are proving to be a serious challenge for management. In Guatemala, for example, where most if not all of the marine turtle nests laid are believed to be collected, the government authorities have instituted an informal “conservation quota” system that requires egg collectors to donate a percentage (15%, proposed to be increased to 20%) of the eggs from each nest to marine turtle hatcheries, in return for a receipt that legalizes the remainder for consumption and sale. In the absence of sustained patrols on all nesting beaches, it is impossible to determine the extent of compliance with this system. Some insular jurisdictions also reported egg poaching levels approaching 100% on some beaches. The exploitation is largely unquantified, and its impact on the Critically Endangered (cf. IUCN) Hawksbill Turtle and Leatherback is impossible to judge.
- **Declining markets for turtle products in the insular Caribbean countries reviewed.** While the consumption and marketing of marine turtle meat continue to be important in most of the insular Caribbean jurisdictions where marine turtle fisheries continue to operate, the commercial market for other marine turtle products in those jurisdictions examined for this review appears to have declined in relation to the situation 10 and certainly 20 years ago. In particular, there appears to be very little marketing of shell or shell products. Other than for Saint Vincent and the Grenadines, where some fishers have indicated to an independent researcher that they retain Hawksbill shells in anticipation of a possible opening of international markets

(Grazette, 2002), no information has been provided in the course of this study to suggest that there is a high demand for or that there are stockpiles in the insular Caribbean of Hawksbill shell products. Although there continue to be seizures of tourist souvenirs from the insular Caribbean in the USA and other countries (see **International trade in marine turtles**), these appear to be relatively low in number. As has been documented, for example, in Grenada and Saint Vincent and the Grenadines, where the majority of Hawksbill shells tend to be discarded, the impact of CITES and other controls in both exporting countries and import markets appears to have considerably reduced, if not virtually eliminated, the trade in Hawksbill shell in most of the insular Caribbean countries reviewed.

- **Persistent high demand for marine turtles and turtle products in the mainland Americas.** Consumption and marketing of marine turtles and turtle products in the mainland Americas reviewed are extensive. In most Central American countries, for example, the markets are many, and the marketing extends throughout the country. Although marine turtle meat appears to be marketed in coastal markets, Hawksbill objects and eggs of all species are marketed nationwide. The use of Hawksbill scutes in the manufacture of spurs for cockfighting is particularly common and supports both national and regional trade. Cosmetics and other products made from marine turtle oil are also marketed. Many of these products no doubt derive from “subsistence” and “indigenous” take and might be considered legal; however, this depends on the clarity and specificity of the laws in effect, which, in these countries, is a recognized problem. Much of it is clearly illegal. The national and international dimensions of this are documented in detail by Chacón (2002).

International trade in marine turtles

All marine turtle species occurring in the WCR have been included in CITES Appendix I since 1977 and the Caribbean population of the Hawksbill Turtle has been listed in CITES Appendix I since 1975. All jurisdictions examined for this review, with the exception of the UK overseas territory of Anguilla, are currently CITES Parties and many have been so since the early days of the Convention’s operation. Hence, the complete protection from international trade afforded through CITES has applied to the marine turtles in much of the WCR for nearly three decades.

- **Little evidence of large commercial trade based on official statistics.** There is very little evidence in official statistics of significant trade in marine turtle products in the years since the closing of the Japanese market for *bekko* (Hawksbill shell) as of 1 January 1993. CITES annual report data, derived from the UNEP-WCMC CITES Trade Database, document relatively low levels of trade, primarily in scientific specimens and personal items, often reported seized, mostly to the USA. Fisheries departments in the insular Caribbean are generally unaware of seizures in importing countries: most reported no knowledge of any international trade in marine turtles from their jurisdictions. What is interesting to note from the CITES statistics is the number of transactions (the great majority recorded by the USA) involving the import of marine turtle eggs from Central America, most (but not all) of which were recorded as personal items that were seized on entry. It is unknown to what extent these transactions represent the full volume of illegal trade in eggs into the USA. However, they clearly reflect the importance of this commodity in these countries.

In addition to trade in marine turtle eggs, CITES statistics document continued trade in marine turtle products—again, largely imports reported by the USA—such as Hawksbill shell items and turtle carapaces, as tourist souvenir specimens. There have also been a number of seizures of shipments that were recorded as

commercial shipments, of meat, relatively large numbers of carapaces, and shell items. As with eggs, it is impossible to make an inference from these statistics as to the true level of illegal trade in these items. However, there appears to be consensus from within the region that this international trade is low in comparison with the level of regional trade, in Central America in particular.

- **Extensive regional trade in Central America.** As documented most recently by Chacón (2002), the extensive marketing of marine turtle eggs and Hawksbill shell objects within Central American countries clearly moves beyond national borders. This trade is believed to be primarily regional, with the exception of the many Hawksbill shell objects which are also purchased by foreign tourists and exported—to an unknown degree without detection—to their home countries. There is some evidence of international trade in commercial quantities, namely in the form of seizures (including one shipment of Hawksbill scutes intercepted at the airport in Cartagena, Colombia, destined for Panama) and reports from market vendors of the origin of Hawksbill shell or shell objects (such as Colombian Hawksbill shell items on sale in Bocas del Toro, Panama). In some cases, these products are regularly (and illegally) exported to nearby island jurisdictions, such as cockfighting spurs from Colombia to Aruba.
- **Take by foreign fishers and the potential for trade.** Whether or not it is properly characterized as international trade, throughout the region covered in this study there are reports based on anecdotal information or documented evidence of take of marine turtles by foreign fishers, either subsistence/artisanal or industrial. In Honduras, fishers reported landing Hawksbill Turtles captured in Belize; in the San Andrés Archipelago (Colombia), marine turtles are believed to be captured by the Honduran conch and lobster fleets that operate in the area; in Trinidad, marine turtles are observed being brought on board Venezuelan vessels operating in Trinidadian waters. In Anguilla, where a moratorium on the take of turtles is in place, there have been enquiries into whether marine turtle meat could be imported from a neighbouring country where a legal fishery exists. This clearly demonstrates the potential for international trade even if such trade is not currently taking place.

Management issues

Management of exploitation

With few exceptions and regardless of the differences in the legal frameworks between the 26 jurisdictions reviewed, the legal norms in place in those countries in which exploitation is permitted do not limit exploitation in such a way as to contribute to the sustainability of marine turtle populations. In effect, they do not serve management that would be consistent with the standards and practice of sustainable use (see **Table 2**). Based on the broader definition of management adopted for this review, it is difficult to conclude other than there is little active management of marine turtles in many of the jurisdictions examined. This is not to say that a jurisdiction might not be quite adept at basic and/or applied research, habitat protection and/or general conservation, but less apparent is a holistic integrated effort aimed at maintaining the marine turtle resource over time, despite the fact that best practices developed to achieve this end are increasingly available. There is a general failure to apply basic principles of resource management, such as those set by FAO in its Code of Conduct for Responsible Fisheries (FAO, 1995) and Guidelines on the Precautionary Approach to Capture Fisheries and Species Introductions (FAO, 1996).

It is not clear whether this failing results from the array of constraints to marine turtle management or from more perverse circumstances, whereby marine turtles, having either ceased to be an export commodity or been depleted to the point of no longer being considered a fisheries resource, are not valued as sufficiently important to warrant investment in their management. Clearly these animals continue to be an economic resource for some sectors of society, albeit primarily at the subsistence or artisanal level, and the object of attention for numerous research and conservation projects largely managed by NGOs and CBOs; however, they remain largely outside the priority management framework of governments.

- **Lack of stock assessment or impact assessment aimed at sustainability.** With the possible exception of a management programme for the legal collection and marketing of marine turtle eggs by the community of Ostional on the Pacific coast of Costa Rica and a recent comprehensive evaluation of the Green Turtle fishery in Caribbean Nicaragua under the auspices of the Wildlife Conservation Society (WCS), in no country has any stock assessment or impact assessment been reported to have been undertaken as a precursor to or part of the establishment or revision of legal controls on marine turtle exploitation. No attempt has been made, in any jurisdiction participating in this review, to determine a sustainable level of exploitation based on defined criteria, despite the fact that a sustainable take, even from such depleted populations as those in the Caribbean, is at least theoretically possible for some stocks. (Whether it would be truly sustainable would depend on the level of compliance, systematic monitoring and other aspects of the management regime.)
- **Failure to adopt marine turtle fishery controls that foster sustainability.** All of the legal fisheries in the insular Caribbean countries reviewed operate on the basis of minimum size limits (coupled, in most cases, with protection of nests and eggs), which targets exploitation on the large juveniles and adult turtles that decades of scientific research have demonstrated are the most important age classes to protect in order to prevent population declines and foster population recovery. Maintenance of this anachronistic standard defies the principles and practice of sustainable use. In no case are these fisheries defined as limited entry, with access restricted to bona fide turtle fishers, or restricted by quotas or other controls that could assist in promoting sustainability. An analogous problem exists in most of the mainland Americas countries reviewed, where exemptions for indigenous or subsistence take allow for uncontrolled, largely artisanal fisheries.

Efforts under way to address high levels of marine turtle exploitation, much of it illegal, in Nicaragua and Colombia offer numerous insights into how such measures might be devised and implemented. In the case of Nicaragua, WCS, working with government agencies, fishers and other stakeholders, is discussing dramatic reductions in marine turtle fishing effort and options for alternative livelihoods as it works to develop a conservation and management plan (Lagueux *et al.*, 2002). In Colombia, a multi-institutional, multi-stakeholder effort including indigenous Wayúu fishers aims at a sustainable-use regime for marine turtles in Guajira Department (Hernández, 2002). A programme not yet in implementation includes a system of transferable capture quotas for certain size classes of turtles, which would decline in number over time and apply only to local use of meat, thus excluding other marine turtle products and marketing and sale beyond these points. In both instances, the analyses undertaken and lessons learned thus far in these processes should be highly instructive for efforts to address illegal and/or unsustainable exploitation of marine turtles elsewhere in the region.

- **Lack of monitoring of legal exploitation to ensure sustainability.** The numbers of marine turtles being taken in legal fisheries are, with few exceptions, unknown, as, in most situations, no systematic or compre-

hensive monitoring is being taken of the number of turtles landed. The same is true of the legal collection of eggs. This situation is compounded by the lack of quantitative information on the number of turtles killed and nests excavated illegally. For some of the smaller islands in the Caribbean, estimates of both legal and illegal take are made, but these range in reliability, some of them being based on seizures and documented evidence and others on anecdotal information. In no instance, however, is there any indication that these numbers are analysed with a view to detecting trends that may be meaningful for an assessment of the impact of exploitation on marine turtle populations. The lack of monitoring of a legal take of marine turtles must be recognized as a serious shortcoming in management. In fact, there can be no management where systematic monitoring—recording of the numbers, species and age classes landed, fishing effort, and other parameters and analysis of the trends in those—is not taking place, and there can be no adaptive regime where there are no baseline data against which to evaluate the success (or failure) of conservation measures.

- **Insufficient monitoring of population trends.** In few of the jurisdictions where a legal fishery exists has there been a concerted effort to monitor marine turtle population trends *in situ* to ensure the fishery is not depleting marine turtle numbers.

Some jurisdictions have had nesting beach programmes in place for years (in rare cases over a decade), but in many such programmes have only recently begun. In relatively few instances (Costa Rica, Antigua, Barbados, and Trinidad offer the best examples from this study), have these been under way long enough to allow managers to develop credible assumptions about the status of local populations. Nesting populations offer excellent insight into the status of the population as a whole and have the advantage of being predictable in place and time, which can facilitate regular monitoring. However, by the time a manager documents a serious decline on the nesting beach (reflecting unsustainable rates of mortality 20 to 40 years earlier), it can be too late to design and implement a successful recovery strategy—particularly if the major source of mortality is in a distant country.

As earlier recommended by the CITES Wider Caribbean Hawksbill Turtle Dialogue Meetings, there is a need to develop standardized population monitoring protocols for implementation at Index sites throughout the region. Any successful management scheme must incorporate monitoring of both nesting and foraging populations, particularly foraging juveniles. At-sea census techniques are not as well developed or as straightforward to undertake from a statistical (analysis) point of view, but they are fundamental to understanding the dynamics of a population and its ability to sustain targeted levels of exploitation.

- **A range of noteworthy policy and management successes.** Many advancements are being made throughout the WCR in marine turtle management, including: national-level strategic planning; long-term population monitoring projects; dozens of basic and applied research programmes; innovative co-management agreements; monitoring programmes to document marine turtle exploitation; analyses and processes aimed at the development of sustainable-use regimes; organized public outreach initiatives; active media campaigns; public-private partnerships; involvement of communities and fishers in research and monitoring; certification schemes to encourage vendors to abide by national and international rules and regulations; significant investments in training and mentoring within and between countries; development of regional best practices on a wide variety of subjects; availability of conservation tools (e.g. a regional clearinghouse for tags and tagging technologies, database management software, curriculum materials, Internet-based resources); strengthening of national-level regulations; active regional networking among scientists and policy-makers;

and participation in two treaties that have recently entered into force and provide for the protection of marine turtles at the regional level. These have been emphasized in the country reports and can serve as models for replication.

Addressing other threats to marine turtles

Adequate management of exploitation of marine turtles (or any species) should take into account the other threats that they face. Two important threats of particular relevance to the WCR—but beyond the scope of this review—are discussed briefly below. Both warrant a comprehensive regional evaluation, along with recommendations and priorities for management action.

- **Loss and degradation of habitat.** In the insular Caribbean in particular, loss of nesting habitat to beach-front development is a major pressure on marine turtles. Degradation of nesting habitat can take many forms, but three problems that are particularly prevalent in the insular Caribbean are: mining of beach sand for construction, coastal construction and armoring, and the effects of beach-front lighting, which deter females from coming to shore to nest and disorient hatchlings so that they are unable to find the sea.

Similarly, and throughout the region, the loss of foraging habitat presents a significant management challenge. Losses accrue through the degradation and destruction of seagrass and live coral reef and more general degradation (e.g. from pollution, anchoring, over-fishing and marine recreational activities) of shallow coastal ecosystems, including mangrove and estuary habitats, that offer refugia, nurture prey species, and provide other important services. Marine turtle nesting and foraging habitats have been set aside in legally protected areas in a number of jurisdictions, but other measures to control the effects of human encroachment and activity have also been implemented and may be just as effective. There is a need for much broader consideration of marine turtle management needs as part of environmental impact assessment of coastal development projects.

- **Incidental mortality in fisheries.** In both the insular Caribbean and mainland Americas, the problem of incidental take and mortality of marine turtles in commercial and artisanal fisheries has been raised by many participants in this study and cited by a number of authors as a causal factor in population declines. Rates of incidental take may be even higher at a regional level than rates of direct take. Incidental capture of marine turtles in fisheries operations may be the most important factor limiting the recovery of marine turtles in the French Antilles, for example (Chevalier, 2003): more than half of the marine turtle mortalities or injuries recorded in Guadeloupe in the period 1999-2002 were attributable to fisheries interactions (Lartiges, unpubl. data, cited in Chevalier, 2003), and findings from a recent study (Delcroix, 2003) suggest that in Guadeloupe this is the single greatest cause of marine turtle mortality, exceeding all others combined and probably involving more than 1000 turtles per year (J. Chevalier, *in litt.*, 27 August 2004). In another example, ca. 3000 gravid Leatherbacks have been estimated to be accidentally caught in gill nets offshore from nesting beaches in Trinidad every year (Lee Lum, 2003), killing more turtles than all other sources of mortality combined; this situation is currently receiving priority attention at the highest levels of government.

There is a recognized need to quantify and promote measures to reduce incidental take of marine turtles. The deployment of turtle excluder devices (TEDs) is required by law in those countries operating a trawl fishery for shrimp, but some questions have been raised about how effectively this requirement is being enforced. In

the insular Caribbean, the problem of incidental mortality relates more to the use of coastal gill nets, longlines and other (non-trawl) fisheries, which are also deployed elsewhere in the region.

It is noteworthy that significant recent progress has been made in understanding the global challenge of incidental capture of marine turtles in fishing operations, but few countries have comprehensive programmes in place to address the problem at local levels. While the issue of incidental capture was outside the scope of this review, the subject has increasingly been the focus of inter-governmental dialogue. According to FAO (2004), the question of marine turtle conservation and interactions with fishing operations was raised at the 25th Session of the Committee on Fisheries (COFI), which agreed that a Technical Consultation on the topic should be held. An Expert Consultation on Interactions between Sea Turtles and Fisheries within an Ecosystem Context (organized to provide technical input to the Technical Consultation) convened in Rome in 2004, building on the proceedings of several other expert-based fora—including the Second International Fisheries Forum (2002), the US National Marine Fisheries Service International Technical Expert Workshop on Marine Turtle Bycatch in Longline Fisheries (2003), and the Bellagio Conference on Sea Turtle Conservation in the Pacific (2003)—that have recently addressed marine turtle issues, including fisheries interactions, and offered recommendations. An expert-based consultation convened to address—and offer solutions to—these issues from a WCR standpoint would be both timely and useful.

Constraints to management

Governments and other stakeholders in the region describe a range of constraints to more effective management of marine turtles. In addition to the issues discussed above, such as an inadequate legal framework and lack of a coherent, scientifically based, and effective management regime, these constraints include: understaffed and under-resourced fisheries/wildlife/parks offices; insufficient infrastructure for monitoring (e.g. lack of transportation for fisheries/wildlife officers, lack of reporting requirements and/or protocols) and enforcement; unreliable support from law enforcement; lack of trained personnel or training opportunities; limited (but clearly improving) political and public support; gaps in knowledge, such as marine turtle population numbers and critical sites; the absence of a baseline against which to define current population trends; the difficulty in securing funding to undertake long-term studies; and a generally poorly informed citizenry (many jurisdictions nevertheless reported progress based on an increasingly informed public, including more reporting of marine turtle sightings and infractions). Although many of these factors are common throughout the region and in particular in relation to the Small Island Developing States of the insular Caribbean, they vary in their degree of tractability depending on the jurisdiction. It is a noteworthy result of this review that many jurisdictions have reported clear progress in addressing one or more of these constraints.

In many jurisdictions, in particular the Latin American countries reviewed, the socio-economics of marine turtle exploitation present a major management challenge. Much of this exploitation is undertaken by indigenous and/or economically depressed coastal communities with few income-generating alternatives to the marine turtle resource. Improving management of marine turtles in these instances necessitates addressing in a holistic way the larger questions of sustainable livelihoods and rural development.

A final point should be noted regarding the importance of sustained technical assistance and training for individuals and agencies discharging marine turtle management responsibilities or otherwise engaged in marine turtle management efforts. The need for more training opportunities, and funding to take advantage of them, has been highlighted by several governments in the context of this review.

Table 2

Summary findings on management issues relating to exploitation and trade of marine turtles in the Lesser Antilles and Caribbean sector of Central America, Colombia and Venezuela

Jurisdiction	National Strategy ¹	Management of Exploitation			Population Monitoring		Critical Habitats ⁷		
		Sustainable take scientifically determined	Systematic monitoring of legal take	Annual legal take known	Nesting (# sites)	Foraging (# sites)	Major nesting beaches known	Nesting habitats legally protected (# sites) ⁸	Foraging habitats legally protected (# sites) ⁸
Anguilla (GB)	In review	Moratorium			√ (>1)		√	√ (5) ₉	
Sint Maarten (AN)	√	N/A – Complete legal protection					√		
Saba (AN)	√	N/A – Complete legal protection					√	√ ¹⁰	
Sint Eustatius (AN)	√	N/A – Complete legal protection			√ (1)		√	√ ¹⁰	
Saint Kitts & Nevis	√				√ (>4)		√		
Antigua & Barbuda	√				√ (1)				
Montserrat (GB)	–				√ (>4)		√		
Guadeloupe (FR)	In review ²	N/A – Complete legal protection			√ (3)		√	√ (>4)	
Dominica	In prep				√ (2)			√ (2)	
Martinique (FR)	In review ²	N/A – Complete legal protection					√	√ (>1)	
Saint Lucia	√				√ (1)		√	√ (2)	
Barbados	√	N/A – Complete legal protection			√ (>2)		√		
Saint Vincent & the Grenadines	√							√ (>1)	
Grenada	In prep				√ (>3)		√		
Trinidad & Tobago	In review				√ (>6)		√	√ (1)	
Bonaire (AN)	√	N/A – Complete legal protection			√ (>1)		√	√ (3)	
Curacao (AN)	√	N/A – Complete legal protection					√	√ (7)	
Aruba (NL)	√	N/A – Complete legal protection			√ (>2)		√	√ (>2)	
Venezuela	√	N/A – Complete legal protection			√ (>6)		√	√ (>9)	√ (>5)
Colombia	√ ³				√ (>1)		√	√ (>2)	√ (>5)
Panama	In review				√ (3)		√	√ (1)	√ (2)
Costa Rica	In prep	N/A – Complete legal protection			√ (3)		√	√ (2)	√ (3)
Nicaragua	In prep ⁴	√			√ (>2)		√	√ (>2)	√ (>1)
Honduras	–							√ (2)	Y (12)
Guatemala	√ ⁵						√	√ (1)	√ (3)
Belize	√	N/A ⁶	N/A ⁶	√ ⁶	√ (>2)		√	√ (>3)	√ (>10)

KEY: √ = Yes blank space = No – = no information available to authors

To emphasize the variability between adjacent range States, insular jurisdictions are listed in geographical order from Anguilla south to Aruba, and the mainland American countries are listed starting with Venezuela, the furthest south-east, and moving north through Colombia and Central America (see Figure 1).

Table 2 (continued)

Summary findings on management issues relating to exploitation and trade of marine turtles in the Lesser Antilles and Caribbean sector of Central America, Colombia and Venezuela

Notes:	
1	Unless otherwise specified, reference is to a national Sea Turtle Recovery Action Plan (STRAP) developed under the auspices of WIDECAST and the UNEP Caribbean Environment Programme.
2	<i>Plan de Restauration des Tortues Marines des Antilles Françaises</i> (Draft), under the auspices of the <i>Office National de la Chasse et de la Faune Sauvage</i> (ONCFS), <i>Direction Régionale de l'Environnement</i> (DIREN) (Chevalier, 2003).
3	<i>Programa Nacional para la Conservación de las Tortugas Marinas y Continentales de Colombia</i> , under the auspices of the <i>Dirección General de Ecosistemas Ministerio del Medio Ambiente</i> (MMA, 2002).
4	Draft Management Strategy for Sea Turtle Conservation on the Caribbean Coast of Nicaragua, under the auspices of the Wildlife Conservation Society (Lagueux <i>et al.</i> , 2002).
5	<i>Estrategia nacional de manejo y conservación de tortugas marinas, Guatemala</i> , under the auspices of the <i>Consejo Nacional de Areas Protegidas</i> (CONAP) (Sánchez Castañeda <i>et al.</i> , 2002).
6	Belize recently (2002) adopted marine turtle regulations requiring issuance, in writing, of a permit by the Fisheries Administrator for the take or use of any marine turtle (other than the Hawksbill Turtle, which is fully protected at all times) for traditional or cultural use, with the permit specifying the "amount and specific purpose for such use". To date (November 2005), no such permits have been issued.
7	Although many countries have reasonable information on the location of major nesting grounds, very little information exists on major foraging grounds or migratory pathways.
8	While in several instances, protected areas have been established specifically to safeguard important marine turtle nesting or foraging area, most protected areas, particularly marine protected areas (including marine reserves), incorporate a wide range of habitats and species; the number of sites refers to the protected areas themselves which, in embracing seagrass, coral, mangrove, or coastal habitats, are presumed to offer protection for marine turtle foraging areas or nesting beaches.
9	Adoption of the marine park ordinance designating the Sint Maarten Marine Park and formalizing its zoning plan are pending; in its current iteration, the Marine Park Ordinance will also provide protection for all seven known marine turtle nesting beaches.
10	A marine protected area surrounds the entire island.

Enforcement issues

Effective law enforcement is about more than a coherent legal framework, effective enforcement protocols and trained personnel. It requires a well-co-ordinated administration, an informed and supportive citizenry and judicial system, credible socio-economic alternatives, and incentives that minimize the attractiveness of illicit activity. A comprehensive review of the state of law enforcement in the region, of incentives that work and of models suitable for replication, would be both timely and useful. In the interim, the following observations are offered based on the results of this analysis.

- **Improving compliance.** The extent of illegal take and trade indicates a clear need to improve compliance with the law. Whether this would be done more effectively through punitive measures (and vigorous enforcement) or incentive-based measures and sustained engagement with communities and relevant sectors clearly depends on the situation. On small islands, for example, there is generally less interest in taking strict enforcement measures against individuals in one's own community, and such measures could be counter-productive. The first step in compliance is informing the public and concerned parties of the regulations in force. This is a recognized problem in a number of jurisdictions. In addition to greater information through a range of media, there appears to be a need for more active extension work with fishers and fishing co-operatives, as well as coastal communities, to consult with them about marine turtle and other relevant regulations (current and proposed) and conservation and management issues. As is suggested by other analyses of illegal wildlife exploitation (e.g. Milner-Gulland and Leader-Williams, 1992), the effectiveness of a mere enforcement presence in deterring poaching should not be under-estimated.

Along a similar vein, there is a clear need to work with hoteliers and other coastal landowners, as well as with planning authorities, to ensure compliance with conservation regulations, such as setback requirements, armouring and mining statutes, pollution laws, beach-front lighting ordinances, construction and zoning restrictions, etc.

- **Enhancing capacity for monitoring and enforcement.** Whether the object is to pursue violations or monitor fishing activity, there is clearly a need for more patrols at sea and on marine turtle nesting beaches to document legal and deter illegal activity. As highlighted above, illegal exploitation and trade of marine turtles are still common, but a lack of manpower and equipment impedes more effective enforcement. In some instances, this might be as simple as having a reliable boat to enable patrols at sea. That nesting beach monitoring has proved to be a very successful deterrent to poaching should be considered an important added benefit to that type of population monitoring. Similarly, turtle-watching tourism has deterred poaching and stimulated enforcement at sites where the revenue generated by such tourism is valued and fostered by communities, NGOs and governments.

Improving enforcement of trade controls requires a strengthening of existing efforts and capacities as well. In many jurisdictions in (and outside) the region, the interception of illegal wildlife shipments is not viewed as a priority by government agencies. In addition to regular training and support for Customs officers and other personnel responsible for controlling international trade, greater co-operation between government agencies in-country and between neighbouring jurisdictions is clearly needed.

- **Generating greater political support for environmental enforcement.** In addition to being a material resource constraint, the lower priority afforded marine resource offences as opposed to other criminal offences by enforcement agencies is a problem for marine turtle management. In addition to enforcing controls on the take of marine turtles, there needs to be more effective enforcement of controls on other activities negatively affecting marine turtles, such as sand-mining.
- **Seizures and prosecutions.** Although this information is very incomplete, there appear to be considerably fewer prosecutions than seizures. Whether the seizures are considered a sufficient deterrent or whether the lack of support from law enforcement agencies and the courts is a major factor behind this is not clear.
- **Range in penalties.** Although this information is very incomplete, there appears to be quite a range in penalties for marine turtle violations, including some that would seem to be a very strong deterrent and some that are so punitive that they appear never to be fully enforced. However, with little or no enforcement effort (and, thus, a low risk of apprehension), it is impossible to judge whether the established penalties are an effective deterrent.
- **Stockpiles.** There is no evidence to indicate that stockpiling of marine turtle parts or products is occurring in the vast majority of States participating in this review (see **Table 3**). Governments are making seizures, but how they dispose of the products or whether they maintain an inventory of these could not be documented by any participants in this review. There has been some evidence uncovered of stockpiled Hawksbill shell products (e.g. Chacón, 2002), but the extent of stockpiling appears to be a matter of speculation.
- **Apparent lack of monitoring of enforcement effort.** There appears to be little systematic approach to law enforcement effort as regards marine turtles. With illegal exploitation being a factor in every jurisdiction covered in this study, this should be considered a problem. A more systematic approach, such as is being implemented in Saint Lucia, involving the recording of relevant data—reports from citizens, seizures, etc. and enforcement effort—and the analysis of that information for marine turtle and broader marine resource management purposes would be useful for assessing the enforcement effort required and the effectiveness of that effort.
- **Public awareness and education.** A number of jurisdictions see public awareness and education and training as one of the few viable approaches to stemming illegal exploitation. Echoing the concerns of many countries in the region, the Department of Fisheries in Saint Lucia believes effective enforcement to be “nearly impossible” owing to resource and other constraints and, for this reason, is seeking to expand public awareness efforts. It should be noted that significant advances have been made in many jurisdictions to heighten awareness and appreciation for marine turtle conservation, such as through engaging local communities and the media in satellite-tracking efforts, turtle-watching schemes, marine turtle “hotlines” and workshops and other outreach activities with user communities. There are many very successful approaches being deployed in the region that are being or could be adapted elsewhere. Perhaps one of the most important gaps in information-sharing is with the tourism sector (e.g. hotels, yachters, dive and tour operators), which would appear to have little awareness of the widespread effect of beach-front development and marine recreation on the survival of marine turtles.

Addressing continued marketing and trade of marine turtle products will also require more extensive public awareness efforts, including more targeted information for the travelling public.

Table 3

Summary findings on enforcement issues relating to exploitation and trade of marine turtles in the Lesser Antilles and Caribbean sector of Central America, Colombia and Venezuela

Jurisdiction	Reports of illegal exploitation and/or sale at nat'l level	Recent ¹ reports of illegal int'l ¹ trade ²	Stockpiles reported	Recent ¹ seizures and/or arrests	Recent ¹ prosecutions and/or penalties	Citizen reports of offenses	General public awareness of laws	Adequate enforcement ³	Penalties adequate deterrent ³
Anguilla (GB)	√	?		√		√	√		√ ⁶
Sint Maarten (AN)	√	√		√	√		√		√
Saba (AN)							√		√
Sint Eustatius (AN)	√						√	√	√
Saint Kitts & Nevis	√	√		√			√		√
Antigua & Barbuda	√	√					√	?	√
Montserrat (GB)	√						?		√
Guadeloupe (FR)	√	√		√	√	√	√	?	√
Dominica	√			√	√	√	√		√
Martinique (FR)	√	?					√		√
Saint Lucia	√	√		√			√ ⁵		√
Barbados	√	√				√	√		√ ⁶
Saint Vincent & the Grenadines	√	√	?				√		√
Grenada	√	√				√			√
Trinidad & Tobago	√	√		√		√			√
Bonaire (AN)	√	? ⁴					√		√
Curacao (AN)	√	? ⁴					√		√
Aruba (NL)	√	√		√	√	√	√		√
Venezuela	√	√		√	√	√			√
Colombia	√	√		√					-
Panama	√	√		√	√	√			?
Costa Rica	√	√		√	√	√			√
Nicaragua	√	√	√	√					√ ⁶
Honduras	√	√		√					-
Guatemala	√	√		√	√				√
Belize	√	√		√					√

KEY: √ = Yes blank space = No ? = available information is unclear or contradictory - = no information available to authors

To emphasize variability in enforcement issues between adjacent range states, insular jurisdictions are listed in geographical order from Anguilla south to Aruba, then across to Venezuela and moving north again through Central America (see Figure 1).

Table 3 (continued)

Summary findings on enforcement issues relating to exploitation and trade of marine turtles in the Lesser Antilles and Caribbean sector of Central America, Colombia and Venezuela

Notes:	
1	“Recent” indicates since 1992
2	Recent reports derive from CITES annual report statistics (1992-2004) or from other sources examined for this report, including published reports and reports from knowledgeable persons in-country. For the insular countries of the Caribbean, the data typically document seizures in foreign ports of entry of usually small numbers of specimens, usually imported for personal use. In no insular country do available data indicate directed commercial trade. Conversely, in Latin America, although not readily discernible from CITES statistics, there is evidence of transboundary trafficking in significant volumes (e.g., Chacón, 2002).
3	Fully recognizing the subjective nature of ‘adequate’, the authors felt, nevertheless, that it was useful to make a first attempt to organize this information on a regional scale; our determinations were made from explicit information provided from in-country experts or inferred from the existing literature.
4	Undocumented marine turtle parts and products, especially eggs, arrive informally and presumably at low volumes aboard boats from Venezuela.
5	Saint Lucia recently lifted an 8.5-year (1996-2004) moratorium on the capture of marine turtles, and, pending the adoption of draft revised regulations, the 1994 <i>Fisheries Regulations</i> are in effect; the extent to which the public are aware of the most recent regulatory change could not be assessed within the time frame of the current analysis.
6	Some participants in this review have suggested, or a reading of the legislation suggests, that monetary fines imposed by law may be too high to serve as an “adequate deterrent;” the extremely punitive nature of these fines gives rise to concern that enforcement officers would not pursue marine turtle infractions or such infractions would not be prosecuted in the courts.

RECOMMENDATIONS

This study has identified a wide range of problems with marine turtle management in the region examined and documented a similarly wide range of innovative approaches to addressing these problems. That some of these management problems persist after decades of discussion (cf. Bacon *et al.*, 1984; Ogren, 1989; Eckert and Abreu Grobois, 2001; IUCN, 2002) is testament to their complexity and the need to harness a broader pool of expertise and capacities than has heretofore been brought to bear on behalf of marine turtles. In some instances, there is clearly a need for greater political will.

In accordance with the FAO Code of Conduct for Responsible Fisheries (FAO, 1995), which states that “the right to fish carries with it the obligation to do so in a responsible manner so as to ensure effective conservation and management of the living aquatic resources”, the management of marine turtles should seek to maintain the availability of the resource “in sufficient quantities for present and future generations in the context of food security, poverty alleviation and sustainable development”. Management measures should, *inter alia*, prevent over-fishing, rehabilitate depleted populations, incorporate the best scientific evidence (taking into account traditional knowledge, as well as relevant environmental, economic and social factors), assign priority to research and data collection (including at international scales) and promote environmentally safe fishing gear and practices in order to protect both the target resource and the ecosystems upon which it depends.

1. In the light of the recognized depleted status of marine turtles in the WCR and in most of the jurisdictions reviewed for this study (the status in some jurisdictions is unknown or, in the absence of objective data, subject to differing views), and in the light of the potential for continuing declines resulting from the legally mandated exploitation of large juvenile and adult turtles or the lack of meaningful controls on marine turtle exploitation, governments allowing legal exploitation of marine turtles should move expeditiously to review and revise comprehensively the legal framework and the broader institutional mandates and priorities that provide for marine turtle management. In so doing, they should clarify their national policy regarding marine turtles.

In addition to measures governing exploitation, including exemptions for subsistence and indigenous use and for the collection of eggs, this review should address the marketing and trade, both internal and international, of marine turtles and turtle products and enforcement of legal provisions, including appropriate penalties and capacities for enforcement. Revised legislation should allow for flexibility in the implementation of effective management regimes and ensure that the competent authorities have the powers to amend relevant regulations in a timely fashion in order to implement management changes. Finally, this review should include the necessary provisions to enable full implementation and enforcement of CITES.

Consideration should be given as to whether this review can be effectively undertaken while hundreds and thousands of marine turtles continue to be exploited, uncounted thousands more drown in indiscriminate fishing gear every year and, in at least some jurisdictions, the majority of eggs laid are collected for sale and consumption. With these challenges apparently in mind, a moratorium on the capture of marine turtles, seen as a useful interim step to enable national stock assessments, was recommended more than a decade ago by the harmonized fishery regulations of OECS (FAO, 1993), a recommendation that was never realized.

2. In support of a comprehensive review and revision of the legal framework for marine turtle management, a comprehensive frame survey (marine turtle catch and use assessment) should be undertaken to quantify and characterize exploitation and use of marine turtles at the national level, including:
 - the landing of turtles at sea and hunting on nesting beaches;
 - exchange and marketing of turtles and turtle products;
 - numbers and types of fishers (and gears) involved, including the extent to which marine turtle landings result from incidental or opportunistic take in other fishing operations or from a targeted fishery;
 - processing and marketing patterns; and
 - the importance to livelihoods of the products and income derived from marine turtle exploitation.

This investigation should also aim to establish the nature and extent of illegal exploitation and trade of marine turtles and eggs and marine turtle products, and the extent to which they may negatively impact marine turtle populations and compromise marine turtle management.

3. If legal exploitation of marine turtles is to continue, the restrictions on this exploitation must reflect the biological parameters of marine turtles, take into account their depleted status and aim, at a minimum, at preventing any further population declines. Any exploitation regime promoting population recovery and maintenance should be established and conducted according to sound management principles and practice, which should include the following:
 - A. Bringing exploitation in line with biological principles, including:
 - complete protection of nesting females at all times;
 - complete protection of all species during the primary nesting season, 1 March to 30 November;
 - complete protection of the Leatherback, which occurs in the region only as an adult, and typically an egg-bearing female;
 - maximum size limits, based on length (which is easier to undertake in the field) rather than weight, so as to safeguard large juveniles and adults;
 - a conservative limit on the numbers of animals and/or eggs that may be exploited, such as through quotas and/or licences; and
 - a requirement that capture quotas be based, if not on a stock assessment, on data derived from national processes and research activities, and that, as far as practicable, these data be collected in such a way as to be compatible with the goal of assessing stocks throughout their full geographical ranges.
 - B. Managing the legal fishery through an enforceable, high-compliance monitoring programme aimed at establishing trends and monitoring these over time. A national programme to monitor marine turtle exploitation should document comprehensively and systematically, and in a manner allowing such records to be analysed and compared over time, the following:
 - the number of fishers taking marine turtles and by what means;
 - the number, size and species distribution of the marine turtles landed;
 - the locality where the animals were taken;
 - catch-per-unit-effort; and
 - the disposition of the marine turtles landed, including value of the animal and/or products if sold or traded.

In support of reliable monitoring of the fishery, the following should be required:

- that ownership identification tags be installed on approved gear (e.g. nets);
- that turtles be landed alive or intact, prohibiting, for example, the use of spear guns and extended net sets that can result in drowning, and providing for reliable recording and verification of turtle landings; and
- that the licensing process include as a criterion full participation in the monitoring programme.

C. Establishing a systematic marine turtle monitoring programme that will:

- document distribution and abundance of local populations;
- identify major nesting grounds and foraging areas;
- designate Index nesting beaches and Index foraging grounds and document the numbers of marine turtles occurring in these over time;
- manage data records such that statistically significant trends in abundance can be identified and inform management; and
- identify and monitor threats and other factors influencing marine turtle survival.

4. Mechanisms to quantify levels of incidental mortality of marine turtles, arguably the largest single sources of mortality in some jurisdictions, should be developed. Drawing on examples from within the region (e.g. from Trinidad and Guadeloupe) and beyond, measures to reduce or eliminate the incidental capture and mortality of marine turtles, such as through stakeholder-led processes, incentives packages, time-area closures and/or alternative types of gear or fishing methodology, should be researched, evaluated, and implemented.
5. Critical habitats, both terrestrial and marine, for marine turtles should be identified and protected and incorporated into broader biodiversity management programmes. The identification of critical habitats should occur over the range of the population, taking into account that foraging habitats for seasonally encountered breeding animals may be located in distant range States. It is noted that new governance regimes may be necessary to safeguard marine turtles in international waters, including high-seas migratory corridors, and to protect highly mobile life stages adequately.
6. Increased efforts should be made to engage rural communities and fishers in marine turtle conservation and management. Fisheries and rural development extension efforts should be implemented that involve regular exchanges with fishers and hunters regarding marine turtles and their conservation and management needs and their participation in efforts to manage marine turtles so as to enhance compliance with regulations and support for marine turtle management. Support directed toward sustainable fishery practices and/or alternative livelihoods, including but not limited to non-extractive use of marine turtles, should be provided, as relevant and necessary, to assist fishers and hunters meaningfully in their efforts to comply with revised marine turtle regulations.

Recognizing the range of negative impacts of coastal development (e.g. sand-mining, destruction of vegetation, beach construction and armouring, beach-front lighting, vehicular use of nesting beaches) on marine turtles and turtle habitat and the increasing role of marine turtles in the “tourism product” of many countries in the WCR, increased efforts should likewise be made to engage the tourism sector in comprehensive efforts to manage and conserve marine turtles and their habitats.

7. A greater investment of resources—human, financial, logistical—in marine turtle management is clearly needed if these species are to recover. Financial, logistical and political support and encouragement should be extended to relevant government agencies to develop and implement a modern, scientifically based conservation and management regime for nationally depleted marine turtle stocks, including for the revision of the legal framework, scientific studies, monitoring programmes, co-ordination with other jurisdictions sharing the same turtle stocks, enforcement capacity and institutional strengthening of government agencies whose mandate includes marine turtles and their habitats. Sustained technical assistance, including training and other forms of professional development, is essential if these efforts are to succeed.

In this context, it should be noted that substantial financial, technical and infrastructural investments are being made in the region in the form of fisheries development and management. By and large, these investments appear to be focused on maximizing catches and economic returns rather than fostering sustainability. Government budgetary appropriations, overseas development assistance and private-sector investment must recognize that there can be no such thing as fisheries “management” if there is no baseline stock assessment or trend data, no monitoring of fisheries landings, no enforcement presence at sea and no underlying legal or regulatory framework that supports controls and their enforcement in relation to marine resource use. Similarly, the development of tourism infrastructure should more effectively address impacts on biodiversity and marine turtles. Both private and public foreign investment in the fisheries and tourism sectors should take account of the increased responsibilities—and costs—of the relevant government agencies in managing for sustainability the resources concerned and the broader biodiversity impacts that may ensue.

8. The essential role of the non-government sector, in some instances including universities, research institutions and other agencies, as well as NGOs and CBOs, in partnering (including through co-management arrangements) with governments to undertake marine turtle conservation and management should be enhanced through the provision of financial, logistical and political support by governments and the donor community, in particular in the development of partnerships, including co-management arrangements, to meet mutually agreed objectives.
9. Due recognition should be afforded the socio-economic circumstances, in particular in the Latin American countries reviewed, that drive much of marine turtle exploitation. There is a clear need for a multi-sectoral, integrated approach that brings marine turtle exploitation in line with the principle of sustainability and finds solutions that enhance rather than depress livelihoods and quality of life, especially for the most vulnerable of human populations. Donor and technical assistance agencies with capacities in rural development should be encouraged to engage in efforts to improve the balance between marine turtles and coastal communities.
10. Effective management of marine turtles at the national level necessitates a regional approach to management, in the collection and recording of data on marine turtles and in the design of management regimes aiming at the sustainability of marine turtle populations.

Greater emphasis, including by donor agencies, should be given to identifying the boundaries of shared stocks, such as through telemetric and/or genetic studies. In addition, range States should be afforded greater access to the research tools necessary for a modern understanding of stock origin, movement and home range. Data should be collected and analysed to contribute not only to national stock assessments, but to provide a scientific basis for co-ordinated responses to shared marine turtle management issues.

11. Along the same vein, mechanisms must be developed and implemented that provide not only for co-operation but also for co-ordination in implementing management measures between countries that share management responsibility for marine turtle stocks. Developing a scientifically based regime for exploiting marine turtles at the “national” level will focus exploitation on foraging populations which, in most instances, comprise stocks of mixed origin. There is a need for management measures to factor in exploitation and other impacts outside “national” jurisdictions, as well as the management objectives of jurisdictions that are placing a priority on the recovery of marine turtle populations.

Many contributors to this review noted the importance to their national management efforts of a regional management plan and of funding to support the co-operative efforts needed to implement such a plan. The WCR benefits from two regional treaties relating to marine turtles: the SPAW Protocol, which entered into force in 2000, and IAC, which entered into effect in 2001. Comprehensive membership by the countries of the WCR will greatly enhance the effectiveness of these instruments in serving as a regional forum for collaboration and co-operation in marine turtle management. Serious consideration should be afforded to how these agreements could provide the political apparatus for multilateral decision-making on specific management measures as well as how they can facilitate the process and assist in providing for the technical and institutional infrastructure that will be required if the process is to be successful.

12. There is a need for greater international co-operation in stemming illegal international trade in marine turtle products. Existing efforts to address regional wildlife trade issues in Central America, in particular, should be strengthened through increased financial, logistical and political support and expanded to support necessary bilateral and multilateral efforts in other jurisdictions in the region.

REFERENCES

- Abreu Grobois, F.A., V. Guzmán, E. Cuevas and M. Alba Gamio (Compilers). (2005). *Memorias del Taller Rumbo a la COP 3: Diagnóstico del estado de la tortuga carey (Eretmochelys imbricata) en la Península de Yucatán y determinación de acciones estratégicas*. SEMARNAT, CONANP, IFAW, PRONATURA–Península de Yucatán, WWF, Defenders of Wildlife.
- Aiken, J.J., B.J. Godley, A.C. Broderick, T. Austin, G. Ebanks-Petrie and G.C. Hays. (2001). Two hundred years after a commercial marine turtle fishery: the current status of marine turtles nesting in the Cayman Islands. *Oryx* 35:145–152.
- Bacon, P., F. Berry, K. Bjorndal, H. Hirth, L. Ogren and M. Weber (Eds). (1984). *Proceedings of the Western Atlantic Turtle Symposium, 17–22 July 1983, San José, Costa Rica*, I. RSMAS Printing, Miami. 306 pp.
- Bass, A.L. (1999). Genetic analysis to elucidate the natural history and behaviour of hawksbill turtles (*Eretmochelys imbricata*) in the wider Caribbean: a review and re-analysis. *Chelonian Conservation and Biology* 3(2):195–199.
- Bjorndal, K.A. (1982). The consequences of herbivory for the life history pattern of the Caribbean green turtle, *Chelonia mydas*. Pp. 111–116. In: K.A. Bjorndal (Ed.). *Biology and Conservation of Sea Turtles*. Smithsonian Institution Press, Washington, DC.
- Bjorndal, K.A. and A.B. Bolten. (2003). From ghosts to key species: restoring sea turtle populations to fulfill their ecological roles. *Marine Turtle Newsletter* 100:16–21. (To access all articles published in the *Marine Turtle Newsletter*, visit www.seaturtle.org/mtn/)
- Bjorndal, K.A. and J.B.C. Jackson. (2003). Roles of sea turtles in marine ecosystems: reconstructing the past. Pp. 259–273. In: P.L. Lutz, J.A. Musick and J. Wyneken (Eds). *The Biology of Sea Turtles*, II. CRC Press, Boca Raton, Florida.

- Bjorndal, K.A., A.B. Bolten and H.R. Martins. (2000). Somatic growth model of juvenile loggerhead sea turtles: duration of the pelagic stage. *Marine Ecology Progress Series* 202:265–272.
- Bjorndal, K.A., A. Carr, A.B. Meylan, J.A. Mortimer. (1985). Reproductive biology of the hawksbill *Eretmochelys imbricata* at Tortuguero, Costa Rica, with notes on the ecology of the species in the Caribbean. *Biological Conservation* 34:353–368.
- Bolten, A.B. (2003). Introduction: The loggerhead sea turtle—a most excellent fish. Pp. 1–3. In: A.B. Bolten and B.E. Witherington (Eds). *Loggerhead Sea Turtles*. Smithsonian Books, Washington, DC.
- Bouchard, S.S. and K.A. Bjorndal. (2000). Sea turtles as biological transporters of nutrients and energy from marine to terrestrial ecosystems. *Ecology* 81:2305–2313.
- Boulon, R.H., P.H. Dutton and D.L. McDonald. (1996). Leatherback turtles (*Dermochelys coriacea*) on St. Croix, U.S. Virgin Islands: fifteen years of conservation. *Chelonian Conservation and Biology* 2(2):141–147.
- Bowen, B.W. (2003). What is a loggerhead turtle? The genetic perspective. Pp. 7–27. In: A.B. Bolten and B.E. Witherington (Eds). *Loggerhead Sea Turtles*. Smithsonian Books, Washington, DC.
- Bowen, B.W. and S.A. Karl. (1997). Population genetics, phylogeography, and molecular evolution. Pp. 29–50. In: P.L. Lutz and J.A. Musick (Eds). *The Biology of Sea Turtles*. CRC Press, Boca Raton, Florida.
- Bowen, B.W. and W.N. Witzell. (1996). *Proceedings of the International Symposium on Sea Turtle Conservation Genetics*. NOAA Technical Memorandum NMFS-SEFSC-396. US Department of Commerce.
- Byrne, R. (2004). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of Marine Turtles of the Lesser Antilles, Central America, Colombia and Venezuela. Completed by Rowan Byrne, RoSTI Project Manager. Dated 8 June 2004.
- Campbell, C.L. (2003). Population assessment and management needs of a green turtle, *Chelonia mydas*, population in the western Caribbean. Ph.D. dissertation, University of Florida. 124 pp.
- Canin, J. (1991). International trade aspects of the Japanese Hawksbill shell ('Bekko') industry. *Marine Turtle Newsletter* 54:17–21. (To access all articles published in the *Marine Turtle Newsletter*, visit www.seaturtle.org/mtn/)
- Carr, A. (1955). *The Windward Road: Adventures of a Naturalist on Remote Caribbean Shores*. The Florida State University Press, Tallahassee. 258 pp.
- Carr, A. (1967). *The Sea Turtle: So Excellent a Fish*. University of Texas Press, Austin. 280 pp.
- Carr, A., M.H. Carr and A.B. Meylan. (1978). The ecology and migration of sea turtles, 7. The West Caribbean green turtle colony. *Bulletin of the American Museum of Natural History* 162(1):1–46.
- Carr, A., A. Meylan, J. Mortimer, K. Bjorndal and T. Carr. (1982). *Surveys of sea turtle populations and habitats in the Western Atlantic*. NOAA Technical Memorandum NMFS-SEFC-91. US Department of Commerce.
- Chacón, D. (2001). Cultural and economic roles of sea turtles. Pp. 18–23. In: K.L. Eckert and F.A. Abreu Grobois (Eds). *Proceedings of the Regional Meeting, Marine Turtle Conservation in the Wider Caribbean Region: A Dialogue for Effective Regional Management, Santo Domingo, 16–18 November 1999*. WIDECAST, IUCN-MTSG, WWF and UNEP-CEP. Available at www.iucn-tsg.org/publications/DR_Proceedings/Index.htm (English) and www.iucn-mtsg.org/publications/Memorias_RD/ContenidoRD.htm (Spanish).
- Chacón, D. (2002). *Diagnóstico sobre el comercio de las tortugas marinas y sus derivados en el istmo centroamericano*. Red Regional para la Conservación de las Tortugas Marinas en Centroamérica (RCA), San José, Costa Rica.
- Chaloupka, M.Y. and J.A. Musick. (1997). Age, growth, and population dynamics. Pp. 233–276. In: P.L. Lutz and J.A. Musick (Eds). *The Biology of Sea Turtles*. CRC Press, Boca Raton, Florida.
- Chevalier, J. (2003). Plan de restauration des tortues marines des Antilles Françaises. Document de Travail. Septembre 2003. Office National de la Chasse et de la Faune Sauvage (ONCFS), Direction Régionale de l'Environnement (DIREN). www.martinique.ecologie.gouv.fr/rapports.html

- Chevalier, J. and M. Girondot. (2000). Recent population trend for *Dermochelys coriacea* in French Guiana. Pp.56–57. In: Abreu Grobois, F.A., R. Briseño-Dueñas, R. Márquez, and L. Sarti (Compilers). *Proceedings of the 18th International Sea Turtle Symposium*. NOAA Technical Memorandum NMFS-SEFSC-436. US Department of Commerce. Available at: www.nmfs.noaa.gov/pr/species/turtles/symposia.htm
- CICTMAR (Centro de Investigación y Conservación de Tortugas Marinas). (2002). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of the Marine Turtles of the Lesser Antilles, Central America, Colombia and Venezuela. Completed by Hedelvy J. Guada, Directora Ejecutiva. Dated 17 August 2002.
- Crouse, D.T., L.B. Crowder and H. Caswell. (1987). A stage-based population model for loggerhead sea turtles and implications for conservation. *Ecology* 68:1412–1423.
- Crowder, L.B., D.T. Crouse, S.S. Heppell and T.H. Martin. (1994). Predicting the impact of turtle excluder devices on loggerhead sea turtle populations. *Ecological Applications* 4:437–445.
- Delcroix, E. (2003). Etude des captures accidentelles de tortues marines par la pêche maritime dans les eaux de l'archipel guadeloupéen. Maîtrise des Sciences et Techniques Aménagement et Environnement à Metz. Rapport AEVA. 85 pp. Unpublished.
- Díaz-Fernández, R., T. Okayama, T. Uchiyama, E. Carrillo, G. Espinosa, R. Márquez, C. Diez and H. Koike. (1999). Genetic sourcing for the Hawksbill Turtle, *Eretmochelys imbricata*, in the northern Caribbean region. *Chelonian Conservation and Biology* 3(2):296–300.
- Donnelly, M. (1991). Japan bans import of hawksbill shell effective December 1992. *Marine Turtle Newsletter* 54:1–3. (To access all articles published in the *Marine Turtle Newsletter*, visit www.seaturtle.org/mtn/)
- Dutton, D.L., P.H. Dutton, M. Chaloupka and R.H. Boulon. (2005). Increase of a Caribbean leatherback turtle *Dermochelys coriacea* nesting population linked to long-term nest protection. *Biological Conservation* 126:186–194.
- Dutton, P.H., B.W. Bowen, D.W. Owens, A. Barragan and S.K. Davis. (1999). Global phylogeography of the leatherback turtle (*Dermochelys coriacea*). *Journal of Zoology, London* 248:397–409.
- Eckert, K.L. (1987). Environmental unpredictability and leatherback sea turtle (*Dermochelys coriacea*) nest loss. *Herpetologica* 43(3):315–323.
- Eckert, K.L. (1995a). *Draft General Guidelines and Criteria for Management of Threatened and Endangered Marine Turtles in the Wider Caribbean Region*. UNEP(OCA)/CAR WG.19/INF.7. Prepared by WIDECAS for the 3rd Meeting of the Interim Scientific and Technical Advisory Committee to the SPAW Protocol. Kingston, 11–13 October 1995. United Nations Caribbean Environment Programme, Kingston, Jamaica. 95 pp.
- Eckert, K.L. (1995b). Leatherback Sea Turtle, *Dermochelys coriacea*. Pp. 37–75. In: P.T. Plotkin (Ed.). *National Marine Fisheries Service and U. S. Fish and Wildlife Service Status Reviews for Sea Turtles Listed under the Endangered Species Act of 1973*. US National Marine Fisheries Service, Silver Spring, Maryland. www.nmfs.noaa.gov/pr/readingrm/statrvws/Sea_Turtle_Status_Reviews.pdf
- Eckert, K.L. (2001). Status and distribution of the leatherback sea turtle, *Dermochelys coriacea*, in the Wider Caribbean Region. Pp. 24–31. In: K.L. Eckert and F.A. Abreu Grobois (Eds). *Proceedings of the Regional Meeting, Marine Turtle Conservation in the Wider Caribbean Region: A Dialogue for Effective Regional Management, Santo Domingo, 16–18 November 1999*. WIDECAS, IUCN-MTSG, WWF and UNEP-CEP. www.iucn-tsg.org/publications/DR_Proceedings/Index.htm (English) and www.iucn-mtsg.org/publications/Memorias_RD/ContenidoRD.htm (Spanish)

- Eckert, K.L. and F.A. Abreu Grobois (Eds). (2001). *Proceedings of the Regional Meeting, Marine Turtle Conservation in the Wider Caribbean Region: A Dialogue for Effective Regional Management, Santo Domingo, 16–18 November 1999*. WIDECAST, IUCN-MTSG, WWF and UNEP-CEP. xx + 154 pp. www.iucn-tsg.org/publications/DR_Proceedings/Index.htm (English) and www.iucn-mtsg.org/publications/Memorias_RD/ContenidoRD.htm (Spanish).
- Eckert, K.L. and A.H. Hemphill. (2005). Sea turtles as flagships for protection of the Wider Caribbean Region. *MAST* 3(2) and 4(1):119–143. www.marecentre.nl/mast/MASTturtleissue.html
- Eckert, K.L., S.A. Eckert, T.W. Adams and A.D. Tucker. (1989). Inter-nesting migrations by leatherback sea turtles (*Dermochelys coriacea*) in the West Indies. *Herpetologica* 45(2):190–194.
- Eckert, S.A. (1998). Perspectives on the use of satellite telemetry and electronic technologies for the study of marine turtles, with reference to the first year-long tracking of leatherback sea turtles. Pp. 44–46. In: S.P. Epperly and J. Braun (Compilers). *Proceedings of the 17th Annual Sea Turtle Symposium*. NOAA Technical Memorandum NMFS-SEFSC-415. US Department of Commerce. Available at: www.nmfs.noaa.gov/pr/species/turtles/symposia.htm
- Eckert, S.A. (2002). Distribution of juvenile leatherback sea turtle, *Dermochelys coriacea*, sightings. *Marine Ecology Progress Series* 230:289–293.
- Eckert, S.A. (2006 [in press]). Dive behavior, internesting and post-nesting movements of leatherback sea turtles (*Dermochelys coriacea*) from Trinidad nesting beaches. *Marine Biology*.
- Eckert, S.A., D. Bagley, S. Kubis, L. Ehrhart, C. Johnson, K. Stewart and D. DeFreese. (2006 [in press]). Internesting, post-nesting movements and foraging habitats of leatherback sea turtles (*Dermochelys coriacea*) nesting in Florida. *Chelonian Conservation and Biology*.
- Ehrhart, L.M., D.A. Bagley and W.E. Redfoot. (2003). Loggerhead turtles in the Atlantic Ocean: geographic distribution, abundance, and population status. Pp. 157–174. In: A.B. Bolten and B.E. Witherington (Eds). *Loggerhead Sea Turtles*. Smithsonian Books, Washington, DC.
- Encalada, S.E., K.A. Bjorndal, A.B. Bolten, J.C. Zurita, B. Schroeder, E. Possardt, C.J. Sears and B.W. Bowen. (1998). Population structure of loggerhead turtle (*Caretta caretta*) nesting colonies in the Atlantic and Mediterranean as inferred from mitochondrial DNA control region sequences. *Marine Biology* 130:567–575.
- FAO. (1993). Marine fishery resources of the Antilles. *FAO Fisheries Technical Paper* 326:1–235. Food and Agriculture Organization of the United Nations, Rome.
- FAO. (1995). Code of Conduct for Responsible Fisheries. Adopted by the 28th Session of the FAO Conference. Food and Agriculture Organization of the United Nations, Rome. 34 pp. + annexes. www.fao.org/fi/agreem/codecond/codecon.asp
- FAO. (1996). Precautionary approach to capture fisheries and species introductions. Elaborated by the Technical Consultation on the Precautionary Approach to Capture Fisheries (including Species Introductions). Lysekil, Sweden, 6–13 June 1995. *FAO Technical Guidelines for Responsible Fisheries. No. 2*. Food and Agriculture Organization of the United Nations, Rome. 54 pp. www.fao.org/fi/eims_search/advanced_s_result.asp
- FAO. (2004). *Report of the Expert Consultation on Interactions between Sea Turtles and Fisheries within an Ecosystem Context*. Rome, Italy, 9–12 March 2004. *FAO Fisheries Report No. 738*. Food and Agricultural Organization of the United Nations, Rome. 37 pp.
- FFWCC (Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission). (2004). Feature: Loggerhead Nesting in Florida. research.myfwc.com/features/view_article.asp?id=2411.
- Fleming, E. (2001). *Swimming Against the Tide: Recent Surveys of Exploitation, Trade, and Management of Marine Turtles in the Northern Caribbean*. TRAFFIC North America. Washington, DC. 161 pp.
- Frazer, N.B. (1986). Survival from egg to adulthood in a declining population of loggerhead turtles, *Caretta caretta*. *Herpetologica* 42(1):47–55

- Frazer, N.B. (1989). Management options: a philosophical approach to population models. Pp. 198–207. In: L. Ogren (Ed.-in-Chief). *Proceedings of the Second Western Atlantic Turtle Symposium*. NOAA Technical Memorandum NMFS-SEFC-226. US Department of Commerce.
- Frazer, N. B. and R. C. Ladner. (1986). A growth curve for green sea turtles, *Chelonia mydas*, in the US Virgin Islands, 1913–14. *Copeia* 1986:798–802.
- Frazier, J. (2001). General natural history of marine turtles. Pp. 3–17. In: K.L. Eckert and F.A. Abreu Grobois (Eds). *Proceedings of the Regional Meeting, Marine Turtle Conservation in the Wider Caribbean Region: A Dialogue for Effective Regional Management, Santo Domingo, 16–18 November 1999*. WIDECAST, IUCN-MTSG, WWF and UNEP-CEP. www.iucn-tsg.org/publications/DR_Proceedings/Index.htm (English) and www.iucn-mtsg.org/publications/Memorias_RD/ContenidoRD.htm (Spanish)
- Frazier, J. (2003). Prehistoric and ancient historic interactions between humans and marine turtles. Pp. 1–38. In: P.L. Lutz, J.A. Musick and J. Wyneken (Eds). *The Biology of Sea Turtles*, II. CRC Press, Boca Raton, Florida.
- Frazier, J. (2005a). Marine turtles: the role of flagship species in interactions between people and the Sea. *MAST* 3(2) and 4(1):5–38. www.marecentre.nl/mast/MASTturtleissue.html
- Frazier, J. (2005b). Flagging the Flagship: Valuing Experiences from Ancient Depths. *MAST* 3(2) and 4(1):273–303. www.marecentre.nl/mast/MASTturtleissue.html
- Fuller, J.E., K.L. Eckert and J.I. Richardson. (1992). *WIDECAST Sea Turtle Recovery Action Plan for Antigua and Barbuda*. CEP Technical Report No. 16. UNEP Caribbean Environment Programme, Kingston, Jamaica. 88 pp.
- Girondot, M. and J. Frétey. (1996). Leatherback turtles, *Dermochelys coriacea*, nesting in French Guiana, 1978–1995. *Chelonian Conservation and Biology* 2(2):204–208.
- Godley, B.J., A.C. Broderick, L.M. Campbell, S. Ranger, P.B. Richardson. (2004). An assessment of the status and exploitation of marine turtles in Anguilla. Pp. 39–77. In: *An Assessment of the Status and Exploitation of Marine Turtles in the UK Overseas Territories in the Wider Caribbean*. Final project report for the Department of Environment, Food and Rural Affairs (Defra) and the Foreign Commonwealth Office. www.seaturtle.org/mtrg/projects/tcot/finalreport
- Grazette, S. (2002). Saint Vincent and the Grenadines. Pp. 45–63. In: Harvest and national trade of sea turtles and their products in the Eastern Caribbean. MSc. thesis, Natural Resource Management Programme, University of the West Indies, Barbados.
- Grazette, S. (In press.) An assessment of the sea turtle fishery in Grenada, West Indies. *Oryx*.
- Groombridge, B. and R. Luxmoore. (1989). *The Green Turtle and Hawksbill (Reptilia: Cheloniidae): World Status, Exploitation and Trade*. Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Lausanne, Switzerland. 601 pp.
- Hays, G.C., J.D.R. Houghton and A.E. Myers. (2004a). Pan-Atlantic leatherback turtle movements. *Nature* 429:522.
- Hays, G.C., J.D.R. Houghton, C. Isaacs, R.S. King, C. Lloyd and P. Lovell. (2004b). First records of oceanic dive profiles for leatherback turtles, *Dermochelys coriacea*, indicate behavioural plasticity associated with long-distance migration. *Animal Behaviour* 67:733–743.
- Heppell, S.S., L.B. Crowder and T.R. Menzel. (1999). Life table analysis of long-lived marine species with implications for management. Pp. 137–148. In: J.A. Musick (Ed.). *Life in the Slow Lane: Ecology and Conservation of Long-Lived Marine Animals*. American Fisheries Society Symposium 23. American Fisheries Society, Bethesda, Maryland.
- Heppell, S.S., D.T. Crouse and L.B. Crowder. (2000). Using matrix models to focus research and management efforts in conservation. Pp. 148–168. In: S. Ferson and M. Burgman (Eds). *Quantitative Methods for Conservation Biology*. Springer-Verlag, Berlin.

- Heppell, S.S., M.L. Snover and L.B. Crowder. (2003). Sea turtle population ecology. Pp. 275–306. In: P.L. Lutz, J.A. Musick and J. Wyneken (Eds). *The Biology of Sea Turtles*, II. CRC Press, Boca Raton, Florida.
- Heppell, S.S., D.T. Crouse, L.B. Crowder, S.P. Epperly, W. Gabriel, T. Henwood, R. Márquez and N.B. Thompson. (2004). A population model to estimate recovery time, population size and management impacts on Kemp's ridley sea turtles. *Chelonian Conservation and Biology* 4(4):767–773.
- Hernández, P., S. (2002). Sistema de Aprovechamiento Sostenible de la tortuga verde (*Chelonia mydas*), la tortuga Carey (*Eretmochelys imbricata*), la tortuga caguama (*Caretta caretta*), y la tortuga canal (*Dermochelys coriacea*). Presentación general, 11 de diciembre de 2002. Programa Uso y Valoración, Instituto Alexander von Humboldt.
- Hilterman, M.L., E. Goverse and C.J. de Bres. (2001). *The Sea Turtles of Suriname, 2000*. Biotopic Technical Report, commissioned by World Wildlife Fund—Guianas Forests and Environmental Conservation Project (GFECF), Paramaribo, Suriname.
- Horrocks, J.A. (2001). Reducing threats on foraging grounds. Pp. 121–126. In: K.L. Eckert and F.A. Abreu Grobois (Eds). *Proceedings of the Regional Meeting, Marine Turtle Conservation in the Wider Caribbean Region: A Dialogue for Effective Regional Management, Santo Domingo, 16–18 November 1999*. WIDECAST, IUCN-MTSG, WWF and UNEP-CEP. www.iucn-tsg.org/publications/DR_Proceedings/Index.htm (English) and www.iucn-mtsg.org/publications/Memorias_RD/ContenidoRD.htm (Spanish)
- Horrocks, J.A., L.A. Vermeer, B. Krueger, M. Coyne, B. Schroeder and G. Balazs. (2001). Migration routes and destination characteristics of post-nesting hawksbill turtles satellite-tracked from Barbados, West Indies. *Chelonian Conservation and Biology* 4(1):1–7.
- Instituto Alexander von Humboldt. (2000). El uso de la fauna silvestre como estrategia de conservación. Convenio de Cooperación Técnica y Científica 043. Ministerio del Medio Ambiente, Colombia. Anexos.
- IUCN. (2002). *Hawksbill Turtles in the Caribbean Region: Basic Biological Characteristics and Population Status*. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Background Paper. www.cites.org/eng/prog/HBT/intro.shtml
- IUCN. (2004). *2004 IUCN Red List of Threatened Species*. www.iucnredlist.org.
- Jackson, J.B.C. (1997). Reefs since Columbus. *Coral Reefs* 16, Suppl.: S23–S32.
- James, M.C., S. A. Eckert and R.A. Myers. (2005). Migratory and reproductive movements of male leatherback turtles (*Dermochelys coriacea*). *Marine Biology* 147(4):845–853.
- King, F.W. (1982). Historical review of the decline of the green turtle and the hawksbill. Pp. 183–188. In: K.A. Bjorndal (Ed.). *The Biology and Conservation of Sea Turtles*. Smithsonian Institution Press, Washington, DC.
- Krueger, B., J. Horrocks and J. Beggs. (2003a). Increase in nesting activity by hawksbill turtles (*Eretmochelys imbricata*) in Barbados. P. 149. In: J.A. Seminoff (Comp.). *Proceedings of the 22nd Annual Symposium on Sea Turtle Biology and Conservation*. NOAA Technical Memorandum NMFS-SEFSC-503. US Department of Commerce. (All proceedings available at: www.nmfs.noaa.gov/pr/species/turtles/symposia.htm)
- Krueger, B. K., J. A. Horrocks and J. Beggs. (2003b). International Movements of Adult Female and Juvenile hawksbill Turtles, *Eretmochelys imbricata*, from Barbados, West Indies. Paper presented at the 23rd Annual Symposium on Sea Turtle Biology and Conservation, Kuala Lumpur, Malaysia, March 2003.
- Lagueux, C.J. (1998). *Marine Turtle Fishery of Caribbean Nicaragua: Human Use Patterns and Harvest Trends*. Doctoral dissertation. University of Florida, Gainesville. 215 pp.
- Lagueux, C.J., C.L. Campbell and L.W. Lauck (Eds). (2002). Draft Management Strategy for Sea Turtle Conservation on the Caribbean Coast of Nicaragua. Project #99-033-001, National Fish and Wildlife Foundation, Washington, DC. 113 pp. Unpublished.
- Laurent, L., R. Charles and R. Lieveld. (1999). The Guianas: Sea Turtle Conservation Regional Strategy and Action Plan 2001–2006. Fishery Sector Report, commissioned by World Wildlife Fund—Guianas Forests and Environmental Conservation Project (GFECF), Paramaribo, Suriname.

- Lee Lum, L.M. (2003). *An assessment of incidental turtle catch in the gillnet fishery in Trinidad and Tobago*. Research Report. Institute of Marine Affairs, Trinidad and Tobago. 38 pp.
- León, Y.M. and K.A. Bjorndal. (2002). Selective feeding in the hawksbill turtle, an important predator in coral reef ecosystems. *Marine Ecology Progress Series* 245:249–258.
- Lewis, C.B. (1940). The Cayman Islands and marine turtle. *Bulletin of the Institute of Jamaica Science Series* 2:56–65.
- Lohmann, K.J., B.E. Witherington, C.M.F. Lohmann and M. Salmon. (1997). Orientation, navigation, and a natal beach homing in sea turtles. Pp. 107–135. In: P.L. Lutz and J.A. Musick (Eds). *The Biology of Sea Turtles*. CRC Press, Boca Raton, Florida.
- Long, E. (1774). *The History of Jamaica, or General Survey of the Ancient and Modern State of that Island*. T. Loundes, London.
- Luke, K., J. Horrocks, R. Leroux and P. Dutton. (2004). Origins of green turtle feeding aggregations around Barbados, West Indies. *Marine Biology* 144:799–805.
- Mack, D., N. Duplaix and S. Wells. (1982). Sea Turtles: Animals of Divisible Parts: International Trade in Sea Turtle Products. Pp. 545–563. In: K.A. Bjorndal (Ed.). *The Biology and Conservation of Sea Turtles*. Smithsonian Institution Press, Washington, DC.
- Marcovaldi, M.A. (2001). Status and distribution of the olive ridley turtle, *Lepidochelys olivacea*, in the Western Atlantic Ocean. Pp. 52–56. In: K.L. Eckert and F.A. Abreu Grobois (Eds). *Proceedings of the Regional Meeting, Marine Turtle Conservation in the Wider Caribbean Region: A Dialogue for Effective Regional Management, Santo Domingo, 16–18 November 1999*. WIDECAS, IUCN-MTSG, WWF and UNEP-CEP. www.iucn-tsg.org/publications/DR_Proceedings/Index.htm (English) and www.iucn-mtsg.org/publications/Memorias_RD/ContenidoRD.htm (Spanish)
- Marcovaldi, M.A and A. Filippini. (1991). Trans-Atlantic movement by a juvenile hawksbill turtle. *Marine Turtle Newsletter* 52:3. (To access all articles published in the *Marine Turtle Newsletter*, visit www.seaturtle.org/mtn/)
- Márquez-M., R. (1994). *Synopsis of Biological Data on the Kemp's Ridley Turtle, Lepidochelys kempi (Garman, 1880)*. NOAA Technical Memorandum NMFS-SEFSC-343. US Department of Commerce.
- Márquez, R., J. Díaz, M. Sánchez, P. Burchfield, A. Leo, M. Carrasco, J. Peña, C. Jiménez and R. Bravo. (1999). Results of the Kemp's ridley nesting beach conservation efforts in México. *Marine Turtle Newsletter* 85:2–4. (To access all articles published in the *Marine Turtle Newsletter*, visit www.seaturtle.org/mtn/)
- Meylan, A.B. (1988). Spongivory in hawksbill turtles: a diet of glass. *Science* 239:393–395.
- Meylan, A.B. (1999a). Status of the hawksbill turtle (*Eretmochelys imbricata*) in the Caribbean Region. *Chelonian Conservation and Biology* 3(2):177–184.
- Meylan, A. (1999b). International movements of immature and adult hawksbill turtles (*Eretmochelys imbricata*) in the Caribbean Region. *Chelonian Conservation and Biology* 3(2):189–194.
- Meylan, A.B. and M. Donnelly. (1999a). Status justification for listing the hawksbill turtle (*Eretmochelys imbricata*) as Critically Endangered on the 1996 IUCN Red List of Threatened Animals. *Chelonian Conservation and Biology* 3(2):200–224.
- Milliken, T. and H. Tokunaga. (1987). *The Japanese Sea Turtle Trade 1970–1986*. A special report prepared by TRAFFIC (Japan). Center for Environmental Education, Washington, DC. 171 pp.
- Milner-Gulland, E.J. and N. Leader-Williams. (1992). Illegal exploitation of wildlife. Pp. 195–213. In: T.M. Swanson and E.B. Barbier (Eds). *Economics for the Wilds: Wildlife, Wildlands, Diversity and Development*. Earthscan Publications, London.
- MMA (Ministerio del Medio Ambiente, Colombia). (2002). *Programa Nacional para la Conservación de las Tortugas Marinas y Continentales de Colombia*. Dirección General de Ecosistemas. 63 pp.

- NRC. (1990). *Decline of the Sea Turtles: Causes and Prevention*. National Research Council. National Academy Press, Washington, DC. 259 pp.
- Ogren, L. (Ed.-in-Chief). (1989). *Proceedings of the Second Western Atlantic Turtle Symposium*. NOAA Technical Memorandum NMFS-SEFC-226. US Department of Commerce
- Ordoñez, C., A., Ruiz, S., Troëng, A. Meylan and P. Meylan (2005). *Final Project Report—2004 Hawksbill Turtle (Eretmochelys imbricata) Research and Population Recovery, at Chiriquí Beach and Escudo de Veraguas Island, Ñö Kribo region, Ngöbe-Buglé Comarca, and Bastimentos Island Marine National Park*. Prepared for ANAM, Ngöbe-Buglé Comarca and APRORENANB. Gainesville, Florida.
- Parsons, J. (1962). *The Green Turtle and Man*. University of Florida Press, Gainesville. 121 pp.
- Parsons, J. (1972). The hawksbill turtle and the tortoise shell trade. Pp. 45–60. In: *Études de géographie tropicale offertes à Pierre Gourou*. Mouton, Paris.
- Petersen, J.B. (1997). Taino, Island Carib, and Prehistoric Amerindian Economies in the West Indies: Tropical Forest Adaptations to Island Environments. Pp. 118–130. In: S.M. Wilson (Ed.). *Indigenous Peoples of the Caribbean*. University Press of Florida, Gainesville.
- Pritchard, P.C.H. (1973). International migrations of South American sea turtles (Cheloniidae and Dermochelyidae). *Animal Behaviour* 21:18–27.
- Pritchard, P.C.H. and P. Trebbau. (1984). *The Turtles of Venezuela*. Contributions to Herpetology No. 2. Society for the Study of Amphibians and Reptiles, NY. 401 pp. + plates and maps.
- Rebel, T.P. (1974). *Sea Turtles and the Turtle Industry of the West Indies, Florida, and the Gulf of Mexico*, revised edn.. University of Miami Press, Coral Gables. 250 pp.
- Reichart, H.A. (1989). Olive ridley turtle (*Lepidochelys olivacea*): status report. Pp. 175–188. In: L.H. Ogren (Ed.-in-Chief). *Proceedings of the Second Western Atlantic Turtle Symposium*. NOAA Technical Memorandum NMFS-SEFC-226. US Department of Commerce.
- Reichart, H.A. (1993). *Synopsis of Biological Data on the Olive Ridley Sea Turtle, Lepidochelys olivacea (Eschscholtz, 1829), in the Western Atlantic*. NOAA Technical Memorandum NMFS-SEFSC-336. US Department of Commerce.
- Richardson, J.I., R. Kerr Bjorkland, P. Mason, D.B. Hall, Y. Cai, K. Andrews and R. Bell. (2004). Seventeen years of saturation tagging data reveal a significant increase in nesting hawksbill turtles (*Eretmochelys imbricata*) on Jumby Bay, Long Island, Antigua, West Indies. Poster presented at the 24th Annual Symposium on Sea Turtle Biology and Conservation, San José, Costa Rica, February 2004.
- Rondón M., M.A., H.J. Guada and R.A. Hernández S. (2004). Research and conservation of sea turtles in the Paria Peninsula, Venezuela: Results of the 2003 nesting season. Poster presented at the 24th Annual Symposium on Sea Turtle Biology and Conservation, San José, Costa Rica, February 2004.
- Ross, J.P., S. Beavers, D. Mundell and M. Airth-Kindree. (1989). *The Status of Kemp's Ridley*. Center for Marine Conservation, Washington, DC. 51 pp.
- Sánchez Castañeda, R., M.R. Jolon Morales, C. González Lorenzana, J.C. Villagrán Colón, J.L. Boix Morán and H. Dieseldorff Monzón. (2002). *Estrategia nacional de manejo y conservación de tortugas marinas: Guatemala*. Consejo Nacional de Areas Protegidas-CONAP/FONACON/CBM/EPQ/UNIPESCA. 112 pp.
- Searle, L.A.W. (2001). A Brief History of Sea Turtle Communities, Conservation and Consumption in Belize. Paper presented at the 21st Annual International Symposium on Sea Turtle Biology and Conservation, Philadelphia, USA, February 2001.

- Schroeder, B.A. (2001). Reducing threats at nesting beaches. Pp. 115–120. In: K.L. Eckert and F.A. Abreu Grobois (Eds). *Proceedings of the Regional Meeting, Marine Turtle Conservation in the Wider Caribbean Region: A Dialogue for Effective Regional Management, Santo Domingo, 16–18 November 1999*. WIDECAS, IUCN-MTSG, WWF and UNEP-CEP. www.iucn-tsg.org/publications/DR_Proceedings/Index.htm (English) and www.iucn-mtsg.org/publications/Memorias_RD/ContenidoRD.htm (Spanish)
- Seminoff, J.A. (2004). *Red List Assessment of the Green Sea Turtle (Chelonia mydas) using the 2001 Red List Criteria*. IUCN-SSC Marine Turtle Specialist Group. 34 pp. www.iucn-mtsg.org/red_list/cm/MTSG_Chelonia_mydas_assessment_expanded-format.pdf
- TEWG (Turtle Expert Working Group). (2000). *Assessment Update for the Kemp's Ridley and Loggerhead Sea Turtle Populations in the Western North Atlantic*. NOAA Technical Memorandum NMFS-SEFSC-444. US Department of Commerce. www.nmfs.noaa.gov/pr/readingrm/Turtles/tewg2000.pdf
- Troëng, S. and C. Drews. (2004). *Money Talks: Economic Aspects of Marine Turtle Use and Conservation*. WWF-International, Gland, Switzerland. www.panda.org
- Troëng, S. and E. Rankin. (2005). Long-term conservation efforts contribute to positive green turtle *Chelonia mydas* nesting trend at Tortuguero, Costa Rica. *Biological Conservation* 121:111–116.
- Troëng, S., D. Chacón and B. Dick. (2004). Possible decline in leatherback turtle *Dermochelys coriacea* nesting along the coast of Caribbean Central America. *Oryx* 38(4):395–403.
- Troëng, S., P.H. Dutton and D. Evans. (2005). Migration of hawksbill turtles *Eretmochelys imbricata* from Tortuguero, Costa Rica. *Ecography* 28(3):394–402.
- Vera, V. (2004). Proyecto de seguimiento y conservación de la población de tortuga verde (*Chelonia mydas*) en el Refugio de Fauna Silvestre Isla Aves (Dependencias federales). Pp. 55–61. In: *Tortugas Marinas en Venezuela: Acciones para su Conservación*. Oficina Nacional de Diversidad Biológica, Dirección de Fauna, Ministerio del Ambiente y de los Recursos Naturales, Venezuela (MARN).
- Versteeg, A.H., J. Tacoma and P. van de Velde. (1990). Archaeological Investigations on Aruba: The Malmok Cemetery. *Publication of the Archaeological Museum Aruba* 2.
- Witherington, B.E. and C.M. Koepfel. (2000). Sea turtle nesting in Florida, USA, during the decade 1989–1998: An analysis of trends. Pp. 94–96. In: H. Kalb and T. Wibbels (Compilers). *Proceedings of the 19th Annual Symposium on Sea Turtle Conservation and Biology*. NOAA Technical Memorandum NMFS-SEFSC-443. US Department of Commerce. Available at: www.nmfs.noaa.gov/pr/species/turtles/symposia.htm
- Witherington, B.E. and R.E. Martin. (2000). *Understanding, Assessing, and Resolving Light-Pollution Problems on Sea Turtle Nesting Beaches (Revised Edition)*. Florida Fish and Wildlife Conservation Commission, FMRI Technical Report TR-2. Tallahassee, Florida. 73 pp. www.nests-certified.org/pdf/LightingTechReport.pdf
- Zug, G.R., H.J. Kalb and S.J. Luzar. (1997). Age and growth in wild Kemp's ridley sea turtles (*Lepidochelys kempii*) from skeletochronological data. *Biological Conservation* 80:261–268.

NATIONAL REVIEWS: LESSER ANTILLES

Anguilla

Introduction

Anguilla is the northernmost of the Leeward Islands of the Lesser Antilles. A low coralline island covering a land area of 91 km², with sandy bays in the south and cliffs and many sandy bays in the north, Anguilla also comprises several small, uninhabited cays, namely Dog Island, Prickly Pear Cays, Seal Island, Sandy Island, Sombrero Island, Scrub Island, Scilly Cay and Anguillita. It is situated on the Anguilla Bank, which it shares with the French/Netherlands Antilles island of Saint Martin/Sint Maarten and the French island of Saint Barthélemy (both of these part of the French overseas department of Guadeloupe) and has an Exclusive Fishery Zone of ca. 85 000 km², extending primarily to the north. Anguilla was established as a British dependent territory through the UK *Anguilla Act of 1980*.

Carr *et al.* (1982) and Meylan (1983) characterized marine turtles at the time of their writing as appearing to be more abundant in Anguilla than in most of the other Leeward Islands. They attributed this situation to the relative absence of tourist development and to the existence of extensive nesting and foraging habitats, many of them on and around the offshore cays. A few years later, all residents interviewed by Hall (1987) reported “a decrease in nesting on the mainland”, and coastal development was proceeding rapidly. In the 20 years or so since Carr *et al.* and Meylan published their accounts, the situation in Anguilla has changed considerably (Procter and Fleming, 1999; Godley *et al.*, 2004; Hodge and Eckert, in review): few marine turtles nest in Anguilla today, as compared with historical accounts of “inexhaustible numbers in the water and on nesting beaches”.

After centuries of exploitation and dramatic declines in numbers of both nesting and foraging turtles in recent decades, a moratorium on the exploitation of marine turtles and eggs was instituted in 1995 for five years and later extended until December 2005. In 2001, the process of developing a Sea Turtle Recovery Action Plan (STRAP) for Anguilla was initiated under the auspices of the Wider Caribbean Sea Turtle Conservation Network (WIDECAST) and the United Nations Caribbean Environment Programme (Hodge and Eckert, in review) and in collaboration with local stakeholders. In addition to documenting the status of and threats to marine turtles in Anguilla, the STRAP identifies a range of issues to be addressed and measures to be taken in order to promote marine turtle population recovery. Amongst these are the protection of nesting beaches, measures to control and manage coastal development and the design and implementation of research activities to identify important habitats and establish a baseline for monitoring marine turtle populations. The STRAP supports the moratorium on the take of marine turtles in that it provides an opportunity to assess population status and promote consensus among stakeholders on how best to manage remnant populations. However, the document cautions that this measure alone will not secure their survival in Anguilla: “the tourism economy still controls the future of Anguilla’s beaches” and, thus, presents a challenge to efforts to secure and safeguard critical habitats for these animals.

The status and exploitation of marine turtles in Anguilla have also been recently investigated as part of a three-year, UK Government-funded project, Turtles of the Caribbean Overseas Territories (TCOT). This project involved a range of activities in the six territories, including a socio-economic survey, field-based population assessment and extensive consultation with the government, NGOs and other stakeholders. Among the results of

this project, which have recently been published (Godley *et al.*, 2004), are a suite of recommendations to foster the recovery of marine turtles in Anguilla. These include: revision of existing legislation, including in relation to the protection and management of habitats that are increasingly under pressure from tourism development; enhancing the management capacity of the Department of Fisheries and Marine Resources (DFMR); and establishing a systematic monitoring programme for marine ecosystems so as to determine abundance trends for marine turtles. In particular, the TCOT report, noting the pending expiration of the moratorium in December 2005 (now renewed to 2020) and the demands that an appropriately controlled and regulated marine turtle fishery would place on an already over-stretched DFMR, proposes that the prohibition on marine turtle exploitation be continued, but that a three-year participatory marine turtle research programme be conducted, involving interested fishers and others in both in-water and nesting beach monitoring and sampling, in order, *inter alia*, to assess the viability of establishing a highly regulated experimental fishery. In making that recommendation, the report proposes a number of revisions to the current legal regime and measures to be incorporated into a comprehensive monitoring programme that would be necessary to ensure that any future exploitation of marine turtles is consistent with the overall recovery needs of these species.

Many of the TCOT report's findings and recommendations are being taken forward through a successor project, Turtles in the UK Overseas Territories (TUKOT), funded by the UK Government's Overseas Territory Environment Programme (OTEP) (see www.seaturtle.org/mtrg/projects/tukot).

Summary of the status of marine turtles in Anguilla

Four species of marine turtle are known historically from Anguilla (see table below). Loggerheads are infrequently encountered and are not known to nest on the island. Leatherbacks are present only during the annual egg-laying season (March–July), while Green Turtles and Hawksbill Turtles both nest on coastal beaches and forage in nearshore and offshore waters. Only Hawksbill Turtles and Leatherbacks nest in discernible numbers.

Occurrence of marine turtles in Anguilla

English common name	Scientific name	Occurrence
Loggerhead	<i>Caretta caretta</i>	I
Green Turtle	<i>Chelonia mydas</i>	N, F
Leatherback	<i>Dermochelys coriacea</i>	N
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	N, F
Kemp's Ridley	<i>Lepidochelys kempii</i>	A
Olive Ridley	<i>Lepidochelys olivacea</i>	A

Key: N=nesting; F= foraging; I=infrequent; A=absent

Foraging turtles, nearly all juveniles, are more in evidence than are nesting adults and include Hawksbill Turtles regularly encountered in the vicinity of reefs and cliffs, Green Turtles on seagrass beds in several nearshore areas and the occasional Loggerhead in hard-bottom habitats. The most important foraging areas are Scilly Cay (Island Harbour) and Forest Bay for Green Turtles; Junks Hole/Savannah Bay for Hawksbill Turtles; and Little Bay/Crocus Bay for both species (DFMR, 2002).



Fishers bringing in a beach seine net at Crocus Bay, one of the most important foraging areas for Green and Hawksbill Turtles around Anguilla.

Periodic monitoring of nesting beaches since 1998 (Connor and Connor, 1998) has provided an estimate (on mainland beaches) of fewer than 20 Leatherback nests and fewer than 30 Hawksbill Turtle nests per year. According to Hodge and Eckert (in review), the total number of female Hawksbill Turtles nesting on mainland beaches and offshore cays (Dog and Scrub islands primarily) is not likely to be more than 30 (the equivalent of some 150 nests). Leatherback nesting appears to be rising, as is also the case in the nearby US Virgin Islands (Boulon *et al.*, 1996) and British Virgin Islands (Hastings, 2002). The most important nesting areas (all species) are Captain's Bay, Scrub Island and Dog Island (DFMR, 2002).

Hodge and Eckert (in review) report the consensus of informed residents that the size of both nesting and foraging populations has declined dramatically during the last 40 years. The TCOT report (Godley *et al.*, 2004) concluded that “the most that can be surmised from the available data is that marine turtle nesting in Anguilla is at critically low levels”. Regarding foraging turtles, one fisher interviewed by Hall (1987) assessed the marine turtle population to be seriously depleted based on his counting “approximately one-tenth the number of turtles” per boat trip he had in past years. However, there are very recent reports, following the 1995 moratorium, of slightly increasing trends in sightings by fishers. These observations may be related to the increased number of sightings in the Virgin Islands in recent years, a trend that has been attributed to the protection of marine turtles in US waters for the past three decades. It may also be because local turtles are less cautious and, thus, more visible, now that fishing pressure has eased. Unfortunately, with no baseline data available, the extent to which local populations may be increasing is impossible to quantify as yet.

Overview of the legal framework for marine turtle management

Membership in international and regional treaties

As an overseas territory of the UK, Anguilla's membership in international agreements is dependent on UK membership, but the membership is not automatic. Anguilla participates in only a small number of the agreements to which the UK is party. Of those considered most relevant to the conservation of marine turtles, set out in the table below, Anguilla is party only to the Convention on Wetlands of International Importance (Ramsar) and the World Heritage Convention. Anguilla was not included in the UK's ratification of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and is, thus, not party to the treaty. In an effort to address these lacunae, the Government of Anguilla initiated, in 2004, the drafting of comprehensive environmental legislation that will enable the extension of appropriate multilateral environmental agreements to Anguilla. Technical assistance for this effort is being provided through OTEP (www.ukotcf.org/OTEP/index.htm, viewed 6 December 2005).

Membership of Anguilla in multilateral agreements relating to marine turtles

Convention	Anguilla (UK)
Cartagena Convention	No
Protocol Concerning Specially Protected Areas and Wildlife (SPAW)	No
Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region	No
Protocol Concerning Pollution from Land-based Sources and Activities	No
Convention on Biological Diversity (CBD)	No
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	No
Convention on Migratory Species (CMS)	No
Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	No
MARPOL 73/78 (Annex I/II)	No
MARPOL 73/78 (Annex III)	No
MARPOL 73/78 (Annex IV)	No
MARPOL 73/78 (Annex V)	No
Convention on Wetlands of International Importance (Ramsar)	1990 (R)
UN Convention on Law of the Sea (UNCLOS)	25.07.97
Western Hemisphere Convention	No
World Heritage Convention	29.08.84

Key: Date of: Ratification (R)

Source: S. Earl, UK Foreign and Commonwealth Office, *in litt.* to J. Gray, TRAFFIC International, 8 November 2005.

In this context, it should be noted that the UK ratified the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, or Cartagena Convention, on 28 February 1986 but has not ratified the Protocol Concerning Specially Protected Areas and Wildlife (SPAW Protocol) under that Convention,

which it signed on 18 January 1990. The UK has also not acceded to the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC).

In 2001, the UK Government and Government of Anguilla concluded an Environment Charter as the basis for collaborative efforts in planning for and implementing biodiversity conservation and environmental management in Anguilla.

Laws and regulations relating to marine turtles

The exploitation of marine turtles in Anguilla has been regulated since 1948. In that year, the *Turtle Ordinance Cap. 99* established a four-month closed season on the take of turtles and turtle eggs extending from 1 June to 30 September and a minimum size limit for all species of turtle of 20 lb (nine kilogrammes). These same provisions were incorporated into subsequent regulations, the most recent of which were the *Fisheries Protection Regulations of 1988*, issued under the *Fisheries Protection Ordinance No. 4 of 1986*.

The *Fisheries Protection Regulations of 1988* were amended on 31 May 1995 (*Am. SRO No. 4 of 1995*), thus bringing into effect a moratorium on the capture of turtles and take of turtle eggs for a period of five years. The amended Regulations also placed an indefinite ban on the use of gill nets, thereby reducing the risk of incidental take of marine turtles in fishery operations.

The 1995 moratorium was renewed for another five-year period through the *Fisheries Protection (Amendment) Regulations of 15 December 2000 (Part 3: Conservation Provisions)*. Section 17 of the law specifically prohibits for a period of five years from 15 December 2000:

- a) the take or attempted take of any turtle;
- b) the killing, purchase, sale or exposure for sale, or possession of a whole turtle or any portion of the meat of a turtle; or
- c) the take or attempted take, purchase, sale or exposure for sale, or possession of turtle eggs.

In contrast to the general penalty set out in these regulations, which is a fine of 5000 East Caribbean dollars (XCD5000) and/or or one month's imprisonment, the penalties mandated for violations of these specific prohibitions are the maximum allowed under the *Fisheries Protection Act (Chapter F40 of 15 December 2000)*: if convicted, a person is liable to one year's imprisonment and a fine of XCD50 000 for a first offence and the department may confiscate any vessel, equipment, such as nets, "or any other thing connected with such offence". These penalties are increased to a fine of XCD250 000 or two years' imprisonment for a second or subsequent offence. In the case of offences committed in the Exclusive Economic Zone (EEZ), imprisonment is not imposed.

Numerous other measures are enabled by Part 3 of the *Fisheries Protection Regulations*, including no-take zones, licensing requirements and the development of a fisheries management and development plan that sets out management objectives and measures for each fishery.

The 2000 moratorium was renewed for another 15-year period through the *Fisheries Protection (Amendment) Regulations (Part 3: Conservation Provisions)* which, as this review goes to press, have yet to be gazetted and dated. The same provisions and penalties apply, as noted above, for the 1995 renewal (J.C. Gumbs, DFMR, *in litt.*, 18 May 2006).

As already noted, Anguilla is currently not party to CITES. Allan (1998) reported that there was no legislation in the territory governing the import and export of wildlife and wildlife products, including CITES-listed species. This has proved to be a problem in the context of the current moratorium, as enquiries have been made about importing marine turtle products from neighbouring islands (countries) (DFMR, 2002). Hodge (2002) reported that the government was drafting legislation that would support the extension of CITES to Anguilla and, according to S. Nash, Chief, Capacity Building Unit, CITES Secretariat, (*in litt.* to J. Gray, TRAFFIC International, 21 September 2005), this has now been developed.

Several pieces of legislation offer habitat protection that is relevant to marine turtles. The *Marine Parks Act, Revised Statutes of Anguilla, Chapter M30 of 15 December 2000* supersedes an ordinance of 1982 and provides for the designation of “any portion of the marine areas of Anguilla” as a marine park, so as to: a) protect the fish, flora and fauna and wrecks; b) preserve and enhance the natural beauty; c) promote enjoyment by the public and d) promote scientific study and research in such areas. In addition, the Act provides for designation of management authorities and regulations affecting the use of these areas. Specific measures provided by this Act are set out in the *Marine Parks Regulations, Revised Regulations of Anguilla (R.R.A.) M30-1 of 15 December 2000*; one such measure is a prohibition on fishing in a marine park.

The *Beach Protection Act, Chapter B25 of 15 December 2000*, which supersedes the *1988 Beach Protection Ordinance*, protects listed beaches from sand and gravel extraction within 200ft of the foreshore and sets a penalty for violation of the Act at a fine of XCD5000 and 12 months’ imprisonment. The *Beach Protection Orders, Revised Regulations of Anguilla (R.R.A.) B25-1* designates 18 beaches as protected.

Responsible authorities

DFMR, established in 1991, has authority for exploitation, conservation and enforcement of legislation relating to marine resources, including marine turtles. It is also responsible for the development and management of fisheries and marine parks and all coastal zone management (Godley *et al.*, 2004). Customs is responsible for oversight of imports and exports. Authority for enforcing marine turtle legislation is vested in the Royal Anguilla Police Force.

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective

According to Hodge and Eckert (in review), exploitation of marine turtles in Anguilla has been carried out for centuries; recent archaeological evidence suggests that these animals have been hunted from local waters for at least 1000 years (Crock, 2000). This exploitation has involved all species, for meat, oil (used as recently as the 1960s, primarily for lubricating tools), shell, and eggs. During this long history of exploitation, there has never been a systematic effort to quantify the numbers of turtles or eggs taken and further characterize—and monitor—this exploitation; as a consequence, exploitation levels and trends in these over time are unknown.

Connor and Connor (1998) reported from an interview with one of several fishers that they interviewed about past exploitation of marine turtles in Anguilla (prior to the moratorium enacted in 1995), that the majority of turtles hunted in Anguilla were mainly caught for their shells; he vividly recalled that the shells were exported to some of the neighbouring Caribbean islands and reported that several people from Saint Lucia frequented Anguilla to collect turtle shells. In addition, shells were used to make jewellery and other articles. As regards meat, this fisher reported that it was not in great demand in Anguilla, where it was cooked like any other meat with rice and potatoes, and that it was mainly sold locally or in Saint Martin. By contrast, turtle eggs were collected by “many people” in Anguilla, including himself.

Meylan (1983) expressed concern that increased use of spear guns in Anguilla was leading to an increased take of turtles. Turtles were being taken predominantly by divers with spear guns seeking lobsters, conches and reef fishes. Although this was largely opportunistic, the spear guns enabled them to take nearly every turtle they encountered. She further reported that turtle eggs were taken whenever they were found. Hall (1987) provided a similar report: eggs were taken whenever possible, including during the closed season, and used locally to “increase male ‘stamina’”; turtles weighing 10–15 lb were often taken in violation of the 20-lb minimum size limit because the meat was considered more tender and these animals were easier to spear; and sub-adults and adults of all species were taken for their meat, although Hawksbill Turtles were most often taken for their shells.

Meylan (1983) provided details of the domestic trade in turtle products in Anguilla, which included the sale of Green and Hawksbill Turtle meat to individuals and hotels, and polished carapaces, but did not involve eggs. She further reported that there was no local handicraft in tortoiseshell.

There are few estimates of the numbers of turtles that have been exploited in Anguilla in past decades and there appears to be very little basis on which to judge their veracity. Richardson and Gumbs (1984) provided no estimates of numbers of turtles taken in their report to the First Western Atlantic Turtle Symposium, although they reported that there were 5–10 turtle fishers, none of whom were dependent on marine turtles as their sole source of income. Hall (1987), reporting to the Second Western Atlantic Turtle Symposium, estimated the annual exploitation of marine turtles to be 100–200, as compared with an estimated 200–300 per year in 1984, again, with no-one fishing for turtles as a full-time occupation. Information collected as part of the TCOT project (Godley *et al.*, 2004—see next section) suggests that the exploitation levels in the decade immediately prior to the 1995 moratorium may have been much higher; indeed, Gumbs (J.C. Gumbs, DFMR, pers. comm., 27 October 2004) believes Hall’s figures to be “way too low” and that at least 1000 and possibly many more turtles may have been taken “in a good year” during the 1980s.

Recent (since 1992) exploitation

According to DFMR (2002), no records were maintained by the Department of the number, size or species of marine turtles taken in the legal fishery that operated until 1995. Although the number of fishers regularly landing turtles was considered small, perhaps no more than the 5–10 estimated by Richardson and Gumbs in 1983, the number of turtles any one of them might have taken in a given year could vary from 20 to 100 (J.C. Gumbs, *in litt.*, 27 September 2002). That said, turtles are not considered to have been a major source of sustenance or income for these fishers and there does not appear to have been a commercial market: turtles were most likely to have been shared amongst family and friends or sold to persons “on order”. Green Turtles were targeted more than others, for meat, and turtle eggs continued to be taken.

Godley *et al.* (2004) present a somewhat different picture of marine turtle exploitation prior to the moratorium, based on information compiled from a socio-economic survey of 72 Anguillian residents. Sixty-two of these interviewees reported that they had eaten turtle meat prior to the 1995 moratorium; while for many it was an occasional variation in the diet, it appears to have constituted a very important source of protein for some families. Of the 51 respondents who engaged in fishing for whatever purpose, 27 reported that they fished for marine turtles prior to the moratorium and provided information on their activities. From these responses, the pattern of exploitation in Anguilla appears to have been one of many fishers taking a small number of turtles with a small number of fishers regularly taking high numbers of turtles; at least one fisher reported catching 2000 Green Turtles per year. Because interviewees were reporting on activities of more than a decade ago, were doing so from different perspectives and with “different desired outcomes” (S. Ranger, Marine Conservation Society, *in litt.*, 2 March 2005), and did not offer any component data (number of fishing days, average number of turtles landed per day), it is difficult to judge the accuracy of these figures. DFMR (J.C. Gumbs, pers. comm., 2004) believes these figures to be far higher than the numbers actually involved, at least for the years just prior to the implementation of the moratorium.

Additional information compiled from the recent socio-economic survey (Godley *et al.*, 2004) confirms the findings of Connor and Connor (1998) that many of the marine turtles caught were sold in neighbouring Saint Martin. The single fisher reporting an unusually high annual take of 2000 Green Turtles reported selling his entire catch to restaurants, hotels and the market in Saint Martin (with the shells reported to have been sold annually to traders in both Anguilla and Saint Martin), while other fishers also reported selling portions of their catch in Saint Martin. Eight of the fishers who reported selling whole shells did so at points consistent with a local market (e.g. on the street, at the harbour, at people’s homes), and eight reported selling them at places consistent with a tourist market (e.g. market in Saint Martin, restaurants, retail outlets, hotels); most catered to both markets. The majority of sales of Hawksbill Turtle scutes were reported to be to traders from other Caribbean islands (e.g. Saint Lucia, Saint Kitts, Antigua). Only one vendor was found to have regularly sold shells or shell products.

DFMR (2002) has reported that, although there have been complaints, fishers have generally been adhering to the moratorium and this has been confirmed by the findings of the TCOT project. Although, in 2002, there was no evidence of illegal nets being set for turtles and little evidence of illegal take (although there is little enforcement and no formal monitoring), DFMR (2002) considered it likely that some fishers continued to take turtles opportunistically when spear-fishing. More recently, according to DFMR (J.C. Gumbs, *in litt.*, 10 August 2004), there has been evidence of targeted, illegal take of turtles (i.e. with nets), including: a turtle net set in the nearshore that was discovered by the Department in April 2003; reports from credible sources of nets set in areas not visited by the Department (namely the southern coast of the island); and a report from a fisher of two men butchering turtles at sea. At least some of this take is believed to be for sale on the illegal market. The Department also reports that there still seems to be a problem with poaching of turtle eggs on a number of the offshore cays: J.C. Gumbs (*in litt.*, 10 August 2004) indicates that there is hard evidence of continued egg poaching, including emptied nests and discarded eggshells behind a restaurant on one of the offshore cays. There are no estimates of the numbers involved in any of these illegal activities.

Allan (1998) reported finding some Green Turtle shells for sale in Anguilla in the course of his market surveys there in early 1998; however, the number was small, only five from 59 survey sites visited.

International trade

Historical perspective

There are no statistics on international trade in marine turtles involving Anguilla. There are no records of such trade for the period 1975 to 1992 in CITES trade statistics derived from the UNEP-WCMC CITES Trade Database, and no exports of Hawksbill Turtle shell from Anguilla recorded as imports in Japanese Customs statistics for the same period.

Both Meylan (1983) and Hall (1987) reported on international trade of marine turtles from Anguilla. Meylan reported fishers carrying Green and Hawksbill Turtle meat to Saint Martin and occasionally live turtles being transported by ferry to Saint Martin for sale to hotel restaurants on the island. In addition, she reported that Hawksbill Turtle shell was sold to buyers on Saint Martin or to “entrepreneurs” from Saint Thomas and Puerto Rico, who visited the island for this purpose. She reported that the price for raw shell in 1980 was 20 US dollars (USD20)/kg. Also, in addition to being sold locally, the dried carapaces of Hawksbill Turtles and Green Turtles were sold to shops on Saint Martin. She considered this latter trade to be small in magnitude.

Hall (1987) indicated that fishers from Saint Martin, including Haitians living on the island, were accused by Anguillians of taking many juvenile turtles in Anguillian waters and suggested that fishers from Saint Barthélemy could be doing the same. She further reported that Hawksbill Turtle scutes from locally taken turtles were sold internationally “for handicrafts” at USD25–30/lb and that whole shells were offered for sale in local gift shops at USD35–50. Jewellery was not made locally, but she encountered one shop selling Hawksbill Turtle shell bracelets that—because of the way in which they were designed and fashioned—she believed could have been imported from the Dominican Republic.

Information gathered through the TCOT project from a single vendor in Anguilla would appear to confirm the information presented by Meylan (1983) and Hall (1987). The vendor acted as a broker for shells and scutes that he purchased directly from fishers on a monthly basis. He sold these to traders from the Dominican Republic, who in turn sold him items made from scutes. A decline in demand prompted this



Credit: P. Richardson/MCS

A bucket of Hawksbill scutes (top) left in a fisher’s back yard from a time when he used to sell to traders, and tortoiseshell jewellery bought from foreign traders and left over from a time when a vendor sold these items in a shop in Sandy Ground, Anguilla.

vendor to stop buying from these traders and the traders ceased to visit in the 1980s. He no longer trades in turtle shell items.

Recent (since 1992) international trade

The only records of trade in marine turtle products to or from Anguilla reported to CITES for the period 1993–2004, inclusive, date from 2004 and, with the exception of two Hawksbill shells reported imported into the USA as personal items, these are limited to exports to the UK of scientific specimens (blood samples for genetic analysis)—recorded as one kilogramme each from Green Turtles, Hawksbill Turtles and Leatherbacks—presumably associated with the TCOT project. Allan (1998) reported that several sources in Anguilla claimed that any marine turtles caught illegally by locals would usually be taken to Sint Maarten/Saint Martin, where the demand for turtle meat and shell was said to still be high. This is apparently still the case, as the Sint Maarten Nature Conservation Foundation (A. Caballero, *in litt.*, 23 March 2005) reports that Anguillian fishers sell in Sint Maarten turtles that they have taken as by-catch while fishing. DFMR (2002) also makes note of this trade, but adds that no turtles are believed to be imported to Anguilla; the Department does not consider international trade in marine turtles involving Anguilla to be anything but negligible.

Enforcement issues

DFMR (2002) reports that “enforcement [of the moratorium] is lacking” and turtles are “probably” still taken opportunistically by a few spear-fishers and known still to be taken illegally with turtle nets (J.C. Gumbs, *in litt.*, 10 August 2004). The absence of surveillance and enforcement means that the risk of a penalty has not stopped the few fishers who are determined to break the law (J.C. Gumbs, *in litt.*, 27 September 2002). In addition to capacity, there is a problem of capability in that not all DFMR staff have powers of arrest.

There can be little doubt that, in theory, the penalties provided in the 2000 (and 2005) *Fisheries Protection (Amendment) Regulations* for violating the turtle conservation provisions—one year's imprisonment, a fine of XCD50 000 for a first offence (and XCD250 000 for a subsequent offence) and confiscation of any equipment—should be an effective deterrent. However, findings of the TCOT project indicate that none of the respondents to their socio-economic questionnaire knew what the specific penalties were. In addition, although there have been confiscations of marine turtles, there have been no successful prosecutions in instances where the authorities have apprehended individuals who acted in contravention of the moratorium. Investigating this via a separate survey, the TCOT project found that several respondents indicated that the penalties for turtle violations (fines of XCD50 000 or XCD250 000 and one or two years' imprisonment) were wholly inappropriate and some suggested that the severity of the penalty may also result in Fisheries Officers' being reluctant to prosecute. This perception has been borne out by at least one enforcement incident cited in the TCOT report (Godley *et al.*, 2004).

DFMR (2002) further reports a potential problem relating to the lack of legislation on the import and export of marine turtle and other wildlife products. The Department has had at least one enquiry from a fisher about the legality of importing turtle meat from a neighbouring island where a legal fishery for turtles still operates. This underscores the need for wildlife trade legislation to be enacted in Anguilla and the need for harmonized marine turtle legislation across range States.

Marine turtle management

Management of exploitation

Until the moratorium entered into effect in 1995, exploitation of marine turtles was controlled only through the provisions set in place in 1948, i.e. a four-month closed season and a minimum size limit of 20 lb (nine kilogrammes). These restrictions were clearly inadequate in preventing over-exploitation of marine turtles. Hodge and Eckert (in review) point to the following in particular:

- the closed season did not encompass peak periods of nesting, which for Leatherbacks is April–June and for Hawksbill Turtles is July–October;
- the minimum size limit did not account for size differences between species and protected only young turtles rather than the large juveniles and adults that are most important for population maintenance and recovery;
- the penalties were not commensurate with product value and there was no provision for the confiscation of equipment used in the offence; and
- the fishery was “open entry” and there was no limit to the number of turtles that could be caught per year.

In addition to these regulations (and their deficiencies), there appear not to have been any other management activities for marine turtles in Anguilla. No records were maintained of the numbers of turtles taken, the species, weights, or other data and, thus, no analyses have been undertaken of trends in these from which to infer population trends and judge the adequacy of the fisheries controls. There are also no data on the numbers of eggs collected from turtle nests. Finally, based on reports from the 1980s, there appears to have been little enforcement of the few restrictions that were in place, a situation that, by all accounts, continues.

This rudimentary management regime cannot be considered an appropriate framework for reinstatement of a legal fishery. There appears to be recognition of this. Because of the moratorium, however, there has been little formal discussion about revising the marine turtle provisions (DFMR, 2002), so as to include, for example, maximum size limits, quotas and licensing of fishers (Hodge, 2002), measures that should be considered as fundamental to any marine turtle management regime that involves exploitation.

DFMR (2002) has taken the position that 10 years of reliable and consistent population data should be available before a determination can reasonably be made on the status (and trends) of local marine turtle populations and whether or not they can withstand renewed exploitation. It was with this perspective that the current moratorium was extended in 2000 and again in 2005. Although there has been progress in that selected beaches in Anguilla have been monitored for nesting since 1995, these efforts have been inconsistent and data on the distribution, abundance and trend of foraging assemblages, which would be the target of any renewed exploitation scenario, are non-existent. DFMR (2002) is severely limited by internal resources and has been unable to undertake the research required. Hence, 10 years after the moratorium was first put in place, the knowledge base has not significantly advanced, and important population parameters remain unknown. There is, thus, no scientific basis to evaluate a management proposal that would include a resumption of the legal fishery, at whatever level. This gives rise to the question of how the current moratorium, set to be lifted in December 2020, will be reviewed.

In so far as international trade in marine turtles is concerned, Anguilla’s status as a non-Party to CITES and lack of wildlife trade legislation should be considered a shortcoming for marine turtle management, particularly in the light of enquiries regarding possible imports of marine turtles from neighbouring islands.

Species research and conservation

Although there has not been a great deal of research on marine turtles in Anguilla, several projects have been initiated in recent years that, if sustained, could fill important information gaps. Hodge (2002) reports that nesting beach monitoring, through the Anguilla National Trust, has been under way at a number of beaches island-wide since the first marine turtle conservation project was initiated in partnership with WIDECAST following the establishment of the moratorium in 1995. One Index beach has now been designated, at Captain's Bay on the eastern end of the island, but, despite a plan to monitor intensively all nesting on the beach, these efforts have only been sporadic and, thus, have not yielded enough data for meaningful analysis. Similarly, plans to begin monitoring on one of the offshore islands (Scrub Island) and develop it as a site for “saturation monitoring” (whereby all-night patrols by project personnel record and tag every nesting female for the purpose of building a comprehensive database on the status and trend of the nesting population at the site) have proven unfeasible in the light of the limited resources of DFMR (J.C. Gumbs, *in litt.*, 10 August 2004). Monitoring of foraging populations in Anguilla is less advanced. Sightings of turtles and the number of different species seen at each dive site were provided to the Anguilla National Trust by the island's three dive shops during the 1990s (Hodge *et al.*, 2003), forming a potentially valuable baseline for future efforts.



Credit: S. Ranger/MCS

Staff of the UK Government-funded project, Turtles of the Caribbean Overseas Territories (TCOT), and of the Department of Fisheries and Marine Resources (DFMR) of Anguilla carry out research with fishers at Fish Hole Pond, Scrub Island, in 2002.

An in-depth investigation of marine turtles in Anguilla was initiated in December 2002 by DFMR as part of the three-year TCOT project conducted by the UK Marine Turtle Research Group, Marine Conservation Society and collaborators and funded by the UK Government. This project included several components aimed at enhancing understanding of marine turtle populations in Anguilla, including nesting beach surveys, in-water sampling of foraging areas and preliminary sampling for genetic studies. These activities have yielded useful information and laid the basis for future work, much of which is being taken forward by its successor project, TUKOT (Turtles in the UK Overseas Territories), funded by OTEP. The TUKOT programme in Anguilla includes marine turtle monitoring, training of DFMR staff and others in sampling and other field research methodologies, investigations of the movements of marine turtles to and from Anguilla and their genetic relationship to populations elsewhere in the Caribbean, as well as consultations with government agencies and key sectors and stakeholders, such as representatives from the tourism industry and former turtle fishers.

Habitat conservation

There are numerous habitat issues facing marine turtles in Anguilla, as a result of an increasing human population and rapid tourism growth (Hodge and Eckert, in review; Godley *et al.*, 2004).



(L) Turtle tracks indicating attempted nesting at Windward Point, a beach on Anguilla where sand-mining is officially prohibited but, apparently, still conducted. (R) Great Bay, Dog Island, a designated marine park on Anguilla.

A system of marine protected areas for Anguilla has been under development since the early 1980s (Procter and Fleming, 1999). In 1989, the Government of Anguilla put forward a proposal for a comprehensive marine parks programme and many of the associated activities have since been carried out. In 1993, five areas were designated as marine parks: Sandy Island; Prickly Pear Cays and Seal Island; Dog Island; Little Bay and Shoal Bay; and Island Harbour (Procter and Fleming, 1999). According to DFMR (2002), anchoring is prohibited in these areas, except at permanent moorings that have been installed (and for which permits are required), thus protecting important seagrass and coral reef habitats. Godley *et al.* (2004) echo the earlier recommendations of Hodge and Eckert (in review) that management plans need to be prepared for these marine parks that would ensure, *inter*

alia, permanent and complete protection for marine turtles, such as through no-take zones, and regulation of tourism activities that could have negative impacts.

There is no complete protection of any nesting beach at the moment. Through the *Beach Protection Orders* of December 2000, sand-mining is prohibited on 18 beaches, at least two of which (Captain's Bay and Windward Point) are visited by nesting marine turtles. Godley *et al.* (2004) raise questions about the protection conferred on Windward Point, which they found being heavily mined for sand. Although surveys by DFMR in 2003/2004 found no evidence of actual nesting on Windward Point beach, surveys during the period 1997–2000 undertaken by the Anguilla National Trust documented marine turtle nesting there (J.C. Gumbs, *in litt.*, 24 March 2005), thus suggesting that the continued sand-mining on the beach is affecting the number of turtles nesting, as well as perhaps, any nests that have actually been deposited. Given the low levels of nesting turtles in Anguilla, protection of this beach and all other turtle nesting beaches from sand-mining and other impacts from development activities is an important element in fostering these species' recovery (Godley *et al.*, 2004).

Education and public awareness

Hodge and Eckert (in review) make a number of recommendations for fisheries extension activities to inform fishers about marine turtles, the regulations in effect and related issues. Godley *et al.* (2004) identify the need to target the tourism sector in similar efforts.

The Anguilla National Trust has historically taken the lead in fostering public awareness of marine turtle conservation issues by sponsoring public lectures and school competitions (artwork, poetry), involving the media in reporting of the issues and encouraging coastal hotels and landowners to participate in nesting beach monitoring. In partnership with WIDECAST, the Trust produced a curriculum manual (Hodge *et al.*, 2003) designed for use as a teaching supplement in the environmental education syllabus being infused, at that time, into the education system; it was also intended to foster dialogue within the community with regard to the moratorium, engender community support for conservation and sustainable management of marine turtles, and encourage awareness “of the value of turtles in our environment”.

Constraints to marine turtle conservation and management

Although there are shortcomings in the legal framework for marine turtle management and conservation in Anguilla, DFMR (2002) views the major problems to be lack of resources and political support. With only six full-time staff responsible for discharging a broad mandate that includes fisheries management and development, marine park and coastal zone management, monitoring and enforcement, the Department has insufficient human resources to carry out a full range of marine turtle management activities. In addition, limited financial resources prevent it from carrying out many activities, including surveillance and law enforcement. The assignment of designated marine enforcement officers to promote compliance with and enforcement of environmental laws is one measure suggested to address this problem. Finally, there is a need to generate more public support (DFMR, 2002). According to Hodge (2002), public support is “minor” and environmental issues “need to be a higher priority on the political agenda”.

DFMR (2002) also reports that fishers complain about the current moratorium because turtle fisheries are still operating in a number of other islands (e.g. Saint Kitts and Nevis, British Virgin Islands). In their judgment, there

would be greater support for marine turtle conservation in Anguilla if other countries were making similar efforts, such as through a regional management plan.

Summary and recommendations

The management framework in place for the legal fishery of marine turtles in Anguilla, which operated until 1995, was inadequate to prevent population declines and these declines have occurred. The moratorium on the take of marine turtles and eggs instituted in 1995 and extended to 2020 is believed to have given the marine turtles of Anguilla a reprieve: although illegal take of both turtles and turtle eggs has continued, there appears to be generally high compliance with the moratorium. While the penalties for violations of the moratorium constitute, in theory, a strong deterrent, lack of awareness of the specifics of the penalties, as well as their overall severity (they are considered by many, it would appear, to be far beyond what is appropriate for the offences), appear to have compromised their effectiveness. Most importantly, there has been a general lack in enforcement effort, owing primarily to the limited resources of DFMR.

Given the general lack of population monitoring during the time that the moratorium has been in place and the time required to develop an adequate baseline for marine turtles and collect sufficient data to evaluate statistically meaningful population trends, there is little scientific basis at this time on which to evaluate the reinstatement of the legal fishery.

In accordance with the FAO Code of Conduct for Responsible Fisheries (FAO, 1995), an explicitly precautionary code, which states that “the right to fish carries with it the obligation to do so in a responsible manner so as to ensure effective conservation and management of the living aquatic resources”, the management of marine turtle resources in Anguilla should seek to maintain the availability of the resource “in sufficient quantities for present and future generations in the context of food security, poverty alleviation and sustainable development”. Management measures should, *inter alia*, prevent over-fishing, rehabilitate depleted populations, incorporate the best scientific evidence (taking into account traditional knowledge, as well as relevant environmental, economic and social factors), assign priority to research and data collection (including at international scales) and promote environmentally safe fishing gear and practices in order to protect both the target resource and the ecosystems upon which it depends.

To this end, consideration should be given to strengthening Anguilla’s capacity to meet the fundamental requirements of a management regime when the moratorium is lifted, namely: restrictions on exploitation that are consistent with the species' biological requirements; a monitoring programme—systematic, sustained and rigorous collection and review of data—either on the specifics of exploitation or of wild populations so as to discern trends that can inform management; mechanisms to identify, monitor and address other threats to the species being exploited, so that these threats can be factored with exploitation to assess what level of overall mortality the species might sustain; and a high level of compliance (sometimes achievable only through vigorous enforcement) with the restrictions put in place to ensure that management goals are achieved.

As the government debates the nature of any exploitation regime that may re-emerge in 2020, the following suggestions may be helpful:

1. If legal exploitation is to resume, the restrictions on this exploitation should reflect the biological parameters of marine turtles and be established and conducted according to sound management principles and practice, and aim to achieve the following:

- A. Bringing exploitation in line with biological principles, including:
- complete protection of nesting females at all times;
 - complete protection of all species during the primary nesting season, 1 March to 30 November;
 - complete protection of the Leatherback, which occurs in the country only as an adult, and typically an egg-bearing female;
 - maximum size limits, based on length (which is easier to undertake in the field) rather than weight, so as to safeguard large juveniles and adults;
 - a conservative limit on the numbers of animals that may be exploited, based on a scientific stock assessment; and
 - a requirement that capture quotas be based, if not on stock assessment, on data derived from national processes and research activities, and that, as far as practicable, these data be collected in such a way as to be compatible with the goal of assessing stocks throughout their full geographic ranges.

- B. Managing the legal fishery through an enforceable, high-compliance monitoring programme aimed at establishing trends and monitoring these over time. A national programme to monitor marine turtle exploitation should document comprehensively and systematically, and in a manner allowing such records to be analysed and compared over time, the following:
- the number of fishers taking marine turtles and by what means;
 - the number, size and species distribution of the marine turtles landed;
 - the locality where animals were taken;
 - catch-per-unit effort; and
 - the disposition of the marine turtles landed, including value of the animal and/or products if sold or traded.

In further support of reliable monitoring of the fishery, the following should be considered as requirements for participation:

- that ownership identification tags be installed on approved gear (e.g. nets)
- that turtles be landed alive or intact; prohibiting, for example, the use of spear guns and extended net sets that can result in drowning, and providing for reliable recording and verification of turtle landings; and
- that the licensing process include as a criterion full participation in the monitoring programme.

- C. Establishing a systematic marine turtle monitoring programme that will:
- document distribution and abundance of local populations;
 - identify major nesting grounds and foraging areas;
 - designate Index nesting beaches and Index foraging grounds and document the numbers of marine turtles occurring in these over time;

- manage data records such that statistically significant trends in abundance can be identified and inform management; and
- identify and monitor threats and other factors influencing marine turtle survival.

Irrespective of whether a moratorium is in place, the following are recommended as essential in promoting the recovery and maintenance of Anguilla's marine turtle resource:

2. Given the current moratorium on exploitation of marine turtles and the rapid expansion of the tourism sector, habitat pressures are likely to represent the major challenge to marine turtle recovery in Anguilla over the coming years. Recognizing the potential importance of marine turtles and intact marine turtle habitat for Anguilla's "tourism product", critical habitats, both terrestrial and marine, should be identified and protected and incorporated into broader biodiversity management programmes. The government should consider:
 - expanding the number of protected nesting beaches;
 - enhancing habitat protection measures, including restriction/regulation of tourism and other activities near nesting beaches during the egg-laying season and vigorous enforcement of such measures, such as against sand-mining;
 - adopting regulations to prevent or otherwise manage leaving of nets and other debris on the beach;
 - improving coastal zone management (and monitoring) capacity, including through environmental impact assessment, particularly in relation to the construction of beach-front hotels and other tourism infrastructure;
 - expanding the system of protected areas; and
 - strengthening the management framework for protected areas to ensure that these areas fulfill their stated objectives.
3. Mechanisms to quantify levels of incidental catch of marine turtles should be developed. Measures to reduce or eliminate incidental catch of marine turtles, such as through time-area closures and/or alternative (especially to gill nets) types of gear, should be implemented.
4. There is a need for greater enforcement capacity and effort, including training, logistical support and a mobile enforcement unit. This capacity should involve outreach and other activities that will engage greater efforts on the part of police for fisheries and broader environmental enforcement. A mutually agreed set of protocols and procedures for these agencies to follow in such circumstances may be an option to consider.
5. Increased efforts should be made to engage local communities, including fishers, in marine turtle conservation and management. Fisheries extension efforts should be implemented that involve regular exchanges with fishers of information on marine turtles and their conservation and management needs and the participation of fishers in efforts to manage marine turtles so as to enhance compliance with regulations and support for marine turtle conservation. Support directed towards sustainable fishery practices and/or alternative livelihoods should be provided, as relevant and necessary, to assist fishers meaningfully in their efforts to comply with revised marine turtle regulations.
6. Financial, logistical, and political support and encouragement should be extended to relevant government agencies to develop and implement a modern, scientifically based conservation and management regime for nationally depleted marine turtle stocks, including for the revision of the legal framework, scientific studies,

monitoring programmes, enforcement capacity and institutional strengthening of government agencies whose mandate includes marine turtles and their habitats. Both private and public foreign investment in the fisheries and tourism sectors in Anguilla should take account of the increased responsibilities—and costs—of DFMR and other agencies in managing for sustainability the resources concerned and the broader biodiversity impacts that may ensue.

7. Financial, logistical, and political support and encouragement should also be extended to active NGO research, conservation, monitoring and public outreach efforts. Partnerships between the government and relevant NGOs should benefit from increased financial commitments on the part of bilateral and multilateral assistance agencies; co-management agreements, developed by consensus, are encouraged.
8. Finally, Allan (1998) notes the concerns raised at the CITES Training Seminar held for UK overseas territories in 1997 regarding the fact that ratification of CITES would have serious resource implications for Anguilla, including for the drafting, implementation and enforcement of legislation, designation of CITES Management and Scientific Authorities and discharging of their responsibilities. These concerns were raised again at the UK Caribbean Overseas Territories Wildlife Trade Law Enforcement Workshop held in Anguilla in July 2003 (Pendry and Allan, 2003), particularly in regard to inadequate staff resources and training and other forms of capacity-building. These concerns and the enforcement priorities identified at the workshop in 2003 should be taken into account as Anguilla moves forward with the drafting of CITES-implementing legislation that, *inter alia*, should address the possibility of localized international trade in marine turtles and other CITES-protected species

References

- Allan, C. (1998). *Conched Out. A review of the trade in CITES-listed species in the United Kingdom overseas territories in the Caribbean*. WWF-UK, Godalming, Surrey, UK.
- Boulon, R.H., Jr., P.H. Dutton and D.L. McDonald. (1996). Leatherback turtles (*Dermochelys coriacea*) on St. Croix, US Virgin Islands: Fifteen years of conservation. *Chelonian Conservation and Biology* 2(2):141–147.
- Carr, A., A. Meylan, J. Mortimer, K. Bjørndal, and T. Carr. (1982). *Surveys of sea turtle populations and habitats in the Western Atlantic*. NOAA Technical Memorandum NMFS-SEFC-91. US Department of Commerce.
- Connor, R. and J. Connor. (1998). Anguilla's Sea Turtle Project: April–November 1998 (Nesting Period). Presented to: Anguilla National Trust. Unpublished.
- Crock, J.G. (2000). Inter-island Interaction and the development of chiefdoms in the Eastern Caribbean. Ph.D. Dissertation, University of Pittsburgh, Pennsylvania.
- DFMR (Department of Fisheries and Marine Resources). (2002). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of the Marine Turtles of Lesser Antilles, Central America, Colombia and Venezuela. Completed by Mr. James C. Gumbs, Marine Biologist. Dated 16 September 2002.
- Eckert, K.L. (1995). *Draft General Guidelines and Criteria for Management of Threatened and Endangered Marine Turtles in the Wider Caribbean Region*. UNEP(OCA)/CAR WG.19/INF.7. Prepared by WIDECAS and adopted by the 3rd Meeting of the Interim Scientific and Technical Advisory Committee to the SPAW Protocol. Kingston, 11–13 October 1995. United Nations Environment Programme. Kingston, Jamaica. 95 pp.

- FAO. (1995). Code of Conduct for Responsible Fisheries. Adopted by the 28th Session of the FAO Conference. Food and Agriculture Organization of the United Nations, Rome. 34 pp. + annexes. www.fao.org/fi/agreem/codecond/codecon.asp
- Godley, B.J., A.C. Broderick, L.M. Campbell, S. Ranger, P.B. Richardson. (2004). An assessment of the status and exploitation of marine turtles in Anguilla. Pp. 39–77. In: *An Assessment of the Status and Exploitation of Marine Turtles in the UK Overseas Territories in the Wider Caribbean*. Final project report for the Department of Environment, Food and Rural Affairs (Defra) and the Foreign Commonwealth Office. www.seaturtle.org/mtrg/projects/tcot/finalreport
- Hall, K.V. (1987). National Report for Anguilla. Submitted to the Second Western Atlantic Turtle Symposium, 12–16 October 1987, Mayagüez, Puerto Rico. 5 pp. + tables. Unpublished.
- Hastings, M. (2002). A conservation success: Leatherback Turtles in the British Virgin Islands. *Marine Turtle Newsletter* 99:5–7. (To access all articles published in the *Marine Turtle Newsletter*, visit www.seaturtle.org/mtn/)
- Hodge, K.V.D., Associate Executive Director, The Anguilla National Trust. (2002). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of the Marine Turtles of Lesser Antilles, Central America, Colombia and Venezuela. Dated 16 September 2002.
- Hodge, K.V.D., R. Connor and G. Brooks. (2003). *Anguilla Sea Turtle Educator's Guide*. The Anguilla National Trust. Anguilla, British West Indies. 45 pp.
- Hodge, K.V.D. and K.L. Eckert. (In review.) *WIDECAST Sea Turtle Recovery Action Plan for Anguilla*. WIDECAST and UNEP Caribbean Environment Programme Technical Report Series. Kingston, Jamaica.
- Meylan, A.B. (1983). Marine turtles of the Leeward Islands, Lesser Antilles. *Atoll Research Bulletin* 278:3–6.
- Pendry, S. and C. Allan. (2003). UK Overseas Territories Wildlife Trade Law Enforcement Workshop, Anguilla, 14–18 July 2003. Draft summary report. TRAFFIC International and Foreign and Commonwealth Office. 17 pp. Unpublished.
- Procter, D. and L.V. Fleming (Eds). (1999). *Biodiversity: the UK Overseas Territories*. Joint Nature Conservation Committee. Peterborough, UK.
- Richardson, L. and C. Gumbs. (1984). National Report for Anguilla. Submitted 6 January 1983. Pp. 7–11. In: Bacon, P., F. Berry, K. Bjørndal, H. Hirth, L. Ogren, and M. Weber (Eds). *Proceedings of the Western Atlantic Turtle Symposium, 17–22 July 1983, San José, Costa Rica*, III, Appendix 7. University of Miami Press, Florida.

Antigua and Barbuda

Introduction

The archipelagic State of Antigua and Barbuda, independent since 1981, lies ca. 250 miles south-east of Puerto Rico in the southern sector of the Leeward Islands. Antigua and Barbuda is one of the smallest countries in the Western Hemisphere and one of the smallest countries in the world (GOAB, 2001). Habitat important to marine turtles, including seagrass beds, coral reefs and sandy beaches, can be found throughout the islands' territory. Sandy beaches potentially suitable for nesting cover an estimated 102 km of coastline on the main islands of Antigua (26 km) and Barbuda (76 km) (Joseph *et al.*, 1984). Marine turtles feed in the seagrass meadows and coral reefs that surround, to varying degrees, all of the islands of the archipelago.

Demographic research on the Hawksbill Turtle, conducted at Pasture Bay (Long Island, a privately owned islet) since 1987, has provided one of the most robust and valuable datasets in the world for this marine turtle species. Based on these data, as well as other information available at the time, a Sea Turtle Recovery Action Plan (STRAP) for Antigua and Barbuda was developed and published under the auspices of the Wider Caribbean Sea Turtle Conservation Network (WIDECAST) and the United Nations Caribbean Environment Programme (Fuller *et al.*, 1992). The STRAP reviewed in detail the status of and threats to marine turtles in the country and provided a series of recommendations for improving the management and recovery of populations. It concluded that only a fraction of the number of turtles that once occurred historically persisted in the country and cautioned that “unless action is taken very soon, the last remaining sea turtles may vanish from Antigua beaches much as they did from the Cayman Islands 150 years ago”.

In addition to exploitation, both legal and illegal, the STRAP documented an array of threats facing the country's marine turtles, including: incidental take in fishing gear, particularly longlines, and the loss of nesting beaches to coastal development. A decade later, the Government of Antigua and Barbuda echoed these findings in reporting to the Convention on Biological Diversity (CBD) that “nesting females and hatchling turtles [were] threatened by coastal development” (GOAB, 2001).

Among the recommended actions put forward by Fuller *et al.* (1992) were the enactment of a moratorium on the exploitation of marine turtles and their eggs (“until such time as there is sufficient information to show that a regulated harvest will not compromise the sustainable recovery of depleted sea turtle stocks”); an increase in law enforcement capacity and effort; the protection of essential habitat; development of an effective coastal zone management framework; and surveys to establish baselines and monitor population trends and to identify locally important nesting and foraging grounds for protection and management. According to the Fisheries Division (2002), it is only now that the capacity exists within the government to consider these comprehensive recommendations seriously.

Summary of the status of marine turtles in Antigua and Barbuda

Three marine turtle species are known to nest in Antigua and Barbuda: the Green Turtle, Hawksbill Turtle and Leatherback (see table opposite). In addition, foraging Hawksbill Turtles and Green Turtles of varying sizes are present in the country's waters throughout the year. Leatherbacks occur only seasonally to nest: gravid females arrive in early summer to lay their eggs and presumably return to more temperate latitudes in June or July after

egg-laying has been completed. The Loggerhead is not known to nest but is occasionally caught offshore. Neither the Kemp's Ridley nor the Olive Ridley has ever been documented, although there are anecdotal accounts of the latter's being caught in the waters of Barbuda (Fuller *et al.*, 1992).

Occurrence of marine turtles in Antigua and Barbuda

English common name	Scientific name	Occurrence
Loggerhead	<i>Caretta caretta</i>	I
Green Turtle	<i>Chelonia mydas</i>	N, F
Leatherback	<i>Dermochelys coriacea</i>	N
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	N, F
Kemp's Ridley	<i>Lepidochelys kempii</i>	A
Olive Ridley	<i>Lepidochelys olivacea</i>	A?

Key: N=nesting; F= foraging; I=infrequent; A=absent

Major marine turtle foraging areas in Antigua and Barbuda are not known. The Government of Antigua and Barbuda reports marine turtle nesting on several of Antigua's beaches, including Jabberwock, Pearn's, Rendezvous Bay, Turtle Bay and Devil's Bridge, in addition to Welcher Bay in Barbuda and a number of beaches on offshore islets (GOAB, 2001). The Fisheries Division (2002) has identified the major nesting grounds as:

- Antigua:** Mill Reef beaches (Hawksbill Turtles and Green Turtles), Crabbe Hill (Hawksbill Turtles, Leatherbacks, Green Turtles); Sandy Island (Hawksbill Turtles and Green Turtles)
- Barbuda:** Low Bay (Hawksbill Turtles)
- Long Island:** Pasture Bay (Hawksbill Turtles)

Fuller *et al.* (1992) reviewed available information on trends in marine turtle numbers, including published 19th and early 20th century reports, from which they concluded that the small numbers of turtles occurring in the country were remnants of a much larger population. They noted that warnings that marine turtles, especially nesting assemblages, were "declining steadily" had been sounded in the literature in the early 1970s and continued with the findings of Rebel (1974) and Cato *et al.* (1978), which noted that heavy exploitation, including killing of breeding females and extensive collection of eggs, was causing declines in the numbers of turtles caught and nesting on beaches. Based on this research and extensive interviews with fishers and others, Fuller *et al.* (1992) reported that some beaches that once supported nesting were no longer visited by nesting turtles and that many others received only a few nests per year. Further, several fishers had indicated to them that they no longer hunted turtles on the nesting beaches because the number of arriving females had declined to the point where it was no longer worth the effort.

At the time of their writing, Fuller *et al.* (1992) estimated that fewer than 130 females (of the three species combined) nested annually in the country, of which 100 were thought to be Hawksbill Turtles. The Government of Antigua and Barbuda still characterizes Hawksbill Turtles as the "most common" nesting species, followed by the Green Turtle (noting that populations have "declined dramatically") and the Leatherback, a "seasonal visitor" that rarely nests (GOAB, 2001).

Studies designed to investigate the genetic identity of Hawksbill Turtles nesting on Long Island are under way; early results were reported by Bass *et al.* (1996) and Bass (1999). The Jumby Bay Hawksbill Project (JBHP) (Pasture Bay, Long Island) has been at the forefront of satellite-tracking post-nesting females. In 1998, three turtles fitted with satellite transmitters left Long Island and travelled to foraging grounds in Redonda (Antigua and Barbuda), Saint Kitts and Sint Eustatius (J. Richardson and K. Andrews, University of Georgia, unpubl. data). The recapture of turtles carrying metal flipper tags has also provided insight into wider-ranging international movements. For example, Cato *et al.* (1978) reported that one female Green Turtle tagged while nesting on Aves Island (Isla de Aves, Venezuela) was later caught in Barbuda. Fuller *et al.* (1992) reported a Hawksbill Turtle that was tagged nesting on Long Island and captured five months later in Dominica; similarly, Meylan (1999) reported another Hawksbill Turtle tagged on Long Island and later recaptured in Saint Kitts.

Overview of the legal framework for marine turtle management

Membership in international and regional treaties

Antigua and Barbuda actively participates in relatively few multilateral agreements that are directly or indirectly relevant to the conservation of marine turtles (see table below). The country became a Party to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1997 but, notably, has not yet acceded to the Protocol Concerning Specially Protected Areas and Wildlife (SPAW Protocol) of the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, or Cartagena Convention, the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC), or the global Convention on Migratory Species (CMS).

Membership of Antigua and Barbuda in multilateral agreements relating to marine turtles

Convention	Antigua and Barbuda
Cartagena Convention	11.09.1986 (A)
Protocol concerning Specially Protected Areas and Wildlife (SPAW)	18.01.1990 (S)
Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region	11.09.1986 (A)
Protocol Concerning Pollution from Land-based Sources and Activities	No
Convention on Biological Diversity (CBD)	09.03.1993 (R)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	06.10.1997 (E)
Convention on Migratory Species (CMS)	No
Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	No
MARPOL 73/78 (Annex I/II)	29.04.1988 (A)
MARPOL 73/78 (Annex III)	29.04.1988 (A)
MARPOL 73/78 (Annex IV)	29.04.1988 (A)
MARPOL 73/78 (Annex V)	29.04.1988 (A)
Convention on Wetlands of International Importance (Ramsar)	02.10.2005 (E)
UN Convention on Law of the Sea (UNCLOS)	02.02.1989 (R)
Western Hemisphere Convention	No
World Heritage Convention	01.11.1983 (A)

Key: Date of: Signature (S); Ratification (R); Accession (A); Entry into force (E)

Laws and regulations relating to marine turtles

Until 1990, exploitation of marine turtles in Antigua and Barbuda was governed by the *Turtle Ordinance of 1927*. This law established: a four-month closed season from 1 June to 30 September for all marine turtle species, with the exception of the Loggerhead; a minimum size limit of 20 lb (nine kilogrammes) in weight; and penalties, including a fine of “10 pounds”, for violations. Recognition that these requirements were inadequate to prevent declines in marine turtle numbers led to the adoption of the *Fisheries Regulations of 1990* (Section 21 of *The Fisheries Act, 1983*), which provide for:

- “until otherwise declared,” a six-month closed season from 1 March to 31 August, during which it is illegal to fish for, take, sell, purchase or possess any turtle or turtle part;
- a complete prohibition of:
 - disturbance, take, sale, purchase or possession of any turtle eggs or interference with any turtle nest;
 - take, sale, purchase or possession of any undersized turtle;
 - sell or purchase of shell of any undersized turtle.
- minimum size limits, “undersized” turtles being:
 - (a) Leatherbacks weighing less than 350 lb (158.75 kg);
 - (b) Green Turtles weighing less than 180 lb (81.65 kg);
 - (c) Hawksbill Turtles weighing less than 85 lb (38.50 kg);
 - (d) Loggerheads weighing less than 160 lb (72.57 kg).

The Regulations further prohibit the use of spear guns for fishing in Antigua and Barbuda without prior written permission from the Chief Fisheries Officer. Any person convicted of contravening any of the provisions of the Regulations is liable to a fine of 5000 East Caribbean dollars (XCD5000) or 12 months’ imprisonment. In addition, any fishing vessel (together with its gear, stores and cargo) and any vehicle, fishing gear, net or other fishing appliance used in the commission of the offence may be forfeited (Section 33 of the *Fisheries Act, 1983*).

This legislation has recently been updated with the assistance of the FAO and includes new and more stringent measures for the management and conservation of marine turtle populations in Antigua and Barbuda. The new draft regulations prohibit the capture/taking of all marine turtles, turtle eggs and the disturbance of turtles found on shore. The result is a moratorium on the capture of marine turtles, but for which the Minister may still declare open seasons. The draft regulations also set maximum (rather than minimum) size limits, “a measure that is set in place to protect mature females” (T. Lovell, Fisheries Division, *in litt.*, 12 April 2005).

According to the Fisheries Division (2002), although Antigua and Barbuda became a Party to CITES in 1997, there is currently no legislation to implement the Convention. The CITES National Legislation Project, initiated in 1992, assessed Antigua and Barbuda’s CITES-implementing legislation as “believed generally not to meet the requirements for the implementation of CITES” (Anon., 2002) and assigned a deadline of 30 June 2004 for enactment of adequate implementing legislation. This deadline was subsequently extended and, by the 53rd meeting of the CITES Standing Committee (27 June–1 July 2005), Antigua and Barbuda had submitted a CITES Legislation Plan and draft legislation to the CITES Secretariat for comments; the Standing Committee will review legislative progress at its 54th meeting (scheduled for late 2006) (Anon., 2005a and b).

There is no legislation in Antigua and Barbuda providing for enforcement of the fisheries regulations, nor conservation and management measures, such as the protection of important sites (e.g. critical breeding habitat).

Responsible authorities

According to the Fisheries Division (2002), that agency is solely responsible for all aspects of marine turtle management, including exploitation, trade, conservation and enforcement.

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective

The history of commercial and subsistence exploitation of marine turtles in Antigua and Barbuda extends back to the pre-Columbian era. Few marine turtle bones survived the millennia buried in kitchen middens in Antigua and Barbuda, but turtle idols have been found and pottery shards displaying marine turtle motifs are quite common. There is also evidence that seamen and fishers wore turtle motif jewellery, presumably to bestow swimming prowess like that of marine turtles (D. Nicholson, Museum of Antigua and Barbuda, pers. comm., cited in Fuller *et al.* 1992), and that several products were used, including oil (medicinal purposes), shell (e.g. cradle) and scutes (utility items, such as fish hooks), in addition to meat and eggs.

Fuller *et al.* (1992) reported that both resident and foreign fishers have a long history of taking turtles and that although catch records have never been kept, annual landings over the two decades prior to the time of their writing had sometimes reached several hundred—and some estimate several thousand—animals. They cite, for example, the estimate of Cato *et al.* (1978) that 500–3000 turtles were caught annually for domestic consumption in Barbuda alone and Joseph's (1984) estimate that 150 Green Turtles, 250 Hawksbill Turtles and one Leatherback were landed nationwide by local fishers in 1982. Turtles have traditionally been netted or taken from the nesting beaches, but as of the time of Meylan's (1983) writing, they were increasingly being speared by fishers seeking lobsters, reef fishes and conches.

Fuller *et al.* (1992) estimated that the number of turtles caught each year at the time of their writing did not exceed 50 turtles and was probably closer to 30, Green and Hawksbill Turtles combined, with an unknown proportion of nesting females, down from many hundreds a half-century earlier. They reported that Leatherbacks were rarely killed and that the take, whether in nets or from the nesting beach, was probably largely opportunistic. A combination of depleted stocks and low demand had reduced the number of active turtle fishers for whom turtling represented a significant source of income to only two to three individuals. While targeted exploitation of marine turtles was thought to be declining, incidental catch and opportunistic take with spear guns, as had been reported by Meylan (1983), appeared to be growing. In 1992, turtle meat was selling for up to XCD6/lb (comparable to fish), or ca. XCD100 for a whole turtle (Fuller *et al.*, 1992).

Loggerheads were also taken, but in much fewer numbers than Green or Hawksbill Turtles. Meylan (1983) reported that most were of intermediate size, weighing ca. 18–45 kg, and that they were most common around the north-western end of Barbuda, apparently feeding on Queen Conch *Strombus gigas*, and in deep waters east of Antigua.

Fuller *et al.* (1992) expressed concern about the continued, illegal (as of 1990) take of eggs, which they believed exceeded 5000 eggs, the equivalent of ca. 40 clutches, annually. Their informants estimated that roughly half of all eggs laid on Barbuda were collected each year. They noted that Joseph *et al.* (1984) had estimated that in 1982, 2500 eggs were collected “nationwide” for “subsistence use” but indicated that that number was, in 1992,

Credit: Scott A. Eckert/WIDECAST



Loggerhead caught in a fishing net.

perceived to have been a gross underestimate. Marine turtle eggs used to be available in the public market, but once sale and possession became illegal, eggs were consumed by the collector, shared amongst friends, or sold on the black market.

Fuller *et al.* (1992) characterized the entanglement of marine turtles in fish pot lines and longlines as an “increasingly serious problem”, implicating a multi-national legal and illegal longline fishing industry within and adjacent to national waters in the take of 100 or more turtles each year, mainly Loggerheads and Leatherbacks. They noted that entanglement and incidental catch also occurred in trammel nets, seines and gill nets.

Recent (since 1992) exploitation

According to the Fisheries Division (2002), current exploitation of marine turtles in Antigua and Barbuda focuses on Green and Hawksbill Turtles, mainly taken incidentally in trap and net fisheries. Although no records have been maintained of the number and species of turtles taken, based on interviews with fishers, it is estimated that the total number is less than 20 per year and that Hawksbill Turtles are more commonly caught. Fewer than 10 fishers are estimated to retain the turtles that they catch and they are not a major source of income. These turtles are generally shared amongst family and friends or sold informally by the fishers, primarily to rural residents. The Fisheries Division does not regulate or monitor the sale of marine turtles or products and reports no market as such for marine turtles or turtle products.

Although the legal take of turtles would appear to be at low level, illegal take of turtles and turtle eggs is known to occur. The Fisheries Division (2002) has received reports of turtle nests being excavated for their eggs and, based on additional anecdotal evidence, estimates that the number of turtles taken illegally is “small, less than 50 per year” and that these are taken by locals on an opportunistic basis.

International trade

Historical perspective

Fuller *et al.* (1992) documented a long history of trade in marine turtles from Antigua and Barbuda. They cited the report of Cato *et al.* (1978) of an estimated annual take of 150 animals in Barbuda for export, with Hawksbill Turtle shell buyers from Martinique, Saint Lucia and Guadeloupe visiting the island three times each year to buy shell, for which they paid XCD7–8 per lb. In addition, they cited Meylan’s (1983) report of the take of turtles in Barbuda for meat for hotel restaurants, not only in Antigua but also Guadeloupe, and, to a lesser extent, Saint Thomas and Puerto Rico and, further, that during the winter season, live Green Turtles were flown out several times a week on cargo planes coming to the island to pick up lobsters. Most of these were sub-adult and adult

Green Turtles—the juveniles were kept for local consumption. Meylan indicated that a “resident who co-ordinates the export business” reported that “several hundred” marine turtles were exported annually and that these exports included turtle carapaces and tortoiseshell. On Antigua, Meylan found that, in addition to being worked locally and marketed in tourist shops, tortoiseshell was exported raw, with buyers visiting fishers’ homes directly to purchase it; in 1980, the price paid was 12 US dollars (USD12)/kg.

For the period 1975–1992, inclusive, CITES trade statistics derived from the UNEP-WCMC CITES Trade Database record: four carapaces, seized on entry to the USA during the period 1982–1989; one body, imported into Switzerland in 1995; 340 live Hawksbill Turtles, imported into Canada in 1989 (180) and 1990 (160), for scientific purposes; and 60 Hawksbill Turtle eggs, imported to the USA, also for scientific purposes. The Fisheries Division (2002) indicates no knowledge of the reported live Hawksbill Turtle exports, no doubt because the permits in fact were for Hawksbill Turtle eggs exported to the University of Toronto for scientific research related to conservation (N. Mrosovsky, University of Toronto, *in litt.*, 3 November 2004 and see Mrosovsky *et al.*, 1992).

Japanese Customs statistics document a significant trade in Hawksbill Turtle shell reported as originating in Antigua and Barbuda. These data, as analysed by Milliken and Tokunaga (1987) for the period 1970–1986 and compiled for later years by TRAFFIC East Asia-Japan, record imports of Hawksbill Turtle shell into Japan from Antigua and Barbuda for the period 1970–1992 totalling 5559 kg, all of it during the period 1983–1991 (see table below).

Japanese imports (kg) of Hawksbill Turtle shell, 1970-1992, from Antigua and Barbuda, as recorded in Japanese Customs statistics

Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
	0	0	0	0	0	0	0	0	0	0	0	0
Year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Total
	0	49	286	221	293	317	146	562	2505	1180	0	5559

Source: Milliken and Tokunaga, 1987; H. Kiyono, TRAFFIC East Asia-Japan Office, *in litt.* to TRAFFIC International, 29 July 2002.

Fuller *et al.* (1992) refuted the accuracy of these Customs statistics. Based on the estimate of dealers in Hawksbill shell, 1.1 kg of shell derived from a single Hawksbill Turtle from Antigua and Barbuda (Milliken and Tokunaga, 1987) and, therefore, these import volumes would have derived from thousands of the animals, a far greater number than they believed were taken from the country’s waters. Instead, they argued, because the country was not a party to CITES, dealers were fraudulently recording it as the country of origin, a practice apparently not uncommon at the time among dealers trying to evade CITES restrictions (Canin, 1991). Having made that judgment, they conceded that the number of locally caught marine turtles entering international trade was not known. This is the case for the total volume of trade recorded in Japanese Customs statistics for the period 1970–1992: 5559 kg, or the possible equivalent of over 5000 Hawksbill Turtles.

After surveying tourist-oriented shops in Saint John’s and Nelson Dockyard National Park in October 1992, Fuller *et al.* (1992) reported the retail sale, aimed at tourists, of tortoiseshell jewellery (bracelets, earrings, rings),

trinkets (charms, money clips, hair combs) and polished shells ranging in price from USD5 (rings) to USD30 (for polished Hawksbill Turtle shells ca. 25cm in length), with much higher prices reported from airport shops (e.g. polished shells priced at “about USD100”). These items were made by local artisans from turtles caught locally.

Recent (since 1992) international trade

As previously stated, Antigua and Barbuda became a CITES Party in 1997. The only records of trade in marine turtles originating in the country and reported to CITES for the period 1993–2004, inclusive, were: a Hawksbill carapace seized upon entry into the USA in 1994; 30 Hawksbill specimens (presumably blood samples for genetic analysis) imported into Barbados for scientific purposes in 2004; and one kilogramme of Hawksbill meat recorded as having been imported into the USA in 2004. The Fisheries Division (2002) reported no knowledge of the export in 1994 or of any other export of marine turtles or turtle products from the country until the time of their writing and indicated that there were no imports. There are no known stockpiles of raw or worked Hawksbill Turtle scutes or shell products (Fisheries Division, 2002).

Enforcement issues

Fuller *et al.* (1992) cited several authors’ reports of problems of illegal exploitation of marine turtles and their eggs over several decades, which they indicated persisted at the time they were writing. They attributed poaching to several factors:

- fines for turtle violations had only recently been increased to levels likely to serve as a deterrent;
- there appeared to be no precedent for enforcement of conservation laws—at the time of their writing, no infraction of a wildlife protection law had ever been brought to court or successfully prosecuted; and
- no resources were available for effective law enforcement, such as salaries for wardens or a boat or a plane for surveillance.

Fuller *et al.* (1992) recommended that a conservation warden be employed to address this problem and that the creation of a separate Division of Conservation Law Enforcement would enable the government to enforce a growing number of important environmental regulations more effectively, including those related to pollution, protected species, mining and minerals, fisheries and marine resources, boater safety, game and hunting, and coastal zone management. More recently, the Government of Antigua and Barbuda (GOAB, 2001) has emphasized “the enforcement of policies, regulations and legislation” related to biodiversity as one of four strategic objectives of the country’s Biodiversity Strategy and Action Plan.

Marine turtle management

Management of exploitation

Fuller *et al.* (1992) identified three deficiencies in the 1990 *Fisheries Regulations* that comprise the current legal framework for the management of marine turtle exploitation in Antigua and Barbuda. These are discussed below.

1. Although the minimum size limit was raised to embrace a larger range of juvenile size classes and included the Loggerhead for the first time, this provision persists in exempting from protection the breeding adults that

are most important age class to conserve in order to maintain population viability and promote population recovery.

2. The closed season does not encompass the entire marine turtle breeding season and, thus, puts at risk breeding adults, in particular females coming to shore to nest, that are the priority age class for conservation effort. Because the majority of Hawksbill Turtles are still nesting when the season opens on 1 September, some three-quarters of the entire breeding population in Antigua and Barbuda could be legally exterminated.



Credit: Scott A. Eckert/WIDECASST

Scientists measure the curved carapace length of a nesting Leatherback.

3. Size limits should be expressed in shell length (CCL—curved carapace length) rather than total weight to enable measurements to be taken at sea and prior to landing; in this way, undersized turtles may be returned to the sea more readily.

It should be noted that there are other deficiencies in the overall framework for managing exploitation of marine turtles in Antigua and Barbuda, in particular the absence of a monitoring programme to document marine turtle landings, catch-per-unit effort and other parameters that would enable inferences to be made of trends in marine

turtle populations and what those might suggest for revised management measures. That, in addition, there is no other marine turtle population monitoring under way other than at Long Island means that there is no scientific basis upon which to assess population trends, the effects of exploitation and the urgency of revised management measures. The number of turtles caught and released (*versus* landed) incidentally in fishing operations appears also to warrant investigation and, possibly, sustained monitoring.

There has been no stock assessment in the usual sense for any species of marine turtle in Antigua and Barbuda and the Fisheries Division (2002) recognizes that the measures currently in place to manage and monitor the legal fishery are insufficient to prevent a decline in marine turtle populations. For this reason, the Division has been reviewing the 1992 STRAP and discussing revisions to the management provisions in place for these species. Some of the revisions that are being discussed are: a moratorium on the exploitation of marine turtles, extension of the closed season to encompass the full nesting season and establishment of maximum size limits.

As this report goes to press, the *Fisheries Regulations* of 1990 have been updated with the assistance of the FAO and, while they are still in draft form, they are reported to prohibit the capture/taking of all marine turtles, turtle eggs and the disturbance of turtles found on shore. Open seasons may yet be declared by the Minister, but the new draft regulations set maximum (rather than minimum) size limits, “a measure that is set in place to protect mature females” (T. Lovell, *in litt.*, 12 April 2005).

Species research and conservation

The JBHP, initiated in 1987 as a partnership between WIDECAS and the Jumby Bay Island Company, is the only marine turtle research programme in Antigua and Barbuda. The intensive study of this small population (ca. 50 reproductively active females per year—e.g. Stapleton and Stapleton, 2004) nesting at Pasture Bay, Long Island, has made significant scientific contributions to the understanding of Hawksbill Turtle life-history characteristics, including adult female recruitment and survival, and has meaningfully informed national and regional policy debates (Richardson *et al.*, 1999 and McIntosh *et al.*, 2003). The Government of Antigua and Barbuda (GOAB, 2001) also recognizes the JBHP as an excellent example of a planned (and successful) co-existence between development, marine turtle conservation and tourism and has recommended that it and the materials and methodologies developed for it should serve as models to safeguard other Hawksbill Turtle nesting beaches.

Fuller *et al.* (1992) proposed a five-year national Sea Turtle Conservation Programme that included as major components:

- quantifying the legal and illegal take of marine turtles, including incidental take;
- strengthening the regulatory framework, including enacting a moratorium on the take of marine turtles and their eggs as soon as practicable;
- obtaining comprehensive and accurate data on the distribution of turtle nesting and foraging habitat;
- conducting an island-wide survey of Barbuda and surveys of three potentially very important Hawksbill Turtle nesting grounds in Antigua—Sandy Island, Pearn’s Bay beach group, and Mill Reef beach;
- designating Index sites (both nesting beaches and foraging grounds) to serve as focal areas for long-term research and monitoring;
- initiating systematic study of marine habitat use by marine turtles, including residency patterns, foraging behaviour and movement corridors; and
- promoting greater public involvement in marine turtle population monitoring, conservation and recovery initiatives, habitat protection and reporting offences.

In furtherance of these objectives, Eckert (2002) details a national workplan emphasizing: a national socio-economic survey regarding marine turtle use and attitudes; creation of a National Sea Turtle Network (including sightings and population monitoring networks); review and revision of the regulatory framework; development of public awareness materials and activities; and general capacity-building and training for government officers, NGOs and coastal communities. Funding is currently being sought by the Fisheries Division to improve nesting beach management by involving private property owners, hoteliers and coastal communities through a series of outreach and training workshops; target beaches will be selected based on information provided in Fuller *et al.* (1992) and the project will also “seek to reach the wider community in an effort to sensitize them about sea turtle conservation” (T. Lovell, *in litt.*, 5 April 2005).

Habitat conservation

According to the Government of Antigua and Barbuda (GOAB, 2001), the identification of “critical habitats and species (terrestrial and marine) for conservation” is a priority in their biodiversity action planning, as the loss of habitat is one of the greatest threats to biodiversity in the country. In particular, the loss of nesting habitat is “the greatest threat to the three species of endangered sea turtles that are known to nest in Antigua and Barbuda”, while

seagrass, although “little researched and underestimated”, is also recognized as important habitat for “two priority marine animal taxa—turtles and conch”. Several areas important to marine turtles (e.g. Point North-east Area from Boon Point to Indian Town and Barbuda Lagoon) have been proposed as marine reserves (GOAB, 2001), but, as yet, no reserves have been set aside to protect turtle nesting or foraging sites (Fisheries Division, 2002). Cades Bay Marine Reserve, located on the south-west coast, embraces mangrove, coral reef, seagrass and sandy beach habitat and while it was not specifically designed to benefit marine turtles, it does safeguard potentially important habitat (P. James, Senior Fisheries Officer, pers. comm., 2004).

Fuller *et al.* (1992) strongly recommended an island-wide survey of Barbuda; an assessment of three potentially very important Hawksbill Turtle nesting grounds in Antigua (namely, Mill Reef beaches, Sandy Island and Pearn’s Bay beach group); the designation of Index beaches to serve as focal areas for long-term research and monitoring; and systematic study of marine habitat use by turtles. They also suggested that consideration be given to designating the island of Barbuda as a Sea Turtle Refuge.

Education and public awareness

Aside from public school presentations sponsored by the JBHP and the Environmental Awareness Group of Antigua and Barbuda, there appears to have been little effort to heighten awareness of marine turtle conservation in the country. As part of their biodiversity action planning, the government (GOAB, 2001) has identified “increasing public awareness of policies and laws relating to biodiversity” as a priority. The Fisheries Division (2002) views such efforts as “the most important” ingredient for effective marine turtle management in the country.

Constraints to marine turtle conservation and management

The Fisheries Division (2002) is “putting measures in place” to address a number of issues that impede marine turtle management in the country. These include: shortcomings in the legal and regulatory framework, lack of knowledge of marine turtles, limited manpower, lack of trained personnel, insufficient funding and lack of public support. Greater advantage could be taken of regional resources available to assist in these areas, including capacity-building, training and public awareness. WIDECAST, for example, makes available tags and basic field equipment, database management software and other record-keeping tools, educational materials, off-site training and mentoring programmes, best practices documentation and assistance with project development and fund-raising.

Summary and recommendations

Although there has been little systematic monitoring of marine turtle populations in Antigua and Barbuda, they were identified over 10 years ago as representing only a fraction of historical numbers, with nesting populations at risk of complete extirpation, as a result of both legal and illegal exploitation and loss and degradation of both nesting and foraging habitats from a range of factors (Fuller *et al.*, 1992). A legal fishery has persisted and, although it has been regulated for almost 80 years, the restrictions in place not only do not significantly restrict the exploitation of marine turtles, but also target exploitation on large juvenile and adult turtles that are the most important age classes to conserve in order to maintain populations and promote population recovery. Further,

there has been no monitoring of the legal fishery to record landings and other parameters of the fishery and assess trends in these and their implications for marine turtle populations and their management needs and, other than by the JBHP, there has been no population monitoring and no active marine turtle conservation efforts.

The current regime fails to achieve management and is inconsistent with the principles and practice of sustainable use. That these shortcomings have been recognized by the government is a positive first step in what should be a comprehensive effort to modernize the management framework relevant to marine turtle stocks in the country. The lack of a scientifically based stock assessment and limits on the numbers of turtles that may be taken or of fishers licensed to take turtles suggests a need for additional measures that would assist in preventing further population declines and, possibly, promoting population recovery. Fundamental to any exploitation regime aimed at sustainable use is the development and implementation of a monitoring programme for the fishery to record relevant data on landings so as to assess compliance, monitor trends, and infer what those trends may mean for marine turtle populations and for the effectiveness of management measures.

In accordance with the FAO Code of Conduct for Responsible Fisheries (FAO, 1995), an explicitly precautionary code, which states that “the right to fish carries with it the obligation to do so in a responsible manner so as to ensure effective conservation and management of the living aquatic resources”, the management of marine turtle resources in Antigua and Barbuda should seek to maintain the availability of the resource “in sufficient quantities for present and future generations in the context of food security, poverty alleviation and sustainable development”. Management measures should, *inter alia*, prevent over-fishing, rehabilitate depleted populations, incorporate the best scientific evidence (taking into account traditional knowledge, as well as relevant environmental, economic and social factors), assign priority to research and data collection (including at international scales), and promote environmentally safe fishing gear and practices in order to protect both the target resource and the ecosystems upon which it depends.

Among the fundamental components of any regime aimed at management of wild populations are: restrictions on exploitation that are consistent with the species’ biological requirements; a monitoring programme—systematic, sustained, and rigorous collection and review of data—either on the specifics of exploitation or of wild populations so as to discern trends that can inform management; mechanisms to identify, monitor and address other threats to the species being exploited, so that these threats can be factored with exploitation to assess what level of overall mortality the species might sustain; and a high level of compliance (sometimes achievable only through vigorous enforcement) with the restrictions put in place to ensure that management goals are achieved. It does not appear that any of these activities are being undertaken—at least not on the systematic basis that is required—on either Antigua or Barbuda.

1. In the light of the recognized depleted status of marine turtles in Antigua and Barbuda and the potential for continuing declines resulting from the legally mandated exploitation of large juvenile and adult turtles, and in the absence of systematic population monitoring, there is no discernible basis for the maintenance of a legal fishery for marine turtles in Antigua and Barbuda. The government should move expeditiously on a comprehensive revision of both the regulatory framework and the broader institutional mandates and priorities that provide for the types of activities that form part of a management programme. Recently revised draft (not yet gazetted) regulations that fully protect marine turtles in the country’s waters, as well as during nesting, would appear to be a useful advance.

2. In support of a comprehensive review and revision of the legal framework for marine turtle management, a comprehensive frame survey should be undertaken to quantify and characterize exploitation and use of marine turtles at the national level, including:
 - the landing of turtles at sea and hunting on nesting beaches;
 - exchange and marketing of turtles and turtle products;
 - numbers and types of fishers (and gears) involved, including the extent to which marine turtle landings result from incidental or opportunistic take in other fishing operations or from a targeted fishery;
 - processing and marketing patterns; and
 - the importance to livelihoods of the products and income derived from marine turtle exploitation.

This investigation should also aim to establish the nature and extent of illegal exploitation and trade of marine turtles and eggs and marine turtle products, and the extent to which they may negatively impact marine turtle populations and compromise management.

3. If legal exploitation is to continue, the restrictions on this exploitation should reflect the biological parameters of marine turtles, take into account their depleted status and aim, at a minimum, at preventing further population declines. Any exploitation regimen promoting population recovery and maintenance should be established and conducted according to sound management principles and practice, which should include the following:
 - A. Bringing exploitation in line with biological principles, including:
 - complete protection of nesting females, their eggs and young at all times;
 - complete protection of all species during the primary nesting season, 1 March to 30 November;
 - complete protection of the Leatherback, which occurs in the country only as an adult, and typically an egg-bearing female;
 - maximum size limits, based on length (which is easier to undertake in the field) rather than weight, so as to safeguard large juveniles and adults;
 - a conservative limit on the numbers of animals that may be exploited, based on a scientific stock assessment; and
 - a requirement that capture quotas be based, if not on stock assessment, on data derived from national processes and research activities, and that, as far as practicable, these data be collected in such a way as to be compatible with the goal of assessing stocks throughout their full geographic ranges.
 - B. Managing the legal fishery through an enforceable, high-compliance monitoring programme aimed at establishing trends and monitoring these over time. A national programme to monitor marine turtle exploitation should document comprehensively and systematically, and in a manner allowing such records to be analysed and compared over time, the following:
 - the number of fishers taking marine turtles and by what means;
 - the number, size and species distribution of the marine turtles landed;
 - the localities where the turtles were taken;
 - catch-per-unit effort; and
 - the disposition of the marine turtles landed, including value of the animal and/or products if sold or traded.

In further support of reliable monitoring of the fishery, the following should be considered as requirements for participation:

- that ownership identification tags be installed on approved gear (e.g. nets)
- that turtles be landed alive or intact; prohibiting, for example, the use of spear guns and extended net sets that can result in drowning, and providing for reliable recording and verification of turtle landings; and
- that the licensing process include as a criterion full participation in the monitoring programme.

C. Establishing a systematic marine turtle monitoring programme that will:

- document distribution and abundance of local populations;
- identify major nesting grounds and foraging areas;
- designate Index nesting beaches and Index foraging grounds and document the numbers of marine turtles occurring in these over time;
- manage data records such that statistically significant trends in abundance can be identified and inform management; and
- identify and monitor threats and other factors influencing marine turtle survival.

4. Recognizing the importance of habitat pressures on marine turtles and the role of marine turtles and intact marine turtle habitat in the “tourism product”, critical habitats, both terrestrial and marine, should be identified and protected and incorporated into broader biodiversity management programmes. The government should consider:

- expanding the number of protected nesting beaches;
- enhancing habitat protection measures, including restriction/regulation of tourism and other activities near nesting beaches during the egg-laying season and vigorous enforcement of such measures, such as against sand-mining;
- adopting regulations to prevent or otherwise manage leaving of nets and other debris on the beach;
- improving coastal zone management (and monitoring) capacity, including through environmental impact assessment, particularly in relation to the construction of beach-front hotels and other tourism infrastructure and sand-mining;
- expanding the system of protected areas; and
- strengthening the management framework for protected areas to ensure that these areas fulfill their stated objectives.

5. Mechanisms to quantify levels of incidental catch of marine turtles should be developed. Measures to reduce or eliminate incidental catch of marine turtles, such as through time-area closures and/or alternative (especially to gill nets) types of gear, should be implemented.

6. There is a need for greater enforcement of marine turtle regulations and, as has been recognized by the government (Fisheries Division, 2002), a need for an improved legal basis for enforcement. Existing legislation should be revised to establish clear authorities for environmental enforcement, including of the *Fisheries Regulations*.

7. There is a need for greater enforcement capacity and effort, including training, logistical support, and a mobile enforcement unit. This capacity should involve outreach and other activities that will engage greater efforts

on the part of police for fisheries and broader environmental enforcement. A mutually agreed set of protocols and procedures for these agencies to follow in such circumstances may be an option to consider.

8. The Government of Antigua and Barbuda should move forward expeditiously to enact legislation to enable full implementation and enforcement of CITES provisions, including wildlife trade controls, scientific non-detriment findings and control and monitoring, as appropriate, of stockpiles of CITES species.
9. Increased efforts should be made to engage local communities, including fishers, in marine turtle conservation and management. Fisheries extension efforts should be implemented that involve regular exchanges with fishers of information on marine turtles and their conservation and management needs and the participation of fishers in efforts to manage marine turtles so as to enhance compliance with regulations and support for marine turtle conservation. Support directed towards sustainable fishery practices and/or alternative livelihoods should be provided, as relevant and necessary, to assist fishers meaningfully in their efforts to comply with revised marine turtle regulations.
10. There should be effective co-ordination between the fisheries offices in Antigua and Barbuda, so as to ensure that the management measures being implemented for the marine turtles that are undoubtedly moving around the two islands are well integrated and mutually reinforcing and enhance these agencies' abilities to assess trends in the fishery and in the country's turtle populations. Monitoring, including the sharing of data on marine turtle distribution and exploitation, enforcement and public outreach, are two areas that would particularly benefit from effective co-ordination.
11. Financial, logistical, and political support and encouragement should be extended to relevant government agencies to develop and implement a modern, scientifically based conservation and management regime for nationally depleted marine turtle stocks, including for the revision of the legal framework, scientific studies, monitoring programmes, enforcement capacity, and institutional strengthening of government agencies whose mandate includes marine turtles and their habitats. Both private and public foreign investment in the fisheries and tourism sectors in Antigua and Barbuda should take account of the increased responsibilities—and costs—of the Fisheries Division and other agencies in managing for sustainability the resources concerned and the broader biodiversity impacts that may ensue.
12. Community outreach and population monitoring efforts being undertaken by NGOs in collaboration with the government should be expanded through increased financial commitments from bilateral and multilateral assistance agencies. Co-management agreements between the government and NGOs/CBOs, developed by consensus, are encouraged.
13. Antigua and Barbuda, through the Jumby Bay Island Company, is credited with the hemisphere's longest-running and most comprehensive population monitoring programme for the Hawksbill Turtle. Government recognition of this programme as a model for other efforts, both nationally and regionally, speaks to the country's commitment to establishing a leadership role in marine turtle research and management. Efforts to build on existing successes are encouraged.

References

- Anon. (2002). CITES Document CoP12 Doc. 28. Working document of the 12th meeting of the Conference of the Parties, Santiago (Chile), 3–15 November 2002. Accessible at www.cites.org. Viewed 12 December 2005.
- Anon. (2005a). CITES Document SC53 Doc. 31. Working document of the 53rd meeting of the CITES Standing Committee. Accessible at www.cites.org. Viewed 12 December 2005.
- Anon. (2005b). SC53 Summary Record. Official report of the 53rd meeting of the CITES Standing Committee. Accessible at www.cites.org. Viewed 12 December 2005.
- Bass, A.L. (1999). Genetic analysis to elucidate the natural history and behaviour of hawksbill turtles (*Eretmochelys imbricata*) in the wider Caribbean: a review and re-analysis. *Chelonian Conservation and Biology* 3(2):195-199.
- Bass, A.L., D.A. Good, K.A. Bjorndal, J.I. Richardson, Z. Hillis, J.A. Horrocks and B.W. Bowen. (1996). Testing models of female reproductive migratory behaviour and population structure in the Caribbean Hawksbill turtle, *Eretmochelys imbricata*, with mtDNA sequences. *Molecular Ecology* 5(3):321.
- Canin, J. (1991). International trade aspects of the Japanese Hawksbill shell ('Bekko') industry. *Marine Turtle Newsletter* 54:17–21.
- Cato, J.C., F.J. Prochaska and P.C.H. Pritchard. (1978). *An Analysis of the Capture, Marketing and Utilization of Marine Turtles*. A report to NOAA National Marine Fisheries Service, Environmental Assessment Division. St. Petersburg, Florida. 119 pp.
- Eckert, K.L. (2002). Antigua and Barbuda Sea Turtle Program Objectives and Work Plan: Meeting Report and Recommendations. Prepared by WIDECAST for the Division of Fisheries, Government of Antigua and Barbuda, based on a Joint Consultation, 26–27 September 2002, St. John's. Unpublished. 6 pp.
- FAO. (1995). Code of Conduct for Responsible Fisheries. Adopted by the 28th Session of the FAO Conference. Food and Agriculture Organization of the United Nations, Rome. 34 pp. + annexes. www.fao.org/fi/agreem/codecond/codecon.asp
- Fisheries Division. (2002). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of the Marine Turtles of the Lesser Antilles, Central America, Colombia and Venezuela. Completed by Ms. Candia Williams, Consultant Marine Ecologist, Fisheries Division, Ministry of Agriculture, Lands and Fisheries. Dated 30 September 2002.
- Fuller, J.E., K.L. Eckert and J.I. Richardson. (1992). *WIDECAST Sea Turtle Recovery Action Plan for Antigua and Barbuda*. CEP Technical Report No. 16. UNEP Caribbean Environment Programme, Kingston, Jamaica. 88 pp.
- GOAB (Government of Antigua and Barbuda). (2001). *Antigua and Barbuda's First National Report to the Convention on Biological Diversity*. Prepared under UNDP Project ANT/97/G31/1G – Biodiversity Enabling Activity Project. Office of the Prime Minister. March 2001. ag-nr-01-en.doc, available from www.biodiv.org
- Groombridge, B. and R. Luxmoore. (1989). *The Green Turtle and Hawksbill (Reptilia: Cheloniidae): World Status, Exploitation and Trade*. Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Lausanne, Switzerland. 601 pp.
- Joseph, D., J.E. Fuller and R. Camacho. (1984). The National Report for Antigua and Barbuda. Pp. 12–29. In: P. Bacon *et al.* (Eds). *Proceedings of the Western Atlantic Turtle Symposium, 17–22 July 1983, San José, Costa Rica*, III, Appendix 7. University of Miami Press, Florida.
- McIntosh, I., K. Goodman and A. Parrish-Ballentine. (2003). *Tagging and nesting research on Hawksbill turtles (Eretmochelys imbricata) at Jumby Bay, Long Island, Antigua, West Indies: 2003 Annual Report*. Prepared for the Jumby Bay Homeowners Association, Long Island, Antigua. Jumby Bay Hawksbill Project/WIDECAST. 29 pp.

- Meylan, A.B. (1983). Marine turtles of the Leeward Islands, Lesser Antilles. *Atoll Research Bulletin* 278:1–24 + figs.
- Meylan, A.B. (1999). International movements of immature and adult hawksbill turtles (*Eretmochelys imbricata*) in the Caribbean Region. *Chelonian Conservation and Biology* 3(2):189–194.
- Milliken, T. and H. Tokunaga. (1987). *The Japanese Sea Turtle Trade 1970–1986*. A special report prepared by TRAFFIC (Japan). Center for Environmental Education, Washington, DC. 171 pp.
- Mrosovsky, N., A. Bass, L.A. Corliss, J.I. Richardson and T.H. Richardson. (1992). Pivotal and beach temperatures for Hawksbill turtles nesting in Antigua. *Canadian Journal of Zoology* 70:1920–1925.
- Rebel, T.P. (1974). *Sea Turtles and the Turtle Industry of the West Indies, Florida, and the Gulf of Mexico*, revised edn. University of Miami Press, Coral Gables. 250 pp.
- Richardson, J.I., R. Bell and T.H. Richardson. (1999). Population ecology and demographic implications drawn from an 11-year study of nesting Hawksbill turtles, *Eretmochelys imbricata*, at Jumby By, Long Island, Antigua, West Indies. *Chelonian Conservation and Biology* 3(2)244–250.
- Stapleton, S. and C. Stapleton. (2004). Tagging and nesting research on Hawksbill turtles (*Eretmochelys imbricata*) at Jumby Bay, Long Island, Antigua, West Indies: 2004 Annual Report. Prepared for the Jumby Bay Homeowners Association, Long Island, Antigua. Jumby Bay Hawksbill Project/WIDECAST. 23 pp.

Aruba

Introduction

The island of Aruba is located ca. 30 km off the coast of Venezuela and 67 km west of Curaçao; it is the westernmost island of the Dutch Caribbean. Small and flat, Aruba covers a total land area of 193 km² and is semi-arid in climate and vegetation type. It was one of six islands comprising the Netherlands Antilles until 1986, when it became a separate, autonomous entity within the Kingdom of the Netherlands.

Until recently, very little was known about the distribution and abundance of marine turtles in Aruba, other than that their numbers were very low and appeared to have been so for a long time. According to Zeinstra (2002), Aruba's human history dates to 2500 BC and is "interwoven with sea turtles". Citing Rooze and Kristensen (1977) and Versteeg *et al.* (1990), she reviews historical evidence that Green Turtle shields (shells) were found in archeological excavations near Malmok and that the shields were used at funerals for leaders of pre-ceramic indigenous societies.

All marine turtle species have been protected by law in Aruba since 1987 and their eggs have been protected since 1980. However, formal data-collection on nesting and other activities did not begin until 1992, through a formal partnership between the *Directie Landbouw, Veeteelt en Visserij* (LVV—the Directorate of Agriculture, Husbandry and Fisheries) and the Wider Caribbean Sea Turtle Conservation Network (WIDECAST) (T. Barmes, LVV, *in litt.*, to K. Eckert 8 September 1992).

A Sea Turtle Recovery Action Plan (STRAP) for Aruba, developed and published under the auspices of WIDECAST and the United Nations Caribbean Environment Programme (Barmes *et al.*, 1993), reviewed available information on the status and trends of marine turtles in Aruba and the threats they faced. Although the STRAP noted concerns with respect to continued, low-level illegal exploitation of marine turtles, particularly in relation to the very small numbers of animals believed to occur there, it identified habitat issues, largely associated with the high levels of tourism on the island, as the major problems to be addressed. These included: loss and degradation of nesting habitat from tourism infrastructure and recreational equipment; destruction of nests from vehicles driving on the beach; and the effects of beach-front lighting on females coming to shore to nest and on hatchlings, who were often disoriented from reaching the sea.

In the decade that has followed publication of the STRAP, a great deal has been achieved in terms of data-gathering, awareness, and improvements in the laws affecting marine turtles. However, not only has the lighting problem not been solved, it has exacerbated during this time, owing to a doubling of the human population and the infrastructural and other developments and increase in human activities that have ensued (van der Wal and van der Wal, 2004). On the north-east coast, the main threat is from motorized vehicles driving on the beaches, the "large amounts" of inorganic waste that accumulate on the coast and, in recent years, the proliferation of "weekend houses" illegally constructed on the beach and in marine turtle nesting zones (Zeinstra, 2002).

Summary of the status of marine turtles in Aruba

Four species of marine turtle nest on the beaches of Aruba: the Loggerhead, Green Turtle, Leatherback and Hawksbill Turtle (van der Wal and van der Wal, 2003; see table overleaf). There is no indication that

Loggerheads or Leatherbacks are present outside the nesting season. Intriguing is the lack of evidence for Leatherbacks nesting on the island at the time of van Buurt’s writing (1984), as later reports note that this is the primary species nesting on Aruba: he reported nesting along “various beaches on the north coast”, but that only Hawksbill Turtles had been positively identified.

Occurrence of marine turtles in Aruba

English common name	Scientific name	Occurrence
Loggerhead	<i>Caretta caretta</i>	N, F?
Green Turtle	<i>Chelonia mydas</i>	N, F
Leatherback	<i>Dermochelys coriacea</i>	N
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	N, F
Kemp’s Ridley	<i>Lepidochelys kempii</i>	A
Olive Ridley	<i>Lepidochelys olivacea</i>	A

Key: N=nesting; F= foraging; A=absent

Barnes *et al.* (1993) considered it likely that the total number of marine turtle nests laid per year—for all species—in Aruba was fewer than 30 and that the number of nesting females—which evidence at that time suggested were mainly Leatherbacks—might be fewer than 10. Van der Wal and van der Wal (2003) summarized census data for the period 1999–2002. They documented, definitively, 0 (1999), 0 (2000) and 34 (2001)



Credit: WWF-Canon/Roger LeCiccen

Nesting Leatherback

Leatherback nests, as well as nesting by Loggerheads, Hawksbill and Green Turtles, based on daily nest counts on 2700 m of sandy beaches on the western shore of Aruba, during the morning hours, from 1 March to 1 August. Further efforts documented seven, 47 and 24 Leatherback nests on the west coast, in 2002, 2003, and 2004, respectively, and 12 more in Arikok National Park, suggesting that perhaps 140 or more Leatherback nests were laid in Aruba during the period 1999–2004 (E. van der Wal and R. van der Wal, Turtugaruba Foundation, *in litt.*, 27 October 2004) and offering hope that reproductive activity by this species is increasing on the island. Van der Wal and van der Wal also

report, based on beach monitoring, that nesting by species other than Leatherbacks fluctuates and is “very small”: 5–20 Hawksbill Turtle nests, 2–20 Green Turtle nests and 0–12 Loggerhead nests, annually.

Information collected in the past decade or so has documented the relative importance of the various nesting beaches. The island’s primary nesting grounds are: for Leatherbacks, Eagle Beach (from Amsterdam Manor to Tamarijn) on the west coast and Dos Playa Grandi and Dos Playa Chikitu (Arikok National Park) facing the

north-east; for Loggerheads, Malmok on the west coast; for Hawksbill Turtles, Arashi Beach near the western point of the island; and, for Green Turtles, very low-density nesting is reported at several locations around the north-eastern coast from California to the Pet Cemetery (van der Wal and van der Wal, 2002).

Although Green and Hawksbill Turtles of varying sizes are present in Aruba year-round and presumed to feed in the island’s waters, the extent to which Loggerheads and Olive Ridleys forage is unknown. Van Buurt (1984) reported foraging (observed by divers) along the “north coast of Aruba” but provided no further details. Barmes *et al.* (1993) summarized the distribution of living coral reef and seagrass and recommended that an assessment of the importance of these habitats as foraging grounds for marine turtles be undertaken, with the resulting baseline data centrally compiled and archived. To date, the major foraging areas around the island remain unknown.

Because there is no local tagging of nesting or foraging turtles, no international tag returns are available to indicate the full geographic range of Aruba’s marine turtle stocks.

Overview of the legal framework for marine turtle management

Membership in international and regional treaties

Aruba enjoys a unique status as part of the Kingdom of the Netherlands. It is not automatically covered by the membership of the Netherlands in international agreements, nor is it covered by commitments made on behalf of the Netherlands Antilles since its change of status in 1986. See table below.

Membership of Aruba in multilateral agreements relating to marine turtles

Convention	Aruba
Cartagena Convention	01.01.1986 (R)
Protocol Concerning Specially Protected Areas and Wildlife (SPAW)	17.06.2000 (R)
Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region	30.03.1986 (E)
Protocol Concerning Pollution from Land-based Sources and Activities	06.10.1999 (S)
Convention on Biological Diversity (CBD)	04.06.1999 (E)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	29.03.1995 (E)
Convention on Migratory Species (CMS)	01.01.1986 (E)
Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	Yes
MARPOL 73/78 (Annex I/II)	01.01.1986 (Ap)
MARPOL 73/78 (Annex III)	19.04.1988 (S)
MARPOL 73/78 (Annex IV)	No
MARPOL 73/78 (Annex V)	19.04.1988 (S)
Convention on Wetlands of International Importance (Ramsar)	23.09.1971 (E)
UN Convention on Law of the Sea (UNCLOS)	Yes (R)
Western Hemisphere Convention	No
World Heritage Convention	16.03.1993 (E)

Key: Date of: Signature (S); Ratification (R); Entry into force (E); Approval (Ap)

Laws and regulations relating to marine turtles

Marine turtle nests and eggs have been protected in Aruba since 1980 through the *Marien Milieuverordening Aruba* (Marine Environment Ordinance of Aruba) *AB 1980, No. 18*. Article IV stipulates that it is illegal to disturb marine turtle nests, or to remove, destroy, possess, deliver, transport, buy or sell marine turtle eggs. In addition, Article V stipulates that it is prohibited to kill animals and/or plants from the waters of Aruba if such animals and/or plants are listed by subsequent decree. In addition, it is prohibited to sell, purchase, deliver, import, export, or possess such animals and/or their parts or products (living or dead). It is similarly prohibited to use their products for making goods—such as tortoiseshell earrings, for example. All Atlantic/Caribbean species of marine turtle—the Loggerhead, Green Turtle, Leatherback, Hawksbill Turtle, Olive Ridley and Kemp’s Ridley—were listed under this law by *Decree No. 51 of 1987*. Barmes *et al.* (1993) noted that the maximum penalty for violation of the Ordinance was one month in prison and/or a fine of 2500 Aruban guilders (AWG2500), as well as confiscation of the equipment used in committing the violation. A repeat offence within a year doubled the penalty due. They recommended that these penalties be increased in order substantially to exceed product value. The recommendation was achieved with the *Natuurbescherming Beschermingsverordening* (Nature Conservation Ordinance) *AB 1995, No. 2*, under which the penalties for killing a protected species, such as a marine turtle, are at most two years in prison and/or a fine of AWG100 000.

Provisions for implementing the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) were included in the *Landsbesluit in-en Uitvoerverbod Bedreigde Dieren en Planten* (Import and Export of Animals and Plants Decree), *AB 1991, No. 102*, but the Decree was withdrawn from consideration with passage of the *Natuurbescherming Beschermingsverordening* of 1995, which made it possible to: protect indigenous fauna and flora; designate nature reserves; and prohibit trade, import, export, possession (dead or alive), killing or wounding of species listed in the Appendices of CITES or the Protocol Concerning Specially Protected Areas and Wildlife (SPAW Protocol) to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, or Cartagena Convention. Aruba’s CITES-implementing legislation is under review as part of the CITES National Legislation Project (dependent territories have recently been included in the Project). The deadline for having adequate CITES-implementing legislation enacted in the case of Aruba is 30 September 2006 (Anon., 2004; S. Nash, Chief, Capacity Building Unit, CITES Secretariat, *in litt.* to J. Gray, TRAFFIC International, 21 September 2005). It is expected that at some point the *Natuurbescherming Beschermingsverordening* will replace the *Marien Milieuverordening Aruba*, but at present both remain in force (E. van der Wal and R. van der Wal, *in litt.*, 28 October 2004).

There is no legislation in place in Aruba for coastal zone management, including for the designation of marine protected areas. Two decrees are in process, however, under the aegis of the *Natuurbescherming Beschermingsverordening* of 1995: the *Landsbesluit Parke Marino Aruba* and the *Landsbesluit Parke Natural Spaans Lagoen*, intended to designate the waters entirely surrounding Aruba as a marine park (using the Bonaire Marine Park as a model) and, independently, to confer protection to the unique ecosystem of Spaans Lagoen, a designated Ramsar Convention site since May 1980. These decrees also provide a national coastal zone management framework, including a coastal zone management authority. These decrees were expected to be finalized and adopted by Parliament before the end of the legislative session in September 2005 (B. Boekhoudt, Ministry of Labour, Culture and Sports, pers. comm., 18 November 2004). Pending their enactment, an inter-agency task force has been co-ordinating relevant activities and making recommendations.

The *Landsverordening openbare wateren en stranden* (Public Waters and Beaches Ordinance), AB 1987, No. 123, prohibits, *inter alia*, driving on beaches and disposal of solid waste materials on beaches and in public waters.

Responsible authorities

LVV (part of the Ministry of Labour, Culture and Sports) has primary conservation and management authority over marine turtles. The same ministry has jurisdiction over protected areas, although, in practice, protected areas are managed as a partnership between the government and two national NGOs: FANAPA (the Aruba Foundation for Nature and Parks) and StimAruba. The Ministry of Public Health and Environment includes veterinary services and, in that context, is responsible for the implementation of CITES (CSA, 2004; B. Boekhoudt, pers. comm., 18 November 2004).

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective

Marine turtle exploitation was entirely unregulated—and, it would appear, unmonitored—at the time of van Buurt's (1984) writing; he could find no information on landing sites, species landed, fishing gear used, months of landing, or numbers of fishers or turtles involved. Similarly, other than abattoir records from 1977 to 1986 (31 turtles processed in 1977; only four in 1983; and a total of 127 processed over the 10-year period), Barmes *et al.* (1993) could find no data on historical exploitation of marine turtles in Aruba. The consumption of marine turtle meat, considered a delicacy (Barmes *et al.*, 1993), and the sale of marine turtle meat in restaurants and hotels were known but had never been documented or quantified. Barmes *et al.* (1993) reported that the extent of collection of eggs (prohibited since 1980) was unknown, but no evidence of poached nests or sale of eggs had been recorded by the local authorities.

Barmes *et al.* (1993) concluded that there were no turtle fishers in Aruba, nor had there been in recent memory, and that any catch of marine turtles was opportunistic. Local fishers participated in a multi-species fishery and occasionally brought turtles to shore that had been ensnared in seine nets drawn in shallow, nearshore waters. Many of the turtles killed in the abattoir (as required by law until full protection went into effect in September 1987) were known to have been imported from Venezuela and, to a lesser degree, Colombia. These imports apparently diminished in the late 1980s, presumably as a result of the 1987 legal protection measures.

Recent (since 1992) exploitation

Barmes *et al.* (1993) reported evidence of continued exploitation and trade in marine turtles, despite the legal protections in place at the time. In addition to marine turtles taken incidentally by local fishers, meat was still being imported on Venezuelan fishing boats and sold in the floating market in Oranjestad Harbour. Marine turtle carapaces were also imported from Venezuela and sold in gift shops catering to tourists. Finally, there was a low level of illegal trade in tortoiseshell jewellery, also sold in gift shops; total numbers and volumes were unknown. Today, when tortoiseshell-like jewellery appears in local gift shops there is usually an enquiry by informed residents; regarding the last such report (2002), examination by the local CITES Authority indicated that “the suspicion was false” (E. van der Wal and R. van der Wal, *in litt.*, 12 November 2004).

Contemporary levels of poaching appear to be extremely low. In an incident described by informed observers as “unique and opportunistic” (E. van der Wal and R. van der Wal, *in litt.*, 12 November 2004), a Leatherback was killed and offered for sale in June 1999. The carcass was confiscated and the three offenders fined AWG150 each.

Although there was no shrimp trawling in Aruba at the time of their writing (Venezuelan trawlers having been prohibited from Aruba’s waters by the *Algemene Visserij Verordening* (General Fisheries Ordinance) of 1993), Barmes *et al.* (1993) noted that a feasibility study for a domestic longline fishery was under way and expressed concern that if this fishery were expanded, it would be likely to result, based on evidence from elsewhere in the region, in the incidental take and mortality of Leatherbacks and Loggerheads. Today there is no evidence that the fleet has undergone a significant expansion, or that longlining is a marine turtle management issue in Aruba (E. van der Wal and R. van der Wal, *in litt.*, 10 April 2005).

International trade

Historical perspective

International trade in marine turtles involving Aruba is thought to have been limited to the import of live marine turtles and turtle meat from Venezuela and Colombia, mostly adult Green Turtles but also some Hawksbill Turtles, for sale on the domestic market. There are no data on the numbers involved. However, Barmes *et al.* (1993) cite the report of Guada and Vernet (1988) of the killing of Green Turtles along the east coast of the Paraguana Peninsula of Venezuela for black market export to Aruba and Curaçao. This trade was more lucrative for the fishers than sale on the domestic market.

In addition to reports of continued imports of marine turtle meat via Venezuelan fishers, Barmes *et al.* (1993) provided details of illegal sale of marine turtle meat and carapaces and Hawksbill jewellery. The latter appear to have been directed at the tourist market, thus suggesting that additional illegal international trade was occurring through these channels. At the time of their writing, restaurants still purchased “some if not most of the turtle meat” purchased from the floating market, but public awareness of the ban on marine turtle products was growing. In one case (May 1993), a restaurateur advertised a “Mother’s Day Special” that included turtle meat and “several residents” contacted authorities to request enforcement action; the proprietor willingly agreed to dispose of 10 kg of meat and not to purchase it again and no further action was necessary (Barmes *et al.*, 1993).

The only marine turtle exports from Aruba reported to CITES, as required under the Convention, from 1975 to 1992, inclusive, were of two Cheloniidae carapaces, presumably transported by tourist(s), seized upon entry into the Netherlands in 1989. There are no other records of international trade in marine turtles or turtle products involving Aruba, including in Japanese Customs statistics for Hawksbill shell imports into Japan up to 1993, after which such imports were illegal.

Recent (since 1992) international trade

There is little evidence of international trade in marine turtles involving Aruba since 1992: there are no records of such trade reported in CITES trade statistics derived from the UNEP-WCMC CITES Trade Database for the period 1993–2004, inclusive. According to the Aruba CITES Scientific Authority (CSA, 2004), there is “no trade of importance” from Aruba, for which the Authority credits local turtle watches for generating “an appreciation for these animals” that has led to increased awareness and responsibility.

With regard to marine turtle imports, Aruban Customs “regularly seizes spurs for cockfighting, which, upon investigation or acknowledgement by the importing individual, were produced from [Hawksbill] sea turtle shell”; on average, ca. 100 pairs of spurs are confiscated per year, originating in Colombia (CSA, 2004). Despite the fact that cockfighting is illegal in Aruba, the spurs are clearly intended for local use; there are no indications of re-export (CSA, 2004).

In the view of the CITES Scientific Authority, there are fewer CITES infractions today than a decade ago when the *Natuurbescherming Beschermingsverordening* came into force, and Customs officials are described as having “awareness and preparedness” when CITES-listed species enter the country. The import of cock spurs, identified upon entry by x-rays of luggage, is a perpetual challenge and one that recently resulted in a fine of AWG1000 for 24 tortoiseshell spurs (P. Barendsen, CSA, *in litt.*, 12 April 2005).

No stockpiles, registered or otherwise, of marine turtle materials are known to exist in Aruba (van der Wal and van der Wal 2002; CSA 2004). While carapaces are still observed as wall decorations in some restaurants and private homes, van der Wal and van der Wal (2002) offer their impression that these were obtained prior to the 1987 ban and that such displays have not increased in recent years.

Enforcement issues

Barnes *et al.* (1993) reported that enforcement of marine turtle protections were carried out by the police in the absence of fisheries or conservation/natural resource enforcement personnel. Although they noted that there had never been an arrest for a marine turtle violation, the police did confiscate 15 carapaces from a gift shop in September 1993 (but levied no fine).

In June 1999, as reported in the national newspaper *Dario*, three offenders were fined AWG150 each in connection with the killing and attempted sale of an adult Leatherback turtle (E. van der Wal and R. van der Wal, *in litt.*, 27 October 2004). In general, however, the conclusion of Barnes *et al.* (1993) that enforcement agencies are “over-extended and under-staffed, and crimes against wildlife are not viewed as priorities” appears as true today as it was a decade ago. This would appear to be particularly the case in relation to cockfighting and the apparently persistent demand for Hawksbill shell spurs that sustains an illegal trade into the island from Colombia.

Marine turtle management

Management of exploitation

Marine turtles have been protected from exploitation, including international trade, in Aruba since 1987; hence, any such exploitation is illegal. Continued illegal exploitation appears to be sporadic and at low levels (as in the example of the gravid Leatherback turtle killed in 1999), although the illegal import of Hawksbill shell spurs for illegal cockfighting appears to be persistent and to warrant targeted enforcement effort.

Species research and conservation

There has been no stock assessment in the usual sense for any species of marine turtle in Aruba. However, some population assessment data are available. Foot surveys of primary nesting beaches began in 1993 and are continuing. Eagle Beach on the west coast is the most important site for Leatherbacks and has been monitored since 1993; in 1999, these surveys were upgraded to comprehensive daily morning nest and track counts and regular night patrols. The beaches of Arikok National Park have been patrolled daily by Park Rangers and twice-weekly by local biologists since 2000 (Zeinstra, 2002; E. van der Wal and R. van der Wal, *in litt.*, 12 November 2004). No tagging programmes have yet been initiated.



Credit: Edith van der Wal

In situ beach protection for turtles on Aruba; barricades are placed around nesting sites.

In addition to protection with beach patrols, turtle nests at Eagle Beach are protected *in situ* during incubation and hatching. Immediately after nesting, four barricades are placed around the nesting site to reduce human interference (such as driving, digging, littering). After 60 days a wooden enclosure is made on the sand with an additional four barricades. During the day the ocean-facing side of this square is open and hatchlings can find their way to the sea. Just after sunset the enclosure is shut, but re-opened the next morning at daybreak. Without such efforts, the hatchlings invariably crawl to the public road. Some, but not all, hotels are willing and able to turn off lights on the night of an emergence. If photo-pollution is present at the time of an emergence and likely to cause disorientation, a special controlled release method is necessary. Volunteers use dark screens for shading the hatchlings, to allow them to locate the sea. Typically, however, ambient photo-pollution on Eagle Beach necessitates a commitment by hundreds of volunteers each year to participate in “shading” the hatchlings as they emerge and orient to the sea. To re-establish any possibility for “natural and independent” nesting, hatching and reaching the sea, much effort is still needed to achieve acceptable levels of lighting control (cf. Witherington and Martin, 2000), as well as elimination of beach driving (motorized police, transporting of watersports equipment, beach clean-up) (E. van der Wal and R. van der Wal, *in litt.*, 27 October 2004).

The recent establishment of a local NGO, Turtugaruba Foundation, aims at institutionalizing and expanding these volunteer activities, in particular in relation to the need for better regulation and mitigation of beach-front lighting (van der Wal and van der Wal, 2004). Success has already been demonstrated in that two more nesting areas now co-operate in turning off street illumination during the hatching season. These efforts are undertaken both by the government (at Fishermans Huts Beach) and by the private sector (Arashi Beach) (E. van der Wal and R. van der Wal, *in litt.*, 12 November 2004); see **Habitat conservation** below.

Threats to nesting on the more remote north-eastern coast of Aruba include the illegal construction of “weekend houses” (temporary structures typically sited on the beach), illegal but uncontrolled vehicle-driving in nesting habitat, and threats posed by human presence, including beach fires, lights, and general activity, often at night. In response, Zeinstra (2002) has urged “rigorous supervision” of the driving prohibition on beaches and dunes, emphasized by signage and boulders placed to block beach access points; she notes that in some places, including Arikok National Park (Boca Prins and Andicuri beaches), this type of mitigation appears to be working.

Habitat conservation

Since 1963, administration and management of protected areas in the Netherlands Antilles has been the responsibility of the Netherlands Antilles National Parks Foundation, a government-funded non-profit foundation better known by its Dutch name and acronym *Stichting Nationale Parken Nederlandse Antillean*: STINAPA. Since 1983, Aruba has had an independent STINAPA, now officially known as FANAPA, the aim of which is to promote nature conservation through acquisition of land, establishment of parks and education (UNEP, 1996).

The Turtugaruba Foundation has, with permission from local authorities, blocked vehicular access to several of the island’s key marine turtle nesting beaches, including Arashi Beach and the Fishermans Huts area, by strategically placing natural rocks and boulders at access points. A start has now (2005) been made on replacing these boulders by a wall. In the case of Arikok National Park, large pieces of driftwood have been used in place of boulders. The Foundation also participates in several annual beach clean-ups, e.g. with Reef Care, Aruba Hotel and Tourism Association, and others (E. van der Wal and R. van der Wal, *in litt.*, 12 November 2004).

Government entities, including the police, LVV and the *Dienst Openbare Werken* (DOW—Department of Public Affairs), are also involved in various ways in the protection of turtle nests. Police officers on the scene of a turtle nesting at Eagle Beach call the local Sea Turtle Hotline and then proceed to inform onlookers to keep a distance, not to use light or flash photography, etc.; they remain on the scene until a Turtugaruba Foundation representative or volunteer arrives. In 2001, permission was granted by the police to extinguish street lights in two areas (Fishermans Huts, Arashi) where the disorientation of Loggerhead and Hawksbill hatchlings was a persistent threat to their survival. In 2003, in response to security concerns along the shoreline and on tourist beaches, a special “*warda nos costa*” division (supervised by the Police Department) has been patrolling selected beaches day and night; following negotiations with the Turtugarguba Foundation, they agreed to minimize their use of light and alert the Sea Turtle Hotline when signs of marine turtle activity were noticed (E. van der Wal and R. van der Wal 2002, *in litt.*, 12 November 2004).

Until 2002, LVV supplied the road barricades used to protect Leatherback nests at Eagle Beach; subsequently, these were donated by DOW, which is also involved in the placement of boulders at nesting beach access points to discourage vehicular traffic. Finally, the rangers that patrol the beaches of Arikok National Park (and who are

employed by LVV) co-operate in monitoring and protecting the nests in that area (E. van der Wal and R. van der Wal 2002, *in litt.*, 12 November 2004).

Education and public awareness

Barnes *et al.* (1993) recommended that “concerted efforts” be made on the part of both the government and the non-governmental conservation community to provide residents, resource users (such as fishers) and other “audiences” (including schools and tourists) with relevant conservation material.

Today, the Turtugaruba Foundation is the most active entity in implementing this recommendation. The Foundation interacts regularly with the media (including by providing press releases at the beginning of the annual nesting season); routinely gives public lectures; participates in local “open days” and civic events in order to share information broadly with the general public; distributes WIDECAST materials, such as “Watch Where You Drive” bumper stickers, to influence public behaviour; creates original posters and flyers for sharing with both residents and tourists; provides expertise and support for students conducting projects on marine turtles; and contributes to CITES and wildlife trade awareness by sharing information (E. van der Wal and R. van der Wal, *in litt.*, 27 October 2004).

Heightening “awareness and light management” are considered the most serious needs at the present time, as disorientation of nesting females and emergent hatchlings along the well-developed west coast is pervasive (van der Wal and van der Wal, 2002).

Constraints to marine turtle conservation and management

The usual suite of constraints to optimal marine turtle conservation apply to Aruba, including: insufficient compliance with existing regulations; lack of visibility (and therefore deterrence) on the part of law enforcement; incomplete legislation on coastal zone management and protected areas (“still in process”); inadequate funding and trained personnel (within the hotel community, as well as within the government) to address the considerable beach-front lighting problem; and a lack of consensus between NGOs, environmentalist groups and the government on the definition of sustainable development (E. van der Wal and R. van der Wal 2002, *in litt.*, 27 October 2004).

Summary and recommendations

The STRAP for Aruba (Barnes *et al.*, 1993) set forth the following priorities for recovery of the marine turtles of the island: strengthening public awareness initiatives; encouraging greater activism on the part of law enforcement officials in the confiscation of contraband and prosecution of offenders; determining the distribution and timing of the breeding effort; eliminating illegal vehicle traffic on nesting beaches; and promoting full involvement of all beach-front hoteliers in reducing beach-front lighting on the nesting beaches and rescuing (and releasing to the sea) disoriented hatchlings.

An active coalition of governmental and non-governmental entities in Aruba, initiated during the process of developing the STRAP, has an impressive record of effort and achievement in the management of marine turtles and these efforts offer an example for countries in similar circumstances to consider. Among the measures that

the government has taken are: a prohibition on marine turtle exploitation, implemented in 1987; development of CITES-implementing legislation; and development and enactment of laws and regulations regarding designation of protected areas and the mitigation of potentially negative impacts (such as beach driving) on marine turtle habitats. In addition, systematic monitoring has been under way since 1999 and has resulted in a national database on the distribution and abundance of the annual nesting effort.

With these successes in mind, there is progress to be made to correct deficiencies in the overall framework for managing marine turtles in Aruba, and to promote sustained recovery in local stocks. Recommendations to these ends are set out below.

1. Habitat issues constitute the primary threats facing marine turtles in Aruba. There is a need for improved regulations to address human activities, construction and access around nesting beaches and to provide for mitigation of beach-front lighting during the nesting and hatching season. Similarly, there is a need for more public awareness of marine turtle habitat issues coupled with changes in behaviour (e.g. reducing vehicular driving on active nesting beaches and littering of beaches with plastic and other solid waste).
2. Greater enforcement effort, through an increase in directed effort by relevant government agencies or through expanded public awareness activities, should be directed at the persistent illegal use of vehicles on marine turtle nesting beaches and illegal cockfighting, which sustains the demand for illegal imports of Hawksbill shell spurs.
3. Identification and protection of critical habitats, both terrestrial and marine, for marine turtles should be incorporated into broader biodiversity management efforts.
4. Legislation currently under development for the designation of national marine parks and a comprehensive coastal zone management authority should proceed expeditiously.
5. Based on demonstrated successes and existing partnerships between the government, NGOs, local communities and the commercial (e.g. hotel) sector, increased efforts should be made to engage coastal hoteliers and other beach-front establishments, tourists, marine resource users (fishers, divers, yachters) and local communities in marine turtle conservation and management.
6. The dedicated work of the Turtugaruba Foundation and its local partners, together with relevant government agencies, should be encouraged and facilitated with support (financial, logistical, political support), training, and institutional strengthening sufficient to fulfill existing mandates towards marine turtles and their habitats.

References

- Anon. (2004). CITES Decision 13.81. Decision of the 13th meeting of the Conference of the Parties, Bangkok (Thailand), 2–14 October 2004. Accessible at www.cites.org. Viewed 12 December 2005.
- Barnes, T., K. Eckert, and J. Sybesma. (1993). *WIDECAST Sea Turtle Recovery Action Plan for Aruba*. CEP Technical Report No. 25. UNEP Caribbean Environment Programme, Kingston, Jamaica. *xiv* + 58 pp.
- van Buurt, G. (1984). National Report for the Netherlands Antilles. Pp. 329–333. In: P. Bacon *et al.* (Eds). *Proceedings of the Western Atlantic Turtle Symposium, 17–22 July 1983, San José, Costa Rica*, III, Appendix 7. University of Miami Press, Florida.

- CSA (CITES Scientific Authority). (2004). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of Marine Turtles in the Lesser Antilles, Central America, Colombia and Venezuela. Completed by Theo Wools, DVM (Director, Veterinary Service) and Pieter Barendsen, DVM (Subst. Head of Service), Barcadera, Aruba. Dated 5 November 2004.
- Guada, H. J. and P. Vernet (1988). Informe del proyecto situación actual de las tortugas marinas en la costa Caribeña de Venezuela. Estado Falcón: Costa Oeste y Península de Paraguaná. Informe interno de FUDENA. 25 pp.
- Rooze, V. and I. Kristensen. (1977). Onze schildpadden verdwijnen. In: *Aruba, zijn voorgeschiedenis met zijn dieren*. STINAPA Newsletter No.14:43–48.
- UNEP. (1996). *Status of Protected Area Systems in the Wider Caribbean Region*. CEP Technical Report No. 36. UNEP Caribbean Environment Programme, Kingston, Jamaica.
- Veersteeg, A.H., J. Tacome and P. van de Velde. (1990). The archaeological investigation on Aruba: the Malmok cemetery. Pp. 14–18. In: *Publications of the Archaeological Museum Aruba 2*. Oranjestad, Aruba.
- van der Wal, E. and R. van der Wal (Turtugaruba Foundation). (2002). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of Marine Turtles in the Lesser Antilles, Central America, Colombia and Venezuela. Dated 25 September 2002.
- van der Wal, E. and R. van der Wal. (2003). Monitoring the west coast of Aruba. Pp. 170–171. In: J.A. Seminoff (Compiler), *Proceedings of the 22nd Annual Symposium on Sea Turtle Biology and Conservation*. NOAA Technical Memorandum NMFS-SEFSC-503. US Department of Commerce.
- van der Wal, E. and R. van der Wal. (2004). Aruba Country Report. Invited Oral Presentation to WIDECAST Annual Meeting, 21 February 2004, San José, Costa Rica.
- Witherington, B.E. and R.E. Martin. (2000). *Understanding, assessing, and resolving light-pollution problems on sea turtle nesting beaches*. Second Edition, revised 2000. FMRI Technical Report TR-2. Florida Marine Research Institute, St. Petersburg, Florida. 73 pp.
- Zeinstra, L.W.M. (2002). Census of sea turtle nests on Aruba, specifically on the northeast coast. Prepared by CARET: Conservation and Research of Sea Turtles on Aruba. Oranjestad, Aruba. 27 pp.

Barbados

Introduction

With a total land area of 432 km², Barbados is the most easterly and only non-volcanic island in the Lesser Antilles (Hunte, 1984). Barbados achieved independence from the UK in 1966. In the 1990s, tourism and manufacturing surpassed the sugar industry in economic importance (Government of Barbados, 2002).

Historical evidence suggests that Green Turtles may never have been particularly common around Barbados (Ligon, 1673). Hawksbill Turtles were, however, clearly fairly abundant. In a letter dated 8 December 1948, Dudley Wiles, the first Fisheries Officer of Barbados, indicated that 50–60 fishers set nets to catch Hawksbill Turtles on inshore (fringing) reefs between March and July each year. A legal fishery for marine turtles operated in Barbados until 1998, when all marine turtle species were conferred legal protection through an indefinite ban on exploitation (Government of Barbados, 2001). This measure was the first revision of the marine turtle regulations since 1904 and especially benefited the Hawksbill Turtle, which is the only species that nests in significant numbers in the country and had, until that time, been subject to heavy levels of legal and illegal exploitation (Horrocks, 1992).

A Sea Turtle Recovery Action Plan (STRAP) for Barbados (Horrocks, 1992), elaborated and published under the auspices of the Wider Caribbean Sea Turtle Conservation Network (WIDECAST) and the United Nations Caribbean Environment Programme, has guided a range of conservation and management actions taken on behalf of marine turtles by government agencies and NGOs during the last decade. These are being led and facilitated by the Barbados Sea Turtle Project (BSTP), which was initiated in 1987 and operates as a collaborative effort of the Barbados campus of the University of the West Indies and the Fisheries Division of the Ministry of Agriculture and Rural Development (Government of Barbados, 2001).

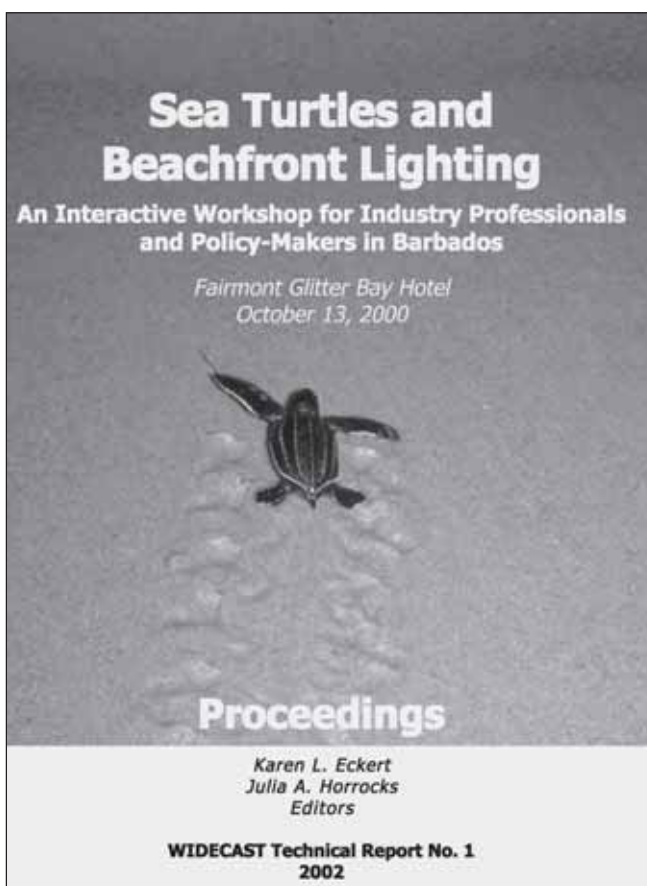
Through the research and education efforts of the BSTP, poaching of marine turtles has been much reduced on regularly monitored beaches, and although some poaching continues on isolated beaches (MPDE, 2002; Government of Barbados, 2002), levels are believed to be considerably lower than in previous years (Government of Barbados, 2001; J.A. Horrocks, University of the West Indies-BSTP, *in litt.*, 20 August 2004). While enforcement of the ban on exploitation seems likely to become an increasingly important issue if numbers of turtles continue to increase, the major challenges currently facing these species in Barbados are habitat-related, namely deterioration and loss of nesting habitat owing to coastal construction, beach armouring, sand-mining, vehicular use of beaches and beach-front lighting, as well as deterioration and degradation of foraging habitat from agricultural run-off, sewage pollution, anchorages and over-fishing (Horrocks, 1992; Government of Barbados, 2002).

The Barbados National Biodiversity Strategy and Action Plan (NBSAP), developed by the Government of Barbados (2002) in fulfillment of obligations under the Convention on Biological Diversity (CBD), has set out a series of measures for addressing the stresses on the country's species and ecosystems, which, as they are implemented, are yielding significant benefits for marine turtles. Specific recommendations made in Horrocks (1992), many of which have been addressed over the course of the last decade, are also credited with contributing to observed marine turtle population increases.



Predation on turtle eggs by exotic and domestic species, including dogs, is a serious management concern in many Caribbean countries.

Hotels, working in partnerships with regional experts, are committed to reducing hatchling disorientation through 'turtle-friendly' lighting on the coastline of Barbados.



The achievements of the BSTP, which now include the provision of a regional marine turtle tagging facility and database archive (WIDECAS Marine Turtle Tagging Centre), are an impressive example of what can be accomplished through sustained effort and commitment, as well as strong collaboration between government, non-government, and academic partners.

Summary of the status of marine turtles in Barbados

Three marine turtle species regularly occur in Barbados. The Green Turtle forages in nearshore waters but does not nest; the Leatherback arrives seasonally to nest; and the Hawksbill Turtle both forages and nests (see table opposite). The Loggerhead is occasionally caught by fishers in open waters, but does not nest in Barbados. The Hawksbill Turtle forages primarily on the bank reef along the west coast and on the patch reefs on the south coast (MPDE, 2002) and nests on the more sheltered and steeply sloping west and south coast beaches (Horrocks, 1992). The most important Hawksbill nesting site on the island is the 1.5 km length of beach between the Hilton Hotel and Coconut Court Hotel at Needham's Point on the south-west tip of the island (MPDE, 2002). Survey effort has been standardized on this beach and the dataset is considered an index of nesting activity at a national (island-wide) scale. Considering only the nesting occurring on the Hilton Index beach each year between 1 June and 30 September, there has been an average annual increase of 47.8% over the last 10 years (Krueger *et al.*, 2003a). Based on public reports, surveys and a tagging programme, the number of nesting females island-wide was estimated at 171–285 in 2000 and nesting frequency increased through 2003 (Government of Barbados, 2001; Horrocks, 2004).

Typically, fewer than 100 nests are made by Leatherbacks each year, but 200 were recorded in 2003 (Horrocks, 2004). Most occur on the east coast, but occasional nests have been made on the west and south coasts (MPDE, 2002). Green Turtles forage on algae and seagrass at 10 main nearshore sites on the south and east coasts; no nesting by this species has been documented (MPDE, 2002; Government of Barbados, 2002).

Occurrence of marine turtles in Barbados

English common name	Scientific name	Occurrence
Loggerhead	<i>Caretta caretta</i>	I, F?
Green Turtle	<i>Chelonia mydas</i>	F
Leatherback	<i>Dermochelys coriacea</i>	N
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	N, F
Kemp's Ridley	<i>Lepidochelys kempii</i>	A
Olive Ridley	<i>Lepidochelys olivacea</i>	A

Key: N=nesting; F= foraging; I=infrequent; A=absent

There is a growing dataset on the stocks of marine turtles that occur in Barbados. The rookery origins of both Hawksbill and Green Turtle foraging populations are known from genetic studies and the extra-territorial foraging grounds of the nesting Hawksbill population of Barbados have been at least partially described from international flipper tag returns and satellite telemetry (MPDE, 2002). Flipper tags of Green and Hawksbill Turtles tagged in Barbados (and captured elsewhere) have been returned from Cuba, Grenada, Nicaragua, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, and Venezuela (J.A. Horrocks, pers. comm., cited in Meylan, 1999; Krueger *et al.*, 2003b; Luke *et al.*, 2004; J.A. Horrocks, pers. comm., 2006). Four post-nesting Hawksbill Turtles satellite-tagged in 1998 stayed in the waters of Barbados for only a few months before travelling to Grenada, Dominica, Trinidad and Venezuela, respectively, where some foraged in the same sites for up to 1.5 years (Horrocks *et al.*, 2001). Genetic stock analysis is currently under way with nesting Leatherbacks (MPDE, 2002).

Overview of the legal framework for marine turtle management

Membership in international and regional treaties

Barbados is a contracting member of numerous international environmental agreements that relate to the conservation of marine turtles, including the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the CBD, and the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, or Cartagena Convention. Barbados ratified the Protocol Concerning Specially Protected Areas and Wildlife (SPA Protocol) to this Convention in 2002 (see table below).

Membership of Barbados in multilateral agreements relating to marine turtles

Convention	Barbados
Cartagena Convention	28.05.1985 (R)
Protocol Concerning Specially Protected Areas and Wildlife (SPAW)	11.2002 (A)
Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region	28.05.1985 (R)
Protocol Concerning Pollution from Land-based Sources and Activities	No
Convention on Biological Diversity (CBD)	10.12.1993 (R)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	9.03.1993 (E)
Convention on Migratory Species (CMS)	No
Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	No
MARPOL 73/78 (Annex I/II)	06.05.1994 (A)
MARPOL 73/78 (Annex III)	06.05.1994 (A)
MARPOL 73/78 (Annex IV)	26.11.2001 (S)
MARPOL 73/78 (Annex V)	06.05.1994 (A)
Convention on Wetlands of International Importance (Ramsar)	No
UN Convention on Law of the Sea (UNCLOS)	12.10.1993 (R)
Western Hemisphere Convention	No
World Heritage Convention	09.04.2002 (Ac)

Key: Date of: Signature (S); Ratification (R); Accession (A); Acceptance (Ac); Entry into force (E)

Laws and regulations relating to marine turtles

The *Fisheries Regulation Act* of 1904 consolidated all other fisheries acts into one piece of legislation. The turtle preservation section of this Act made it unlawful to:

- (1) take or capture, or attempt to take or capture, any turtle or turtle egg on the beach or within one hundred yards of the shore;
- (2) set, or attempt to set, any net or seine or other instrument for the purpose of taking, capturing or fishing for turtles within 100 yards of the shore; and
- (3) buy, sell or expose for sale any turtle weighing less than 30 lb (13.6 kg).

The penalties for contravention of these provisions in 1992 were fines of 100 Barbados dollars (BBD100) and seizure of any turtles caught and any gear used, including boats (Horrocks, 1992).

These provisions remained in effect until implementation of the *Fisheries Act* (1993), which provided for the management and development of fisheries and protection of marine turtles, through the *Fisheries (Management) Regulations* of 1998. These established an indefinite ban on the exploitation of marine turtles and also prohibited the possession, purchase and sale of marine turtles and products. Export is only permitted for research/scientific purposes. Penalties for violations of these prohibitions are a fine of BBD50 000 and/or two years' imprisonment (MPDE, 2002).

According to the Ministry of Physical Development and Environment (MPDE) (MPDE, 2002), other legislation that provides for the conservation of marine turtles includes the:

- *Marine Boundaries and Jurisdiction Act* of 1979, which identifies marine conservation officers to be police, fisheries officials and Coast Guard and Defence Force personnel;
- *Defence Act* of 1979, which assigns responsibility to the Barbados Coast Guard for the enforcement of laws relating to fisheries, territorial waters, beach mining, and other activities; and
- *Coastal Zone and Management Act* (1998–39), which provides a statutory basis for coastal management and planning in Barbados and includes specific provisions for protection of resources, such as from destruction of corals and degradation of the foreshore, and for the designation of marine protected areas and marine parks.

The import and export of wildlife products has not been controlled under a single piece of legislation but, rather, through various statutes and regulations, including the *Fisheries Act* of 1993; the *Wild Birds Protection Act* (*cap.* 398); the *National Conservation Commission Act 1982* (*cap.* 393) and the *Coastal Zone Management Act* (CZMA), which together offer protection for some species of plant life (Government of Barbados, 2002). There are no legal provisions for registering stockpiles that might have existed prior to the implementation of the 1998 *Fisheries Regulations*.

The Government of Barbados is in the final stages of drafting CITES-enabling legislation that will specifically regulate wildlife trade (MPDE, 2002). The CITES National Legislation Project assessed the CITES-implementing legislation of Barbados as “believed generally not to meet the requirements for the implementation of CITES” (Anon., 2002) but, by 31 May 2002, the Government of Barbados had filed a CITES Legislation Plan outlining the process and timeline for enacting adequate implementing legislation and, by 31 December 2003, had submitted draft legislation to the CITES Secretariat for review (Anon., 2005). This legislation is now quite close to enactment (S. Nash, Chief, Capacity Building Unit, CITES Secretariat, *in litt.* to J. Gray, TRAFFIC International, 21 September 2005). Administrative measures taken to support CITES implementation include the training of Customs officers and relevant private sector personnel (e.g. pet shop owners) and the activation of an import/export permit system (Government of Barbados, 2002).

A review of biodiversity legislation for the Barbados NBSAP (Government of Barbados, 2002) identified the need for revision of various statutes and the adoption of others so as to provide a comprehensive legal framework and clearer authorities for, *inter alia*, environmental impact assessment. These and other provisions were included in the *Draft Environmental Management and Conservation Act for Barbados*, aimed at implementing the CBD and the SPAW Protocol.

Responsible authorities

CITES implementation responsibilities rest with various ministries and departments, including MPDE (Environment Unit), the Ministry of Agriculture and Rural Development (Fisheries Division) and the Ministry of Foreign Affairs and Foreign Trade (MPDE, 2002; Government of Barbados, 2002). Marine turtle management responsibilities are shared between the Fisheries Division of the Ministry of Agriculture and Rural Development and the Environment Unit and Coastal Zone Management Unit, both within MPDE. The Fisheries Division, Royal Barbados Police Force, Barbados Coast Guard and Barbados Defence Force have enforcement authorities for laws relating to the management and conservation of marine turtles.

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective

The Barbados Fisheries Division (J.A. Horrocks, *in litt.*, 2 November and 8 December 2004) has provided details of a letter dated 8 December 1948 written by Mr. Dudley Wiles, the first Fisheries Officer of Barbados, reporting on the Barbados turtle fishery. In this letter, Wiles reported that, between 1945 and 1948, the turtle industry was “steadily developed and a larger number of fishermen have become interested in this phase of the fishing industry. At the moment, it is estimated that 50–60 fishermen go after Hawksbill Turtles. The industry became more lucrative to the fishermen on account of a contract being established with an English firm that would buy their raw shell.” Wiles further reported that these fishers used weighted nets positioned on the ledges of inshore (fringing) reefs during the months of March to July. He estimated that the numbers of turtles legally landed in Barbados had steadily increased from 1945 to 1948: 92 turtles in 1945, to 128 in 1946, to 160 in 1947 and 165 in 1948, most of them Hawksbill Turtles. Thirty-three percent of the value of the catch was obtained through the sale of the shells, which were used in the manufacture of various ornaments. Finally, Wiles reported that “this export market has been checked due to the build-up of surplus stocks in the UK. This has been another disappointing phase in the development of this industry, for just as soon as the fishermen have established suitable fishing boats and nets there is a break in the export market.”

Hunte (1984) reviewed available information on the turtle fishery in Barbados, which included records that had been collected by the Division of Fisheries since the early 1960s from 11 of 29 designated fisheries landing sites. Because no specific record-keeping had been undertaken for marine turtles, which were included under “any other deep water species”, Hunte (1984) concluded that these statistics could not be relied upon to reflect trends in abundance of marine turtle stocks around Barbados. However, the weight (kg) of turtles documented as landed in Barbados per operational landing site was recorded each year. Hunte (1984) reviewed these data for the years 1962–1982 and concluded that landings had declined over that period, a trend he noted was supported by everyone that he interviewed. Specifically, he reported that:

1. there was a continuous decline in turtle catch between 1963 (ca. 1300 lb/landing site) and 1974 (ca. 100 lb/landing site); then, catches increased and levelled off until 1982 (ca. 200 lb/landing site), the last year data for which were available;
2. during the 1950s, the average number of turtles caught per fisher, per month, was of the order of 35, but by 1983 this number had declined to about two; and
3. many fishers he interviewed felt that the average size of turtles taken had declined.

Finally, Hunte (1984) reported that the west coast landing sites had recorded the most turtle landings in the past, but by the time he was writing most turtles were caught off the east coast, by only a few fishers, and for supplemental income rather than as their main source of livelihood.

Horrocks (1992) provided more recent data: fishers continued to target adult females and a high percentage (16–22% per annum) of nesting Hawksbill Turtles were killed; females were killed prior to laying and the eggs removed and sold, or the eggs were taken from the nest; in some instances, poachers took the nesting females but

left the eggs. Most turtles were taken while nesting, but turtles were also captured at sea using nets set at both the surface and the bottom; sometimes turtles were speared. Because of the regulations in effect at the time, which protected nesting turtles and eggs, most of this take was illegal.

Horrocks (1992) further reported that there were several market points around the island for the processing and sale of turtle meat, eggs and shell, but because the sale of marine turtles was “increasingly covert”, the exact number of turtles sold was not known. Meat and eggs were sold and consumed locally, as was some shell. Turtle shell articles were widely available in tourist-oriented shops and, until they were reminded of the laws protecting small turtles, department stores had offered whole stuffed juveniles for sale. Finally, she noted that restaurants were responding positively to current public awareness efforts and had voluntarily removed turtle meat from their menus. According to the calculation of Horrocks and Willoughby (1987), an adult Hawksbill Turtle, with an average weight of 160 lb, was worth a total of BBD329 (BBD224 for ca. 80 lb of meat plus BBD105 for ca. 6–8 lb of shell).

Leatherbacks were not usually fished or killed, though an adult female was washed ashore headless and limbless in December 1991 (Horrocks, 1992).

Recent (since 1992) exploitation

There was no systematic data collection on marine turtle landings prior to the implementation, in 1998, of the moratorium on exploitation (MPDE, 2002). Current exploitation is limited to illegal take, which is greatly reduced on regularly monitored beaches and, although it continues on isolated beaches, is thought to be at low levels (MPDE, 2002; Government of Barbados, 2001).

International trade

Historical perspective

Japanese Customs statistics record imports of Hawksbill shell from Barbados over several decades. Only 81 kg were imported from 1950 until 1970 (Groombridge and Luxmoore, 1989), but in that latter year imports increased markedly to almost 400 kg and, over the next two decades, totalled 2845 kg (see table below). At the time Horrocks wrote the STRAP for Barbados (1992), the export of turtle shells and shell products required the permission of the Chief Fisheries Officer and documentation from the Ministry of Trade, Industry and

Japanese imports (kg) of Hawksbill Turtle shell, 1970-1992, from Barbados, as recorded in Japanese Customs statistics

Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
	398	338	337	344	310	31	13	0	23	0	9	0
Year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Total
	11	0	0	0	116	14	0	372	529	0	0	2845

Sources: Milliken and Tokunaga, 1987; H. Kiyono, TRAFFIC East Asia-Japan Office, *in litt.* to TRAFFIC International, 29 July 2002.

Commerce—but the policy at that time did not permit any exports. She considered it unlikely that the Hawksbill Turtle population of Barbados could supply this amount of shell, which was probably recorded as having originated in Barbados (a non-CITES Party until 1993) so as to evade CITES restrictions, a practice apparently not uncommon at the time (Canin, 1991).

CITES trade statistics derived from the UNEP-WCMC CITES Trade Database record very international little trade in marine turtles originating in Barbados from 1980 to 1993. This trade primarily involved single items, such as bodies, carvings or carapaces, and over half of these imports were seized on entry.

Recent (since 1992) international trade

Barbados ratified CITES in 1993. Most of the trade in marine turtles recorded in CITES trade statistics as involving Barbados during the period 1993–2004, inclusive, has been for scientific purposes. In addition to imports (including, in 2004, from Grenada, Antigua and Barbuda, and Saint Kitts and Nevis), of what have generally been blood samples for use in genetic and other analyses in partnership with the BSTP at the University of the West Indies, there have been exports for scientific purposes, including: three Loggerhead and 10 Leatherback specimens to Canada in 2001 and 105 Green Turtle and two Hawksbill specimens to the USA in 2002. Although one Green Turtle carapace from Barbados was seized on entry into the UK in 2002 and another was recorded as imported into the USA the following year, illegal export and import of marine turtles are not known by authorities in Barbados to occur and are currently not thought to be a problem for management (MPDE, 2002).

Enforcement issues

Prior to the implementation of the 1998 *Fisheries (Management) Regulations*, enforcement of the 1904 regulations was clearly undermined by inadequate penalties (Hunte, 1984; Horrocks, 1992). In addition to the inadequate penalties for violations, Horrocks (1992) included as enforcement shortcomings: the fact that environmental laws were not well publicized and/or not respected as being important by the public; the difficulties of achieving a successful prosecution (no prosecutions have ever been made for violating legislation protecting marine turtles); and insufficient capacity in terms of equipment (e.g. boats for the police), personnel and training.

The current regulations provide for a much more serious penalty of a BBD50 000 fine and/or two years' imprisonment. Although this should be a more effective deterrent against poaching, it is possible that the size of the penalty may render it less likely that offenders will be prosecuted (J.A. Horrocks, *in litt.*, 20 October 2004). However, according to the Government of Barbados (2001), “even when human and financial resources constrain full enforcement of the ban, the combination of the ban, removal of the shell trade as an incentive, and educational programmes can be highly effective”. Although poaching of turtles—primarily for eggs and meat and sometimes scutes (J.A. Horrocks, *in litt.*, 20 August 2004)—persists on nesting beaches that are not patrolled, this is not considered to be a major problem facing marine turtles in the country. However, the increasing numbers of nesting turtles have made it more productive for poachers to stake out non-monitored or infrequently monitored beaches (Horrocks, 2004), suggesting that poaching may be increasing and that, if monitoring of beaches were to cease, nesting turtles would be very vulnerable.

There are currently no legal provisions for registering stockpiles of marine turtles or products that might have existed prior to implementation of the *Fisheries (Management) Regulations* in 1998. No stockpiles are known to exist, although there is evidence that some poachers are still preserving shells or collecting scutes (J.A. Horrocks, *in litt.*, 20 October 2004).

Marine turtle management

Management of exploitation

The management measures that were in place before the moratorium was adopted in 1998 were inadequate in a number of areas. For example:

- the minimum size limit failed to protect the large juveniles and adults that are most important for maintaining populations and promoting population recovery;
- the fishery was “open entry” and there was no limit on the number of turtles that could be caught per year; and
- there was insufficient monitoring of landings and no records maintained of poaching activities.

The current moratorium on the exploitation of marine turtles is indefinite and “will remain in place until the government is satisfied that population recovery has occurred and that a sustainable harvest quota has been determined” (Government of Barbados, 2001).

Species research and conservation

The BSTP (www.barbadosseaturtles.org) was initiated in 1987 and operates from the Barbados Cave Hill campus of the University of the West Indies. Activities include: monitoring of nesting and foraging animals (in-water monitoring was initiated in November 1998—Government of Barbados, 2001); tagging of nesting females; monitoring of hatching events; investigations into the genetic structure of nesting and foraging populations of Hawksbill Turtles; studies of international migratory behaviour as revealed by tagging and, more recently, satellite-tracking of nesting females and some males (Horrocks, 2004); response to turtle strandings and care of sick/debilitated turtles; and maintenance of a database to manage all the data collected through these activities. The project has operated a full-time (day and night), year-round Sea Turtle Hotline since the early 1990s that has enabled project staff to respond to many calls for assistance regarding turtle sightings and turtles injured or otherwise in difficulty (Horrocks, 2004).

Population-monitoring studies, facilitated by systematic tagging of nesting females or by regular morning nest counts, are under way to determine long-term population trends at the main Index beach at Needham’s Point (Hilton–Coconut Court) and high-density west coast beaches (MPDE, 2002). During the peak Hawksbill nesting season (1 June–30 September), beaches are patrolled all night with the assistance of national and international volunteers and according to established best practices (Eckert *et al.*, 1999; Beggs *et al.*, 2001).

Systematic tagging also occurs at Index Hawksbill foraging grounds (selected sites on the west coast bank reef). Research into foraging populations is year-round and also focuses on answering questions related to abundance, behaviour, growth rates and habitat use. Hawksbill Turtles (and occasionally Green Turtles) are captured using

standardized field methods, then weighed, measured, checked for tags and photographed, and the location of capture is recorded through GPS (Global Positioning System) before the animals are returned to the water. Laparoscopic investigation and blood-sampling to identify the sex of immatures has recently been initiated. Long-term objectives of this research include a greater understanding of the ecological roles of marine turtles and stock assessment, which for both species is complicated by the fact that foragers in the waters of Barbados are derived from nesting populations in the wider Caribbean and beyond (Horrocks, 2004). Research into foraging populations has been facilitated through collaboration with watersports operators (Horrocks, 2004).

With a grant from the Global Environment Facility, administered through the United Nations Development Programme in 2002, a regional Marine Turtle Tagging Centre (MTTC) was established to maintain a Caribbean database for tagging records and serve as a centre of excellence for marking technologies. Operating through WIDECAS and based at the University of the West Indies in Barbados, the MTTC is assisting marine turtle population monitoring efforts throughout the region through the provision of tags and tagging equipment (now being used in 15 different jurisdictions—Horrocks, 2004), standard record-keeping tools, training and other forms of technical assistance.

Habitat conservation

There is a range of habitat issues affecting marine turtle nesting and foraging habitat in Barbados, in particular as a result of tourism infrastructure and activities. However, numerous legislative and other measures have been put into place or proposed that aim at mitigating negative impacts (Horrocks, 1992; Government of Barbados, 2002). The Integrated Coastal Management Plan (ICMP) and the CZMA provide support through several statutory and policy mechanisms for the management of turtle nesting sites on the island, including elements of beach management in relation to sand-mining, setbacks, vehicular beach access, enclosures and fences, in addition to replanting and protection of littoral vegetation. Further, as part of the development control process, the Coastal Zone Management Unit carefully reviews any application that proposes lighting for upper beach areas and recommends appropriate adjustments in lighting arrangements to prevent possible disorientation of nesting and hatching turtles (Government of Barbados, 2002). These efforts, including relevant environmental impact assessments (Horrocks, 2004), draw on data collected through the BSTP.

The majority of hatchlings from nests laid on developed south coast beaches and a third of those on developed west coast beaches are disoriented and misdirected by artificial lighting; without human intervention, these hatchlings would succumb to attacks by predators, exhaustion, desiccation, or strikes by vehicles on nearby roads and in car parks (Horrocks, 2002). To enhance awareness of the problem, a national workshop entitled “Sea Turtles and Beachfront Lighting: An Interactive Workshop for Industry Professionals and Policy-Makers in Barbados” was convened by the BSTP, WIDECAS and the Barbados Hotel and Tourism Association in 2000. The workshop described problems (for marine turtles) posed by artificial shore-based lighting, with particular emphasis on the technologies that are available to solve these problems. A unanimous resolution urged local hoteliers and the villa rental community to “implement, as soon as practicable, ‘turtle friendly’ lighting on all beaches”. To this end, the resolution called upon the Tourism Development Corporation, in consultation with relevant experts, to: (i) draft a Sea Turtle Policy Statement to be adopted and implemented nationwide; (ii) provide hoteliers and villa rental agencies with standard guidelines and criteria for implementing the Sea Turtle Policy Statement; and (iii) provide coastal hoteliers and landowners with emergency numbers for reporting marine turtle sightings and violations, as well as a calendar noting the nesting and hatching months of local

marine turtle species (Eckert and Horrocks, 2002). As a result, several local hotels have altered their lighting schemes to reduce negative effects on nesting turtles and their young (J.A. Horrocks, pers. comm., 2004), setting an example for others to follow.

No marine turtle nesting sites or foraging areas are completely protected as reserves or parks (J.A. Horrocks, *in litt.*, 20 August 2004). However, discussions are currently under way to designate the main Index beach as protected under the CZMA, thus enabling regulations to be drafted which, *inter alia*, should mitigate the lighting and other impacts from the Hilton and other hotels on that beach (Horrocks, 2004).

The BSTP advises hotels and others on best practice for eco-tourism involving marine turtles (Horrocks, 2004).

Education and public awareness

The Barbados Environmental Association and the BSTP have conducted a range of education and public awareness activities over many years, including monitoring of beaches using volunteers and presentations and provision of materials, such as leaflets and posters, in primary and secondary schools and hotels, and presentations through the media (Horrocks, 1992; Government of Barbados, 2001). Several public education projects have been developed involving residents, fishers and tourists and the Fisheries Division has close and constructive ties with the fishing community (Horrocks, 1992). In addition, the general public has been encouraged to call in information on nesting turtles, poaching incidents and stranded animals. Prior to the onset of the nesting season, a letter is sent to all hotels and restaurants advising them of the laws protecting turtle nesting and about problems that hatchlings may have with beach lighting (Horrocks, 1992).

Constraints to marine turtle conservation and management

The Government of Barbados (2002) notes in the Barbados NBSAP a number of institutional constraints facing the Environment Ministry in fulfilling its mandates in Barbados, including: inadequate staffing, a deficiency in appropriate training, unavailability of vital technical support in terms of information technology and lack of direct financial support. Similarly, it notes that the expanding environmental mandate of the Fisheries Division is stretching that agency's resources. Specifically, limited manpower for monitoring and enforcement on the beaches is an impediment and more training is needed for Customs officials; both of these problems can be rectified through adequate funding and provision of training opportunities (MPDE, 2002).

MPDE (2002) notes that the protection of the beaches has sometimes been confounded when alternative uses, e.g. tourism-related, are considered to be of higher priority. For instance, the need to ensure tourist security has been a major impediment to the maintenance of dark stretches of beach during the nesting season, despite the fact that lighting alternatives are widely available that address both the need for security and the survival requirements of nesting and hatching turtles (Witherington and Martin, 2000; Eckert and Horrocks, 2002).

The difficulties of conserving and managing migratory marine turtles are raised forthrightly by the Government of Barbados (2001) in their national report to the first regional CITES Hawksbill Dialogue. The results of recent scientific studies suggest that the nesting Hawksbill Turtle population of Barbados stays in the country's waters for only a few months each year, before moving to other countries to forage. That three of four post-nesting Hawksbill Turtles satellite-tracked in 1998 returned to foraging grounds located in countries where a legal take

is still allowed (Grenada, Dominica, Trinidad) and that flipper tags are returned from neighbouring countries that have legal fisheries (Saint Lucia, Grenada, Saint Vincent) underscore the limits of national efforts to conserve and manage these animals. The extensive efforts being made in Barbados to conserve local nesting populations, therefore, are compromised by the fact that these animals are taken in legal (and illegal) marine turtle fisheries in other countries, while animals nesting in other countries are protected in the foraging grounds of Barbados. This reality and the widespread problem of incidental take in artisanal and commercial fisheries needs to be addressed at a regional level (MPDE, 2002).

Summary and recommendations

The advances that have been made in Barbados over the past decade or so in marine turtle management, conservation and research are testament to what can be accomplished with committed and sustained—and collaborative—effort by government agencies, NGOs and academia. An indefinite ban on exploitation, adopted after at least 10 years of research and public awareness and education efforts, appears to have been justified, based on what was known (and not known) of turtle populations and levels of off-take. In addition, it appears to have been widely accepted and, finally, to have been successful, as poaching is considered to be at very low levels. However, a suspected increase in poaching on non-monitored or infrequently monitored beaches in response to increasing numbers of nesting turtles suggests a need for increased law enforcement and public outreach initiatives, including talking openly about future research and conservation priorities and the need for stewardship and vigilance during the population recovery process.

The current priority is to mitigate habitat-related problems. Barbados has one of the most comprehensive integrated coastal zone management programmes in the region; marine protected areas have been established (although these to date have not included important marine turtle nesting or feeding grounds); and further improvements in these programmes are under way (Government of Barbados, 2002). Marine turtle population monitoring programmes are in place and knowledge on the status of stocks is improving. A great deal of the information that is being generated through these activities is of great relevance to marine turtles and marine turtle management programmes elsewhere in the region. Finally, through the University of the West Indies and the long involvement of the BSTP in WIDECAST, Barbados is making significant contributions to marine turtle tagging and associated research and conservation efforts in the wider Caribbean basin.

It should be noted that despite these exemplary achievements, the marine turtles of Barbados, its nesting Hawksbill population in particular, continue to be exploited elsewhere in the Caribbean where legal (and illegal) fisheries for marine turtles continue to operate. That the extent of these losses—and the extent to which they jeopardize the recovery of this nesting population—are unknown must be considered a major challenge to the efforts in Barbados over both the short and long terms.

Other considerations are the following:

- Mechanisms to quantify levels of incidental catch of marine turtles should be developed. Measures to reduce or eliminate incidental catch of marine turtles, such as time–area closures and/or alternative types of gear, should be implemented.

- Increased efforts should be made to engage local communities, including fishers, in marine turtle conservation and management. Fisheries extension efforts should be implemented that involve regular exchanges with fishers of information on marine turtles and their conservation and management needs and the participation of fishers in efforts to manage marine turtles so as to enhance compliance with regulations and support for marine turtle conservation.
- Finally, it is hoped that the CITES-implementing legislation that is in the final stages of preparation will provide a legal basis for the registration of wildlife products, such as CITES Appendix-I specimens or nationally protected species, that are legally held by private parties but are considered to represent a possible cover for continued illegal exploitation or trade. A full inventory—and registration—of marine turtle products held by individuals and businesses would establish a baseline for distinguishing newly acquired, illegal products from those pre-dating the 1998 ban and, thus, may assist in efforts to discern the true extent of poaching, as well as to discourage continued poaching activities.

References

- Anon. (2002). CITES Document CoP12 Doc. 28. Working document of the 12th meeting of the Conference of the Parties, Santiago (Chile), 3–15 November 2002. Accessible at www.cites.org. Viewed 12 December 2005.
- Anon. (2005). CITES Document SC53 Doc. 31. Working document of the 53rd meeting of the CITES Standing Committee. Accessible at www.cites.org. Viewed 12 December 2005.
- Beggs, J., B. Krueger and J. Horrocks. (2001). *Barbados Sea Turtle Project: Nesting Beach Monitoring Programme Procedures Manual*. Barbados Sea Turtle Project, University of the West Indies. 35 pp. + app.
- Canin, J. (1991). International trade aspects of the Japanese Hawksbill shell ('Bekko') industry. *Marine Turtle Newsletter* 54:17–21.
- Eckert, K.L., K.A. Bjorndal, F.A. Abreu-Grobois and M.A. Donnelly (Eds). (1999). *Research and Management Techniques for the Conservation of Sea Turtles*. IUCN/SSC Marine Turtle Specialist Group Publication No. 4. Washington, D.C. 235 pp.
- Eckert, K.L. and J.A. Horrocks (Eds). (2002). *Proceedings of "Sea Turtles and Beachfront Lighting: An Interactive Workshop for Industry Professionals and Policy-Makers in Barbados", 13 October 2000*. Sponsored by WIDECAS, Barbados Sea Turtle Project, and Tourism Development Corporation of Barbados. WIDECAS Technical Report 1. v + 43 pp.
- Government of Barbados. (2001). Barbados National Report to the First CITES Wider Caribbean Hawksbill Dialogue (Mexico City, 15–17 May 2001). 5 pp. www.cites.org/common/prog/hbt/country_report/Barbados.pdf
- Government of Barbados. (2002). *A National Biodiversity Strategy and Action Plan for Barbados*. July 2002. Ministry of Physical Development and Environment. xviii + 155 pp. [bb-nbsap.01.en.pdf](http://www.biodiv.org/world/reports) available from www.biodiv.org/world/reports
- Groombridge, B. and R. Luxmoore. (1989). *The Green Turtle and Hawksbill (Reptilia: Cheloniidae): World status, Exploitation and Trade*. Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Lausanne, Switzerland. 601 pp.
- Horrocks, J.A. (1992). *WIDECAS Sea Turtle Recovery Action Plan for Barbados* (K.L. Eckert, Ed.). CEP Technical Report No. 12. UNEP Caribbean Environment Programme, Kingston, Jamaica. 61 pp.

- Horrocks, J.A. (2002). Sea Turtles and Beachfront Lighting in Barbados. Pp. 5–8. In: K.L. Eckert and J.A. Horrocks (Eds). *Proceedings of “Sea Turtles and Beachfront Lighting: An Interactive Workshop for Industry Professionals and Policy-Makers in Barbados”, 13 October 2000*. Sponsored by WIDECAST, Barbados Sea Turtle Project, and Tourism Development Corporation of Barbados. WIDECAST Technical Report 1. v + 43 pp.
- Horrocks, J.A., Senior Lecturer, University of the West Indies-Cave Hill. (2004). Invited Oral Presentation to the 2004 Annual General Meeting of the Wider Caribbean Sea Turtle Conservation Network (WIDECAST). 21 February 2004, San José, Costa Rica.
- Horrocks, J.A., L.A. Vermeer, B. Krueger, M. Coyne, B. Schroeder and G. Balazs. (2001). Migration routes and destination characteristics of post-nesting Hawksbill Turtles satellite-tracked from Barbados, West Indies. *Chelonian Conservation and Biology* 4(1):1–7.
- Horrocks, J.A. and S. Willoughby. (1987). The National Report for Barbados. Presented to the Second Western Atlantic Turtle Symposium, Mayagüez, Puerto Rico, October 1987.
- Hunte, W. (1984). Western Atlantic Turtle Symposium National Report for Barbados. Pp. 36–40. In: P. Bacon *et al.* (Eds). *Proceedings of the Western Atlantic Turtle Symposium, 17–22 July 1983, San José, Costa Rica*, III, Appendix 7. University of Miami Press, Florida.
- Krueger, B.K., J.A. Horrocks and J. Beggs. (2003a). Increase in nesting activity by Hawksbill Turtles (*Eretmochelys imbricata*) in Barbados. Pp. 149. In: J.A. Seminoff (Compiler). *Proceedings of the 22nd Annual Symposium on Sea Turtle Biology and Conservation*. NOAA Technical Memorandum. NMFS-SEFSC-503. US Department of Commerce.
- Krueger, B.K., J.A. Horrocks and J. Beggs. (2003b). International Movements of Adult Female and Juvenile Hawksbill Turtles, *Eretmochelys imbricata*, from Barbados, West Indies. Paper presented at the 23rd Annual Symposium on Sea Turtle Biology and Conservation, Kuala Lumpur, Malaysia, March 2003.
- Ligon, R. (1673). *A True and Exact History of the Island of Barbadoes*. 1970 reprint of the second edition, Frank Cass and Co., Ltd. London.
- Luke, K., J. Horrocks, R. Leroux and P. Dutton. (2004). Origins of green turtle feeding aggregations around Barbados, West Indies. *Marine Biology* 144:799–805.
- Meylan, A.B. (1999). Status of the hawksbill turtle (*Eretmochelys imbricata*) in the Caribbean Region. *Chelonian Conservation and Biology* 3(2):177–184.
- Milliken, T. and H. Tokunaga. (1987). *The Japanese Sea Turtle Trade 1970–1986*. A special report prepared by TRAFFIC (Japan). Center for Environmental Education, Washington, DC. 171 pp.
- MPDE (Ministry of Physical Development and Environment). (2002). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of the Marine Turtles of Lesser Antilles, Central America, Colombia and Venezuela. Completed by Mr. Kwame Emmanuel, Research Officer, Environmental Unit, and Dr. Julia Horrocks, Senior Lecturer, University of the West Indies-Cave Hill and Chair, Barbados CITES Scientific Authority. 30 September 2002.
- Witherington, B.E. and R.E. Martin. (2000). *Understanding, Assessing, and Resolving Light-Pollution Problems on Sea Turtle Nesting Beaches*, 2nd edn, revised 2000. Florida Marine Research Institute Technical Report TR-2. Florida Marine Research Institute, St. Petersburg, Florida. 73 pp.

Commonwealth of Dominica

Introduction

The Commonwealth of Dominica is located in the middle of the Lesser Antilles archipelago, flanked by the French departments of Guadeloupe to the north and Martinique to the south. A volcanic island with a total land area of ca. 750km², it is the largest and least populated of the Windward Islands (Government of Dominica, 2002). The island's coastline extends over 153 km and comprises limited seagrass, mangrove and coral reef habitats owing to the steep topography and rugged coastal terrain (UNEP, 1996). Dominica gained independence from the UK in November 1978.

As the “Nature Island of the Caribbean”, Dominica is considered the most pristine of the Windward Islands. Its lush tropical rainforests harbour a great diversity of plant and animal species, among them two of the world's most stunning and endangered parrot species, the Imperial Parrot, or Sisserou, *Amazona imperialis*, the country's national bird, and the Red-necked Amazon, or Jaco, *Amazona arausiaca*, both endemic to the island. In addition to its wealth of terrestrial biodiversity, Dominica is increasingly known for the splendour of its marine biodiversity. The Government of Dominica has initiated protection of much of this diversity through the establishment of forest and wildlife reserves, national parks, protected areas and marine reserves, among these Morne Trois Pitons National Park, which is one of only two (along with the Pitons Management Area in Saint Lucia) natural World Heritage sites in the Eastern Caribbean, and the Scotts Head–Soufriere Marine Reserve (SSMR).

Local marine turtle populations in Dominica are considered threatened, with population declines attributed to illegal exploitation and loss of habitat, including nesting sites (Government of Dominica, 2002). Marine turtle nests, eggs and nesting turtles have been fully protected by law since 1927 and marine turtles are fully protected in the country's marine reserves. The capture of turtles at sea outside these areas is permitted by law during eight months of the year. This exploitation has been regulated since 1927, including through minimum size limits, which result in the targeting of the large juvenile and adult turtles that are the age classes that are most important for population maintenance and recovery.

An organized turtle fishery does not operate in Dominica; rather, capture of marine turtles is occasional and opportunistic or incidental to other fishing activities (H. Guiste, Fisheries Division, pers. comm., 2005). Although the numbers of marine turtles recorded at designated fisheries landing sites are considered “insignificant” (H. Guiste, pers. comm., 2005), anecdotal reports of turtle captures and landings at other sites indicate that marine turtles are regularly killed around the island throughout the year (R. Byrne, RoSTI, pers. comm., 2005), while 49% of interviewees in a survey in 2003 (Franklin *et al.*, 2004) stated that they ate marine turtle meat. Illegal exploitation, fuelled at least in part by beliefs in the health benefits of turtle meat, is pervasive and persistent. On some beaches, poaching results in the collection of virtually 100% of eggs laid and the killing of any turtles encountered (Durand, 2004; Byrne, 2004a).

A number of initiatives implemented through the efforts of the government, local communities and businesses together with the Wider Caribbean Sea Turtle Conservation Network (WIDECAST), hold great promise for marine turtle conservation in Dominica (Franklin *et al.*, 2004). The Rosalie Sea Turtle Initiative (RoSTI), the country's first marine turtle conservation project, began in 2003 and continues as a partnership between

WIDECAST, the Forestry, Wildlife and Parks Division (FWPD) of the Ministry of Agriculture and the Environment and other public and private agencies. In addition to regular nesting beach monitoring on two of the island's highest-density nesting beaches, the project involves a range of education and outreach activities and a national Sea Turtle Hotline that, among other things, assists FWPD in their enforcement efforts.

Draft fisheries regulations—currently awaiting only ministerial approval—significantly revise the restrictions governing the exploitation of marine turtles, including through the establishment of maximum size limits, extension of the closed season and a permit requirement for catching turtles (H. Guiste, pers. comm., 2005). When adopted, these should greatly enhance the management framework for these species. Similarly, implementation of the country's National Biodiversity Strategy and Action Plan 2001–2005 (NBSAP), developed by the Government of Dominica (2002) in fulfillment of its obligations under the Convention on Biological Diversity (CBD), should significantly enhance the prospects for marine turtles and their habitats. The NBSAP sets forth a set of strategies for conserving the country's terrestrial and marine biodiversity, including the review and revision of existing legislation and development of new legislation to provide, *inter alia*, for the conservation and management of coastal biodiversity; protection of vulnerable/fragile/indigenous marine species and ecosystems; coastal zone management; local community participation in coastal and marine conservation and management; and the implementation and enforcement of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). A key element of the NBSAP is “improved and expanded measures for the conservation and protection of threatened marine and terrestrial ecosystems and species”.

Summary of the status of marine turtles in Dominica

Four species of marine turtle occur in Dominica (Edwards, 1984; Lawrence, 1987; Government of Dominica, 2002; see table below). The Hawksbill Turtle is the most common in the island's waters and nests seasonally. The Leatherback also nests seasonally (usually along the eastern coast), but is not a year-round resident. Both the Loggerhead and Green Turtle occur in the waters around the island. The Loggerhead, referred to as the “Channel Turtle”, is apparently best known by people who fish in the deep channels between the islands (Carr *et al.*, 1982). There is no contemporary evidence of nesting by Loggerheads, although Lawrence (1987) reported “0–1 nestings” per year. Green Turtles are infrequent nesters relative to Hawksbill Turtles and Leatherbacks; Franklin *et al.* (2004) documented only 10 nesting visits to their study site (Rosalie and La Plaine beaches) in 2003, with a peak between July and September.

Occurrence of marine turtles in Dominica

English common name	Scientific name	Occurrence
Loggerhead	<i>Caretta caretta</i>	I
Green Turtle	<i>Chelonia mydas</i>	N, F
Leatherback	<i>Dermochelys coriacea</i>	N
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	N, F
Kemp's Ridley	<i>Lepidochelys kempii</i>	A
Olive Ridley	<i>Lepidochelys olivacea</i>	A

Key: N=nesting; F= foraging; I=infrequent; A=absent

Although marine turtle nesting surveys were first initiated more than two decades ago (Edwards, 1984), these monitoring activities have, until recently, been sporadic, with the result that there remain insufficient data to establish statistically significant trends in marine turtle populations in Dominica. Informed observers have, however, for many years characterized the nesting populations of Green and Hawksbill Turtles as “decreasing” (Groombridge and Luxmoore, 1989).

Based on interviews conducted by the Fisheries Division in 2003, 18 nesting beaches were identified as active. Moving north and then east from the capital city of Roseau, these beaches are Fond Cole, Rock Away, Donkey Beach, Layou, Mero, Batalie, Prince Rupert Bay (Picard/Secret Beach), Douglas Bay, Toucari, Clifton, Batibou Bay, Hampstead Bay, Woodford Hill Bay, Pagua Bay, Saint David Bay, Rosalie Bay, Bout Sable (La Plaine) Bay and Stowe. Durand (FWPD, *in litt.*, 15 September 2005) reports an additional nesting site, a small section of Lanse Bateau beach, just south of Point Mitchel. In general, based on observed patterns of poaching and reports to the national Sea Turtle Hotline, the most important marine turtle nesting grounds, including Rosalie Bay, are located on the north-east and south-east coastlines for all three species (Byrne, 2004a), with the highest-density nesting at Woodford Hill, Rosalie, Bout Sable (La Plaine) and Cabana (FWPD, 2004).

RoSTI started the country’s first comprehensive population monitoring programme at Rosalie and La Plaine (Bout Sable) beaches in April 2003. The project, which continues today, has confirmed that Leatherbacks and Hawksbill and Green Turtles nest at low densities along the country’s south-eastern coast. Rosalie and La Plaine beaches supported a nesting population (all species combined) of fewer than 20 adult females in 2003 (of which three were lost to poaching—Franklin *et al.*, 2004) and fewer than 40 adult females in 2004 (of which two were lost to poaching—RoSTI, unpubl. data).

Preferred foraging grounds are relatively shallow and feature seagrass beds and reefs (Lawrence, 1987). Based on “observations and fishermen reports”, Edwards (1984) reported foraging by Hawksbill and Green Turtles in northern and eastern bays, including Toucari, Hampstead and Saint David. Today, according to FWPD (2004) and Byrne (2004a; *in litt.*, 29 September 2005), the major foraging grounds for Hawksbill Turtles are found along the south-west coast and for Green Turtles along the south-east coast, including in the SSMR, while other marine turtle foraging grounds include those off Rosalie, La Plaine and other beaches along the west coast.

There is little information on international movements of marine turtles occurring in Dominica. There have been no satellite-tracking or genetic studies undertaken to address stock origin, residency and home range, or migratory patterns. However, with some nesting beaches now routinely surveyed at night and gravid females tagged, the prospect of identifying movements by adult females is more likely. For example, a Leatherback tagged while nesting in the US Virgin Islands on 12 April 2004 nested twice on Rosalie Beach, Dominica, in May of that year (Byrne, 2004a). Similarly, a Leatherback tagged while nesting at Rosalie on 25 April 2004 later nested twice on Cipara Beach, Peninsula de Paria, Venezuela (H. Guada, CICTMAR, pers. comm., 2004). Another Leatherback tagged (but which did not nest) on Rosalie Beach in 2004 nested some weeks later in Martinique (R. Byrne, pers. comm., 2005).

Overview of the legal framework for marine turtle management

Membership in international and regional treaties

Dominica (a British Overseas Territory until 1978) was not included in the UK's ratification of CITES in 1976 and acceded to the Convention in 1995. Although a Party to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, or Cartagena Convention, Dominica is not party to that Convention's Protocol Concerning Specially Protected Areas and Wildlife (SPAW Protocol), nor to the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC) (see table below).

Membership of Dominica in multilateral agreements relating to marine turtles

Convention	Dominica
Cartagena Convention	05.10.1990 (A)
Protocol Concerning Specially Protected Areas and Wildlife (SPAW)	No
Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region	05.10.1990 (A)
Protocol Concerning Pollution from Land-based Sources and Activities	No
Convention on Biological Diversity (CBD)	06.04.1994 (R)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	02.11.1995 (E)
Convention on Migratory Species (CMS)	No
Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	No
MARPOL 73/78 (Annex I/II)	21.09.2000 (A)
MARPOL 73/78 (Annex III)	31.08.2001 (S)
MARPOL 73/78 (Annex IV)	No
MARPOL 73/78 (Annex V)	21.09.2000 (A)
Convention on Wetlands of International Importance (Ramsar)	No
UN Convention on Law of the Sea (UNCLOS)	24.10.1991 (R)
Western Hemisphere Convention	No
World Heritage Convention	04.04.1995 (R)

Key: Date of: Signature (S); Ratification (R); Accession (A); Entry into force (E)

Laws and regulations relating to marine turtles

The first legal provisions on behalf of marine turtles in Dominica were enacted in 1927. These provided for, *inter alia*, a closed season, a minimum size limit and a prohibition against interference with turtle nests, eggs and nesting turtles (Durand, *in litt.*, 15 September 2005). These provisions have remained in place, with some variation, since that time.

The *Turtle Ordinance* of 24 November 1972 set the following restrictions (Groombridge and Luxmoore, 1989):

- a four-month closed season from 1 June to 30 September, during which it was prohibited to catch or take marine turtles or their eggs or buy, sell or expose for sale, or possess turtle meat or eggs;
- a minimum size limit of 20 lb (nine kilograms) in weight; and

- a prohibition on the disturbance of turtle eggs or nests and on the take or attempt to take of any turtle laying eggs or on the shore engaged in nesting activities.

The *Forestry and Wildlife Act, Chapter 60:02, Act 12* of 1976 repealed the *Turtle Ordinance* and, in its Ninth Schedule, reiterated most of its provisions; these were carried forward in the Act's most recent amendments, *Act 12* of 1990, Section 21, Ninth Schedule, setting forth:

- a four-month closed season (1 June to 30 September), during which it is prohibited “to catch or take or attempt to catch or take any marine turtle”;
- a minimum size limit of 20 lb in weight; and
- a prohibition on the disturbance of “any turtle nest or eggs” or the taking or attempting to take “any turtle laying eggs or on the shore engaged in nesting activities”.

It should be noted that these current regulations omit the explicit prohibition provided in the *Turtle Ordinance* of the marketing of marine turtles and products during the closed season.

Except for their inclusion in the Ninth Schedule, marine turtles appear to be excluded from much of the *Forestry and Wildlife Act's* provisions by its definition of wildlife, namely “animals of the following groups living beyond the control of man: mammals (including feral pigs); birds and the eggs thereof; frogs and the eggs thereof; reptiles and fishes, their fry and eggs, and crustaceans found in fresh water streams or impoundments”. The only possible basis for penalizing violations of the Ninth Schedule proscriptions is Section 61 (Part VIII), which states that, “Unless a different or other penalty or punishment is specifically prescribed, a person who contravenes any provision of this Act or any regulation is liable to a fine of four hundred dollars and to imprisonment for three months.”

The Government of Dominica (2002) has recognized that the *Forestry and Wildlife Act* of 1976 is “inadequate” and has drafted a set of amendments and implementing regulations that are currently undergoing ministerial review. Among the improvements set out in this draft are provisions for penalties to deter poaching more effectively (S. Durand, FWPD, pers. comm., 2005).

The *Fisheries Act (No. 11)* of 1987, which defines “fish” as “any aquatic [sic] animal, whether piscine or not and includes any shellfish, turtle, mollusc, crustacean, coral, sponge, echinoderm, its young and its eggs”, mandates the relevant minister to “take such measures as he thinks fit under this Act to promote the management and development of fisheries, so as to ensure the optimum utilization of the fisheries resources in the fishery waters for the benefit of Dominica”. Among the many measures stipulated in this Act are the preparation and continual review, for approval by the Minister, of a plan for the management and development of fisheries in the fishery waters, which shall:

- identify each fishery and assess the present state of its exploitation;
- specify the objectives to be achieved in the management of each fishery;
- specify the management and development measures to be taken; and
- specify the licensing programmes to be followed for each fishery, the limitations, if any, to be applied to local fishing operations and the amount of fishing, if any, to be allocated to foreign fishing vessels.

Part III of the Act sets forth a suite of conservation measures, including a prohibition on the use, for fishing, of explosives, poisons and other “noxious substances” and establishes strict penalties (1000 East Caribbean dollars [XCD1000] or, in case of default, six months’ imprisonment) for violations of this provision and any gear restrictions established in the Act’s implementing regulations. Finally, the Act specifies the enforcement powers of authorized officers, defined as “any fisheries officer, any customs officer or police officer and any other person or category of persons designated as an authorized officer by the Minister under Section 26”.

The *Fisheries Act*’s general provisions authorize ministerial promulgation of regulations for a range of purposes, including:

- providing for the licensing, regulation and management of any particular fishery;
- prescribing fisheries management and conservation measures, including gear standards, minimum species sizes, closed areas, prohibited methods of fishing or fishing gear and schemes for limiting entry into all or any specified fisheries; and
- prescribing measures for the protection of turtles, lobsters and conches.

They further authorize ministerial promulgation of regulations that provide penalties of a fine not exceeding XCD5000 and, in case of default of payment, a 12-month prison term, for violations of any implementing regulation of the Act.

Although comprehensive draft regulations for implementing the *Fisheries Act* have been under review since 1987, they have yet to receive ministerial approval and be made into law. This has created numerous problems for implementation of the Act, including for effective enforcement. In addition, although the *Fisheries Act* provides ample scope for enhanced conservation and management measures for marine turtles, no specific regulations have yet been promulgated for these species. The Fisheries Division (H. Guiste, pers. comm., 2005) reports that the draft fisheries regulations significantly revise the provisions for protecting and managing marine turtles; in addition to retaining the protections for marine turtle eggs and nests and marine turtles on land that are currently afforded through the *Forestry and Wildlife Act*, these provisions include:

- maximum size limits;
- extension of the closed season; and
- a permit requirement for the capture of marine turtles.

The Fisheries Division is “optimistic” that these regulations will be promulgated by 2006 (H. Guiste, pers. comm., 2005).

The conservation of marine turtle habitats is provided for by at least two pieces of legislation. Chapter 42:02 of the *National Parks and Protected Areas Act 16* of 1975 (amended by 54 of 1986, 12 of 1990) provides for the designation and management of areas set aside as national parks or protected areas. The Act provides for a National Parks Advisory Council and for the promulgation of regulations requiring, *inter alia*, preservation of flora and fauna; regulation and prohibition of hunting and fishing; preservation and maintenance of water supplies and any water catchment area; prevention of soil erosion and landslides; construction, maintenance, operation and administration of roads, ways, public works and utility services; and the regulation and control of development, construction and building within the national parks system. In addition, the Act provides authorities to police

officers and park wardens to enforce the provisions of the Act and its implementing regulations and sets forth penalties for violations.

Section 22 (Part III) of the *Fisheries Act* of 1987 provides for the designation and management of any fishery area and, as appropriate, any adjacent or surrounding land, to be set aside as a marine reserve where “special measures are necessary” to, *inter alia*, “afford special protection to the flora and fauna of such areas and to protect and preserve the natural breeding ground and habitats of aquatic life, with particular regard to flora/fauna in danger of extinction”. Except as permitted at ministerial level so as to enhance the management of these areas, the Act prohibits in marine reserves:

- fishing or attempting to fish;
- taking or destruction of any flora and fauna other than fish;
- dredging, extraction of sand or gravel, the discharge or deposit of waste “or any other polluting matter”, or the disturbance, alteration or destruction of the natural environment; and
- construction or erection of any buildings or structures on or over any land or waters within such a reserve.

Finally, the Act establishes a fine of XCD5000 and, in cases of default of payment, a 12-month prison term, for those convicted of violating any of these proscriptions.

The CITES National Legislation Project assessed Dominica’s CITES-implementing legislation as “believed generally not to meet the requirements for the implementation of CITES” (Anon., 2002). A deadline of 30 June 2004 for enactment of legislation was not met, although Dominica had submitted a Legislative Plan outlining the timeline and process to that end, and the deadline was subsequently extended. Draft implementing legislation has now been submitted to the CITES Secretariat (Anon., 2005). The Government of Dominica (2002) has noted that implementation and enforcement of CITES have been “hampered by the absence of an enforceable regulatory framework”.

Responsible authorities

Within the Ministry of Agriculture and the Environment, the Fisheries Division is responsible for managing exploitation and trade, while FWPD is charged with conservation and enforcement (Fisheries Division, 2002; FWPD, 2004). The draft fisheries regulations grant authority to the Fisheries Division to engage in conservation and enforcement, as well (H. Guiste, Fisheries Division, *in litt.*, 12 September 2005). The Environmental Coordinating Unit serves as the CITES Management Authority, and the Fisheries Division and FWPD serve as CITES Scientific Authorities for marine and terrestrial species, respectively.

The Dominica Marine Reserves Service, within the Fisheries Division, serves as the management body to “protect, promote and educate about the marine environment on the west of the island” (www.dominicamarinereserves.com, viewed 19 September 2005).

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective

Carr *et al.* (1982) reported local consumption of the meat and eggs of Green and Hawksbill Turtles and Leatherbacks in Dominica. Edwards (1984), based on interviews conducted for the Western Atlantic Turtle Symposium, confirmed that local consumption focused on “meat and eggs, with the Hawksbill shell often being sold to Martinique or Guadeloupe”. In addition, she reported that many of the fishers exploited all of the species when they could, that meat (Hawksbill, Leatherback and Green Turtle) sold for XCD2.50/lb and that “none depend totally on it for a livelihood”. She concluded that “skins and stuffed juveniles are of no importance in Dominica at this time” and that local craftspeople “do not utilize Hawksbill shell in their work”.

In a follow-up report prepared for the Second Western Atlantic Turtle Symposium, Lawrence (1987) described the local tradition of fishing from the beaches at night, which “led to the capture of turtles during their nesting ventures; the disturbance of turtle nests; the collection of turtle eggs and eating of turtle meat—a tradition in itself”. He noted that these practices were “imposed on the population because Dominica has a very narrow coastal shelf with limited demersal fish resources near-shore, which has continuously been under severe pressure over the last years”, concluding that “the nature of the fishing industry has determined the fate of the turtle resources to some extent”.

Lawrence (1987) reported that turtles comprised “a fair percentage of the fish resources that are landed” in many coastal communities. At the same time, he reported that there was “no particular turtle fishery in Dominica”, neither were there any specialized turtle fishers; rather, exploitation was “haphazard”. He further reported that some 60% of the turtles landed were adults captured at sea as they swam towards the coast to nest and the remaining 40% landed were from “incidental catches” in gill nets and longlines; Leatherbacks were caught most frequently by longlining operations. He stated that newer mid-water and bottom gill nets (as opposed to the conventional beach seine) brought “a tremendous degree of mortality pressure on young turtles”. In one monitored period following the opening of the turtle season, a group of gill net fishers averaged four turtles (all four species, carapace lengths of 40–130 cm) in each net set (Lawrence, 1987).

High levels of exploitation have been attributed to fishers in neighbouring Guadeloupe and Martinique who fished the surrounding waters and caught turtles throughout the year with trammel nets, according to Lawrence (1987). He estimated that this exploitation accounted for at least three times the turtles landed locally in Dominica.

Recent (since 1992) exploitation

Although it is permitted to capture marine turtles at sea during eight months of the year in Dominica, an organized marine turtle fishery does not exist and no turtle nets are in use. The marine turtle fishery is informal, occasional and opportunistic or incidental to other fishing operations (H. Guiste, pers. comm., 2005). Although turtle landings are recorded at designated fisheries landing sites as part of the marine fisheries catch documentation efforts of the Fisheries Division, the numbers recorded are considered so insignificant as not to merit synthesis

and analysis. By contrast, the number of marine turtles that are captured and killed at sea or landed at other sites around the island is thought to be much higher: reports received by the RoSTI project indicate that turtles are killed at least weekly and sometimes more frequently throughout the year in the waters around the island (R. Byrne, pers. comm., 2005).

According to the Fisheries Division (2002), “eggs and Green Turtle meat” are considered to be the products most in demand, while FWPD (2004) reports a demand for “all turtle meat, but especially the Leatherback”. The sale of marine turtles and their parts and products is conducted on a very informal basis (H. Guiste, pers. comm., 2005): products are distributed amongst family and friends or sold by individual fishers, most commonly in rural areas, at a price of XCD5.00/lb (Fisheries Division, 2002). There is some trade in marine turtle products aimed at tourists (Byrne, 2004a). The Fisheries Division (H. Guiste, *in litt.*, 11 October 2005) indicates that regulation and monitoring of sales of marine turtles and their parts and products are inadequate and that existing efforts need strengthening. In contrast to earlier reports (Lawrence, 1987), there is no evidence that foreign fishers are currently involved in marine turtle exploitation and such exploitation does not appear to provide a major source of sustenance or income to the individuals involved (FWPD, 2004).

Illegal exploitation of marine turtles in Dominica takes the form of capture of animals at sea in marine reserves, outside the open season, in violation of the minimum-size limit or in violation of regulations regarding nesting females and their eggs. Poaching on nesting beaches is often conducted by individuals in non-fishing communities (H. Guiste, *in litt.*, 12 September 2005) and may claim 100% of turtles and eggs in some areas (Durand, 2004; Byrne, 2004a). Leatherbacks, the most prevalent nesting species, are most often involved, but all species are taken (Fisheries Division, 2002; FWPD, 2004). The RoSTI project began maintaining records of poaching reports and observations in 2003. Franklin *et al.* (2004) report that “in addition to the documented kills [of three Leatherbacks] at La Plaine, calls to the Sea Turtle Hotline and verbal reports to RoSTI staff indicate that extensive poaching occurred during the research season [April–December 2003] in the areas of Woodford Hill, Calibishe, Anse de Mai, and northeastern Dominica”. They also report that “poaching was evident around the island, in some areas more than others, but as a result of the RoSTI project poaching was remarkably reduced within the study site”, and that “all gravid turtles survived their nesting attempts” at Rosalie and La Plaine beaches after the last turtle was killed on 26 May 2003.

As part of a RoSTI Public Awareness Survey designed by WIDECASST and conducted by Dominican youth (trained in interviewing techniques and working in pairs) in 2003, a geographically representative sample of 180 Dominicans were asked a series of questions, including some that focused on the subject of marine turtle use and trade. Most (95%) respondents agreed that marine turtles were important to the people of Dominica; 81% believed that marine turtles had been an important aspect of Dominican culture since they were children; and while more than 60% could recall eating turtle meat and eggs on a regular basis in years past, relatively few (25%) regarded it as a “special meal”. When queried on their present day habits: 49% reported eating turtle meat, 42% reported not, and 9% declined to answer; 27% had taken part in the hunt, 70% had not, and 3% declined to answer; 71% believed that fewer marine turtles are being caught today than in the past, 18% believe that more are caught today; and a majority (55%) believed that “there are fewer sea turtles in Dominica today than in years past” (Franklin *et al.*, 2004).

International trade

Historical perspective

Edwards (1984) reported that a man from Martinique, Mr. Albert, regularly visited Dominica to purchase Hawksbill shells from the fishers; he gave the fishers tangle nets and let them keep the meat. He paid XCD15–20/lb for the shells (which averaged 2–3lb each). According to Lawrence (1987), local use of turtle products as souvenirs was uncommon at the time of his writing because of “a fair degree of consciousness of CITES”. He confirmed, however, that the “overseas ‘on-sea’ trade” involved high levels of year-round exploitation by fishers from neighbouring Guadeloupe and Martinique.

CITES trade statistics derived from the UNEP-WCMC CITES Trade Database record very little international trade in marine turtles originating in Dominica up to and including 1992—only a few specimens. Groombridge and Luxmoore (1989) presented Japanese Customs statistics on imports of Hawksbill shell from Dominica totalling 9613 kg for the period 1962–1968, levels far higher than the 1273 kg recorded imported during the next two decades (see table below). Based on confusion between Dominica and the Dominican Republic that has arisen in other analyses of Japanese Customs statistics, it appears likely that these imports were erroneously ascribed to—and therefore did not involve—Dominica. The Fisheries Division (2002) indicates no knowledge of the trade recorded by CITES or the Government of Japan.

Japanese imports (kg) of Hawksbill Turtle shell, 1970-1992, from Dominica, as recorded in Japanese Customs statistics

Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
	0	0	0	6	0	0	126	0	0	114	90	60
Year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Total
	39	40	0	174	219	142	0	0	263	0	0	1273

Sources: Milliken and Tokunaga, 1987; H. Kiyono, TRAFFIC East Asia-Japan Office, *in litt.* to TRAFFIC International, 29 July 2002.

In response to a RoSTI Public Awareness Survey (administered in 2003 and described above), most (74%) respondents remembered that turtle shells had been used in the past “more for decoration than for utilitarian purposes”, such as display. Most (65%) also recalled “the use of turtle scutes in the production of jewellery”. Opinion was fairly equally divided as to whether these products were consumed locally or traded to merchants from the French islands but sometimes the respondent simply couldn’t recall (Franklin *et al.*, 2004).

Recent (since 1992) international trade

There is virtually no evidence of international trade in marine turtle products involving Dominica since 1992. CITES trade statistics for the period 1992–2004 record only two Hawksbill carapaces, seized on arrival in the USA.

There are no statistics and no estimates on the extent of illegal trade in marine turtles or turtle products to or from Dominica. The Fisheries Division (2002) considers it “very likely” that exports are still occurring to Guadeloupe and Martinique. Byrne (2004a) reports that products are available for sale, mainly to tourists, including “small amounts to cruiseship visitors”, and that raw material (e.g. Hawksbill scutes) is also sometimes sold to tourists. He notes that there is no public awareness (on the part of buyers or sellers) of CITES provisions prohibiting international trade in Appendix-I species, including marine turtles, and no relevant law enforcement. It cannot be known at this time whether these largely informal trade patterns pose a serious problem for the conservation and management of marine turtles in Dominica, but FWPD (2004) ranks such trade as a low priority compared with other contemporary threats.

No stockpiles of marine turtle parts or products are known to exist (Fisheries Division, 2002; FWPD, 2004), only, according to Byrne (2004a), some products displayed in private homes.

Enforcement issues

Illegal exploitation of marine turtles, adult females in particular, and turtle eggs continues to be a challenge to both marine turtle management and law enforcement in Dominica (Durand, 2004; Byrne, 2004a). In some instances, poaching of marine turtles involves armed poachers facing off against unarmed Forestry Officers (Durand, 2004) and individuals hired by others to poach for them (Byrne, 2004a). Notwithstanding, dedicated enforcement efforts on the part of FWPD and police officers, as well as RoSTI staff and community volunteers, have been very successful in reducing poaching. During the 2003 and 2004 nesting seasons, poaching was reduced in Rosalie Bay to zero (Rosalie Beach) and, by 2004, to affect less than 5% of nesting females at the larger La Plaine (Bout Sable) beach to the south (RoSTI, unpubl. data). Poaching was further reduced at La Plaine in 2005 and, as a result of community efforts, at Castle Bruce and Cabana beaches as well (R. Byrne, *in litt.*, 29 September 2005).



Credit: Scott A. Eckert/WIDECAS

Local youths participate in an annual clean-up of Rosalie Bay, an important sea turtle nesting ground in Dominica.

RoSTI, in partnership with FWPD, has operated a 24-hour national Sea Turtle Hotline since April 2003. The Hotline is advertised in brochures, posters, local newspapers and related literature. Although operated by RoSTI staff primarily for use by the general public, it is also used by FWPD and the Fisheries Division. Since its inception, hundreds of calls have been received about nesting and other marine turtle activities around the island. The Hotline has been particularly helpful in reporting poaching incidents and, through the response of government agencies, has helped reduce poaching in many areas. The increase in calls to the Hotline to report incidents of poaching and make requests for enforcement assistance provides evidence of public support for marine turtle enforcement efforts, as well as an increasing awareness and interest in marine turtle protection. Similarly, there are cases where communities have gathered on the beach to offer protection to egg-laying females and their nests or turtle hatchlings (R. Byrne, pers. comm., 2004).

The Government of Dominica (2002) has recognized that legislation in the form of the *Forestry and Wildlife Act* and *Fisheries Act* is inadequate, that fines and fees are low, and that illegal fishing occurs in marine reserves. As noted above, major advancements in redressing these and other shortcomings are pending in the form of implementing regulations for both of these laws, as well as amendments to the *Forestry and Wildlife Act*. Pending adoption of these measures, enforcement actions have been taken under the *Forestry and Wildlife Act*. The first arrest for a marine turtle offence was made in 2003 and resulted in a fine of XCD450 (R. Byrne, pers. comm., 2004). A subsequent instance of poaching, of a Leatherback on La Plaine on 28 April 2005, also resulted in prosecution and imposition of a monetary fine (R. Byrne, *in litt.*, 29 September, 2005).

Marine turtle management

Legal provisions for the protection and management of marine turtles in Dominica have been in place for over half a century and their implementation has been supplemented in recent decades through nesting beach monitoring (foot patrols), establishment of protected areas, and education and outreach activities undertaken by FWPD, the Fisheries Division, RoSTI staff and community volunteers. Major advancements are pending in the form of draft regulations to implement and enable the *Fisheries* and *Forestry and Wildlife Acts*, and a national marine turtle management plan is planned as a collaborative effort between government agencies, RoSTI and other local organizations and experts as part of the Sea Turtle Recovery Action Plan (STRAP) series of WIDECAST and the United Nations Caribbean Environment Programme (Byrne, 2004a).

Management of exploitation

Although nesting marine turtles and turtle nests have been protected and the capture of marine turtles at sea has been regulated for many decades in Dominica, the current regime for managing exploitation of marine turtles is rudimentary, with little effort directed towards reviewing its effectiveness in preventing marine turtle population declines or ensuring the sustainability of the marine turtle resource. There has been no stock assessment in the usual sense for any species of marine turtle and, until very recently, no sustained population monitoring. Both management and monitoring of the legal fishery have been insufficient in ensuring it did not result in population declines. The absence of a monitoring programme for the legal fishery, combined with the lack of marine turtle population monitoring, results in there being no basis to assess the full extent to which the fishery has reduced population numbers, nor to deduce other trends important for informing management.

The restrictions in place contradict science-based wildlife management principles in that minimum size limits target exploitation on the large juvenile or adult turtles (other than on land, during nesting), which are the most important marine turtle age classes to protect in order to prevent population declines and promote population recovery. No other limits, such as quotas, are set on the open-access fishery. Long-standing traditions of turtle consumption and economic circumstances have compounded the logistical difficulties associated with enforcing the protection of nesting females and their eggs and have had, as a consequence, widespread and significant levels of poaching, characterized by FWPD (2004) as a serious problem for management.

The adoption of maximum size limits, an extended closed season and permit requirements set out in the draft fisheries regulations (H. Guiste, pers. comm., 2005) represent a major step forward in modernizing the legal framework for marine turtles. These legal restrictions are one component of a management programme that should also include:

- systematic, continual recording of the fishery in terms of numbers and species and sizes taken and the localities where they were taken, as well as the number of fishers, gear types, etc., and domestic marketing of derived products;
- efforts—outreach, extension work, and education—to inform about and increase compliance with the legal restrictions in effect and related management efforts;
- strict enforcement, through patrols on beaches and at sea and prosecution of violations, bearing in mind as well that community-based programmes and initiatives are considered to be most effective; and
- systematic monitoring of marine turtle populations so as to identify and address management gaps, document critical sites for conservation and detect real and meaningful trends in marine turtle numbers.

Species research and conservation

Data on marine turtle nesting sites and nesting activity in Dominica have been collected since the early 1980s. However, these have not been sustained and systematic enough to enable an assessment of trends. Most recently, the RoSTI project, operating on the south-east coast, has been undertaking a range of research and conservation activities, including monitoring through daily and nightly patrols of nesting in Rosalie Bay. By establishing Rosalie Beach as an Index nesting beach with data collected on a nightly basis by community-based beach patrollers, the project is providing resource managers with the nation's first demographic dataset, while at the same time facilitating training of forestry officers, including through exchange programmes with projects in other Caribbean countries, providing seasonal income to local residents, effectively deterring poaching and conducting outreach activities on behalf of marine turtles. Finally, RoSTI is investigating alternative livelihoods for turtle fishers and chronic poachers (Franklin *et al.*, 2004; Byrne, 2004b).

As a result of partnerships formed, capacity built and enthusiasm generated on the part of the government, communities, local businesses and donors—emerging from the success of the RoSTI project—a number of research and conservation initiatives are in the planning stages for the coming years, including an at-sea census of foraging populations, a series of community-based legislation and enforcement workshops, additional programming partnerships with schools and youth groups, replication of the beach-monitoring protocols at other beaches at high risk from poaching and the formation of a national board of advisors, including NGOs, to oversee the workplan (H. Guiste, pers. comm., 2005).

Habitat conservation

Dominica has a long history of habitat conservation, having protected as far back as 1952 the first site in the Eastern Caribbean to have been designated (in 1997) a natural World Heritage site, Morne Trois Pitons National Park. In addition to Morne Trois Pitons and two other national parks (Morne Diablotin and Cabrits), the country's system of national parks and protected areas includes two marine reserves established “to preserve and protect the marine environment for all users” (www.dominicamarinereserves.com, viewed 19 September 2005). These are the SSMR, established in 2000–2001 and located in the south, and the Cabrits Marine Reserve, originally set aside in 1987 as part of the Cabrits National Park on the northern coast.

The SSMR was established to: “reduce user conflicts, preserve traditional fishing practices; and ensure conservation of the resources for all users”. It is composed of four zones categorized as follows:

- fish nursery area—no fishing allowed;
- recreation area—at Tous Sable beach, for swimming and snorkelling from shore;
- fishing priority area—for local fishing, under strict guidelines;
- scuba diving area—several such areas are demarcated by a buoy placed for dive boats only.

The SSMR is managed by a Local Area Management Authority, established by law in 1998, which is composed of various local stakeholders: fishers, village councillors, the tourism industry, Dominica Watersports Association, the Coast Guard and Fisheries Division. Wardens are legally empowered to collect user fees, maintain moorings, monitor the reefs and maintain infrastructure.

The Government of Dominica (2002) has recognized the need to establish additional coastal and marine protected areas. No specific marine turtle nesting or foraging area has yet been protected (Byrne, 2004a).

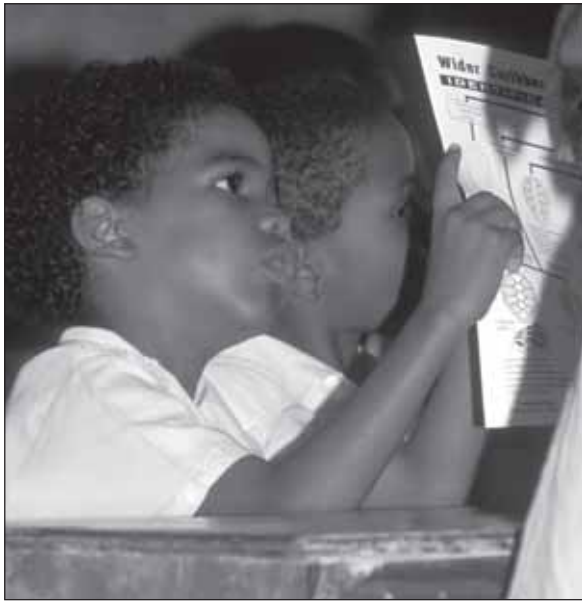
Marine turtles face a number of habitat-related pressures in Dominica. Sand-mining was cited by both Edwards (1984) and Lawrence (1987) as a serious threat to marine turtle eggs and, although illegal, it remains a problem for coastal habitats and for marine turtle nesting habitat in particular (Government of Dominica, 2002). Lawrence (1987) also cited beach-front lighting as a management concern, noting that, in the Woodbridge area, a busy section of the waterfront near the main port, Leatherback hatchlings “are commonly found completely disoriented and moving across the road towards flood lamps that light up the industrialized areas”. More recently, the loss of marine turtle nesting grounds (e.g. Potters-Ville, Point Mitchel) to the construction of seawalls lined with large boulders on the seaward side has become a problem (E. Hypolite, Director, FWPD, *in litt.*, 6 September 2005; H. Guiste, *in litt.*, 12 September 2005) that has also affected portions of beach at Canefield Cliff and Colihaut that provided nesting areas for Hawksbill Turtles (Durand, *in litt.*, 15 September 2005). In addition, Guiste (2003) cites sedimentation from poor agricultural practices and quarry operations along the west coast as a cause of degradation to coral reefs and seagrass beds in Dominica, potentially including important foraging habitat for marine turtles; Durand (*in litt.*, 15 September 2005) reports sedimentation from quarry sites in the areas of Tarou, Layou, Saint Joseph, Mero and Colihaut.

Lawrence (1987) noted that erosion claimed “many nests” and that development crowded along the coastline sometimes forced turtles to cross roads and nest on the landward side, endangering both themselves and their newly hatched young. Franklin *et al.* (2004) estimated that fewer than half of all eggs hatch, owing to cycles of natural erosion, and concluded that while illegal killing is the most important threat to nesting females, “beach erosion is clearly the most significant threat to their young”.

Education and public awareness

FWPD has been involved in education efforts on behalf of marine turtles for many years. They produced their first marine turtle conservation poster in 1984 and have produced a variety of materials for schools and community groups. In addition, they organize and undertake school (primary, secondary and college) visits, publish articles in local newspapers as well as the Division’s monthly and annual newsletters, participate in talk shows and other programmes on radio and television, organize turtle conservation workshops, and present lectures and other types of presentations to community groups, police, tour operators, fishers and other stakeholders (Durand, 2004). The Fisheries Division has also been involved in a variety of local and national outreach activities (H. Guiste, pers. comm., 2005).

Credit: Scott A. Eckert/WIDECAST



The Rosalie Sea Turtle Initiative (RoSTI) provides marine turtle conservation education in Dominica's rural schools (above and right).



Credit: Scott A. Eckert/WIDECAST

The RoSTI project, in active partnership with the government, has produced t-shirts, hats, and postcards; hosted “turtle watches” for residents and tourists; installed informative billboards on nesting beaches; actively engaged local media; published a bi-monthly bulletin; organized an annual turtle festival (as well as participated in the island’s annual dive festival); convened community meetings and training workshops; and sponsored a wide variety of events and programmes to reach the public. Particularly noteworthy amongst the findings of these efforts is the exhilaration generated by the sight of a live turtle, an emotional experience for hundreds of islanders whose only previous contact had been as a consumer of turtle products (Franklin *et al.*, 2004; Byrne, 2004a).

In addition to its role in assisting in reduction of poaching, the Sea Turtle Hotline, operated by RoSTI in partnership with FWPD, has proved very successful in building awareness and appreciation for marine turtles. Operation of the Hotline has built a network of individuals who contact the project when they have information on turtles, enabled RoSTI and FWPD staff to disseminate more educational outreach materials and information as follow-up to phone calls, and been a source for the local media, who frequently call for advice and reports. Individuals who have called often have help set up public lectures and helped bring marine turtle message to their villages by facilitating public and village council meetings as one example.

Constraints to marine turtle conservation and management

According to the Fisheries Division (2002), there are numerous constraints to improved management of marine turtles in Dominica, including: shortcomings in the legal/regulatory framework, lack of knowledge of marine turtles, limited manpower, lack of trained personnel, insufficient funding and lack of public support. The Government of Dominica (2002) expressed similar concerns in the country’s NBSAP, noting in particular, that wildlife covered under the *Forestry and Wildlife Act* was “not managed on a scientific basis at the present time,

and that little [was] known about the extent of the resource or sustainable exploitation levels. This situation has been exacerbated by the current socio-economic situation which has resulted in increased exploitation of wildlife resources.” Byrne (2004a) notes the main constraints as lack of manpower and funding. The most effective use of additional funds, in his view, would be for more beach patrols and monitoring and workshops for training local police in enforcement and communities and officials at all levels in marine turtle conservation and management.

FWPD (2004) views funding to support manpower and public awareness programming as the most important ingredient for effective marine turtle management in Dominica and describes as “optimistic” the potential that, based on the success of the fledgling RoSTI project, “funding will be sourced and found” to enhance staff training, assist in public awareness, and conduct field work.

Summary and recommendations

The Government of Dominica has taken a leadership role in public awareness and support for community-based conservation initiatives and is actively working to modernize the current regime for managing marine turtles, which admittedly falls short of what would be considered consistent with the principles and practice of sustainable use. The lack of a scientifically based stock assessment and limits on the numbers of turtles that may be taken at sea, as well as of continual monitoring of marine turtle exploitation or foraging populations, suggests a need for additional measures that would assist in preventing further population declines and, possibly, promoting population recovery.

In accordance with the FAO Code of Conduct for Responsible Fisheries (FAO, 1995), an explicitly precautionary code, which states that “the right to fish carries with it the obligation to do so in a responsible manner so as to ensure effective conservation and management of the living aquatic resources”, the management of marine turtle resources in Dominica should seek to maintain the availability of the resource “in sufficient quantities for present and future generations in the context of food security, poverty alleviation and sustainable development”. Management measures should, *inter alia*, prevent over-fishing, rehabilitate depleted populations, incorporate the best scientific evidence (taking into account traditional knowledge, as well as relevant environmental, economic and social factors), assign priority to research and data collection (including at international scales) and promote environmentally safe fishing gear and practices in order to protect both the target resource and the ecosystems upon which it depends.

Among the fundamental components of any regime aimed at management of wild populations are: restrictions on exploitation that are consistent with the species’ biological requirements; a monitoring programme—systematic, sustained and rigorous collection and review of data—either on the specifics of exploitation or of wild populations so as to discern trends that can inform management; mechanisms to identify, monitor and address other threats to the species being exploited, so that these threats can be factored with exploitation to assess what level of overall mortality the species might sustain; and a high level of compliance (sometimes achievable only through vigorous enforcement) with the restrictions put in place to ensure that management goals are achieved. None of these are yet in place for marine turtles in Dominica.

Lawrence (1987) summarized the situation nearly two decades ago when he wrote, “there is every need to take greater control of the manner of exploitation of the turtle resources in Dominica”. He applauded the government’s “commitment to conservation” and to the need to strengthen the marine turtle regulations, and

wisely concluded that “laws are only one of the many components of the efforts at conservation. Education at all levels must be pursued as well. There is need for more educational projects to make the population not just follow rules, but to develop a level of consciousness for a species that can be wiped out if not adequately managed.” To this end, the following conclusions and recommendations are presented.

1. The Government of Dominica should move expeditiously to adopt and implement the comprehensive fisheries regulations that enable implementation of the *Fisheries Act* of 1987 and the regulations and proposed amendments to the *Forestry and Wildlife Act* of 1976, so as to modernize the management framework for marine turtles and enable more effective enforcement of marine turtle provisions.
2. In the light of the recognized depleted status of marine turtles in Dominica and the potential for continuing declines resulting from the legally mandated and unmonitored exploitation of large juvenile and adult turtles, the government should consider what legal or regulatory measures, in addition to those provided for in the regulations currently pending approval, may be necessary to ensure that any continued exploitation is consistent with accepted standards for marine turtle management. In addition, it should reconsider the broader institutional mandates and priorities that engender the types of activities that form part of a scientifically based management programme and further consider, in this context, whether a moratorium may be advisable as an interim or longer-term measure designed to facilitate a formal stock assessment.
3. In support of a comprehensive review and revision of the legal framework for marine turtle management, a comprehensive frame survey should be undertaken to quantify and characterize exploitation and use of marine turtles at the national level, including:
 - the landing of turtles at sea and hunting on nesting beaches;
 - exchange and marketing of turtles and turtle products;
 - numbers and types of fishers (and gears) involved, including the extent to which marine turtle landings result from incidental or opportunistic take in other fishing operations or from a targeted fishery;
 - processing and marketing patterns; and
 - the importance to livelihoods of the products and income derived from marine turtle exploitation.

This investigation should also aim to establish the nature and extent of illegal exploitation and trade of marine turtles and eggs and marine turtle products, and the extent to which they may negatively impact marine turtle populations and compromise management.

4. If legal exploitation of marine turtles is to continue, restrictions on this exploitation should reflect the biological parameters of marine turtles, take into account their depleted status and aim, at a minimum, at preventing any further population declines. Any exploitation regimen promoting population recovery and maintenance should be established and conducted according to sound management principles and practice, which should include the following:
 - A. Bringing exploitation in line with biological principles, including:
 - complete protection of nesting females, their eggs and young at all times;
 - complete protection of all species during the primary nesting season, 1 March to 30 November;
 - complete protection of the Leatherback, which occurs in the country only as an adult, and typically an egg-bearing female;

- maximum size limits, based on length (which is easier to undertake in the field) rather than weight, so as to safeguard large juveniles and adults;
- a conservative limit on the numbers of animals that may be exploited, based on a scientific stock assessment; and
- a requirement that capture quotas be based, if not on stock assessment, on data derived from national processes and research activities, and that, as far as practicable, these data be collected in such a way as to be compatible with the goal of assessing stocks throughout their full geographic ranges.

B. Managing the legal fishery through an enforceable, high-compliance monitoring programme aimed at establishing trends and monitoring these over time. A national programme to monitor marine turtle exploitation should document comprehensively and systematically, and in a manner allowing such records to be analysed and compared over time, the following:

- the number of fishers taking marine turtles and by what means;
- the number, size and species distribution of the marine turtles landed;
- the locality where the animals were taken;
- catch-per-unit effort; and
- the disposition of the marine turtles landed, including value of the animals and/or products if sold or traded.

In further support of reliable monitoring of the fishery, the following should be considered as requirements for participation:

- that ownership identification tags be installed on approved gear (e.g. nets)
- that turtles be landed alive or intact; prohibiting, for example, the use of spear guns and extended net sets that can result in drowning, and providing for reliable recording and verification of turtle landings; and
- that the licensing process include as a criterion full participation in the monitoring programme.

C. Establishing a systematic marine turtle monitoring programme that will:

- document distribution and abundance of local populations;
- identify major nesting grounds and foraging areas;
- designate Index nesting beaches and Index foraging grounds and document the numbers of marine turtles occurring in these over time;
- manage data records such that statistically significant trends in abundance can be identified and inform management; and
- identify and monitor threats and other factors influencing marine turtle survival.

5. Recognizing the importance of habitat pressures on marine turtles, critical habitats, both terrestrial and marine, should be identified and protected and incorporated into broader biodiversity management programmes. The government should consider:

- protecting marine turtle nesting beaches and adjacent marine areas, such as, for example, Rosalie and La Plaine, which are two of the highest-density nesting beaches in the country;
- enhancing habitat protection measures, including restriction/regulation of tourism and other activities near nesting beaches during the egg-laying season and vigorous enforcement of such measures, such as against sand-mining;

- adopting regulations to prevent or otherwise manage leaving of nets and other debris on the beach;
 - improving coastal zone management (and monitoring) capacity, including through environmental impact assessment, particularly in relation to the construction of beach-front hotels and other tourism infrastructure and sand-mining;
 - expanding the system of protected areas, in particular marine reserves; and
 - strengthening the management framework for protected areas to ensure that these areas fulfill their stated objectives.
6. In recognition of the informal and opportunistic nature of the marine turtle fishery in Dominica and the absence of comprehensive data, an effort should be organized to characterize present levels of marine turtle exploitation in a fisheries context. This effort should assess the importance of the marine turtle resource to subsistence and livelihoods, as well as the numbers of turtles and fishers involved.
 7. Recognizing that marine turtles are captured incidentally to other fishing operations, an effort should be made to quantify levels of incidental catch of marine turtles and to develop measures to reduce or eliminate it, such as through time–area closures and/or alternative (especially to gill nets) types of gear. The need for specific regulations dictating the procedures to be followed in instances of incidental capture of marine turtles should be reviewed, and dedicated outreach efforts to clarify the legal norms and procedures to follow should be undertaken.
 8. Recognizing that many marine turtles are taken illegally by non-fishers, there is a need for greater enforcement of existing marine turtle laws and regulations, including those that protect nesting females and, as has been recognized by the Government of Dominica in the NBSAP (2002), for an improved legal basis for enforcement. Promulgation of the fisheries regulations and revisions and regulations of the *Forestry and Wildlife Act* will mark a major step in this regard, but the need for additional legal or regulatory measures should be considered, as should the human and logistical resource constraints that impede current enforcement efforts. Well co-ordinated and equipped enforcement operations are seemingly needed to address organized poaching on nesting beaches. An at-sea capacity should improve enforcement in marine reserves and monitor and promote compliance with prevailing fishery and wildlife regulations.
 9. The Government of Dominica should move forward expeditiously to enact legislation to enable full implementation and enforcement of CITES provisions, including wildlife trade controls, scientific non-detriment findings and control and monitoring, as appropriate, of stockpiles of CITES species.
 10. Increased efforts should be made to engage local communities, including fishers, in marine turtle conservation and management. Fisheries extension efforts should be expanded to involve regular exchanges with fishers of information on marine turtles and their conservation and management needs and the participation of fishers in efforts to manage marine turtles so as to enhance compliance with regulations and support for marine turtle conservation. Support directed towards sustainable fishery practices and/or alternative livelihoods should be provided, as relevant and necessary, to assist fishers meaningfully in their efforts to comply with revised marine turtle regulations.
 11. Financial, logistical, and political support and encouragement should be extended to relevant government agencies to develop and implement a modern, scientifically based conservation and management regime for

nationally depleted marine turtle stocks, including for the revision of the legal framework, scientific studies, monitoring programmes, enforcement capacity and institutional strengthening of government agencies whose mandate includes marine turtles and their habitats. Both private and public foreign investment in the fisheries sector in Dominica should take account of the increased responsibilities—and costs—of the Fisheries and Forestry, Wildlife and Parks Divisions in managing for sustainability the resources concerned and the broader biodiversity impacts that may ensue.

12. Financial, logistical, and political support and encouragement should also be extended to active research, conservation, monitoring and public outreach efforts by NGOs, especially collaborative projects such as the RoSTI Index beach monitoring programme. Partnerships between the government and relevant NGOs should benefit from increased financial commitments on the part of bilateral and multilateral assistance agencies; co-management agreements, developed by consensus, are encouraged.

References

- Anon. (2002). CITES Document CoP12 Doc. 28. Working document of the 12th meeting of the Conference of the Parties, Santiago (Chile), 3–15 November 2002. Accessible at www.cites.org. Viewed 12 December 2005.
- Anon. (2005). CITES Document SC53 Doc. 31. Working document of the 53rd meeting of the CITES Standing Committee. Accessible at www.cites.org. Viewed 12 December 2005.
- Byrne, R. (2004a). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of Marine Turtles of the Lesser Antilles, Central America, Colombia and Venezuela. Completed by Rowan Byrne, RoSTI Project Manager. Dated 8 June 2004.
- Byrne, R. (2004b). The Rosalie Sea Turtle Initiative (RoSTI) in Dominica. Invited Oral Presentation to the 2004 Annual General Meeting of the Wider Caribbean Sea Turtle Conservation Network (WIDECAST), 21 February 2004, San José, Costa Rica.
- Carr, A., A. Meylan, J. Mortimer, K. Bjorndal and T. Carr. (1982). *Surveys of sea turtle populations and habitats in the Western Atlantic*. NOAA Technical Memorandum NMFS-SEFC-91, US Department of Commerce.
- Durand, S., Conservation Officer, Forestry, Wildlife and Parks Division. (2004). *Country Report: Dominica*. Invited oral presentation to the 2004 Annual General Meeting of the Wider Caribbean Sea Turtle Conservation Network (WIDECAST), 21 February 2004, San José, Costa Rica.
- Edwards, S. (1984). Western Atlantic Turtle Symposium National Report for Dominica. Submitted 15 November 1982. Pp. 161–168. In: P. Bacon *et al.* (Eds). *Proceedings of the Western Atlantic Turtle Symposium, 17–22 July 1983, San José, Costa Rica*, III, Appendix 7. University of Miami Press, Florida.
- FAO. (1995). Code of Conduct for Responsible Fisheries. Adopted by the 28th Session of the FAO Conference. Food and Agriculture Organization of the United Nations, Rome. 34 pp. + annexes. www.fao.org/fi/agreem/codecond/codecon.asp
- Fisheries Division. (2002). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of Marine Turtles of the Lesser Antilles, Central America, Colombia and Venezuela. Ministry of Agriculture and the Environment. Completed by Mr Algernon Philbert, Senior Fisheries Officer, Roseau. Dated 18 August 2002.
- FWPD (Forestry, Wildlife and Parks Division). (2004). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of Marine Turtles of the Lesser Antilles, Central America, Colombia and Venezuela. Ministry of Agriculture and the Environment. Completed by Mr. Adolphus Christian, Forester Public Service, Roseau. Dated 27 October 2004.

- Franklin, A., R. Byrne and K.L. Eckert. (2004). *2003 Annual Report: Rosalie Sea Turtle Initiative (RoSTI)*. Prepared by WIDECASST for the Ministry of Agriculture and the Environment (Forestry, Wildlife and Parks Division). Roseau, Dominica, West Indies. 57 pp.
- Government of Dominica. (2002). *Commonwealth of Dominica Biodiversity Strategy and Action Plan 2001–2005 (BSAP)*. Ministry of Agriculture and the Environment. Approved by the Cabinet of Ministers on 15 January 2002. dm-nbsap-01-en[1].pdf. Available from www.biodiv.org/world/reports.
- Groombridge, B. and R. Luxmoore. (1989). *The Green Turtle and Hawksbill (Reptilia: Cheloniidae): World Status, Exploitation and Trade*. Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Lausanne, Switzerland. 601pp.
- Guiste, H. (2003). A scoping study aimed at identifying the challenges to the management of the coastal fisheries on the west coast of Dominica. M.Sc. thesis, Hull University, England.
- Lawrence, N. (1987). National Report for Dominica. Presented to the Second Western Atlantic Turtle Symposium, Mayaguëz, Puerto Rico. Unpublished. 48 pp.
- Milliken, T. and H. Tokunaga. (1987). *The Japanese Sea Turtle Trade 1970–1986*. A special report prepared by TRAFFIC (Japan). Center for Environmental Education, Washington, D.C. 171 pp.
- UNEP. (1996). *Status of Protected Area Systems in the Wider Caribbean Region: Country Profile for Dominica*. Technical Report No. 36. UNEP Caribbean Environment Programme, Kingston, Jamaica.

Grenada

Introduction

Grenada is located in the eastern Caribbean at the southern extremity of the Windward Islands, ca. 160 km north of Venezuela. In addition to the island that gives the country its name, Grenada comprises a number of islands and islets that form part of the southern Grenadines. These stretch northward, where they eventually merge with the political jurisdiction of Saint Vincent and the Grenadines. Grenada is the largest island in the country, with a total land area of 312 km² and 121 km of coastline (GOG, 2000). The two other major islands are Carriacou (34 km² in area), located 24 km north-east of Grenada, and Petit Martinique (2.3 km² in area), which lies to the east of the northern section of Carriacou (GOG, 2000). The island of Grenada is predominantly volcanic in origin, very mountainous with a rainforest interior; the two smaller islands are also volcanic in origin but less diverse in topography.

Exploitation of marine turtles in Grenada for meat, eggs, shell and other products, dates back centuries (Shirley, 2002) and continues today. Despite the economic and cultural importance of these animals, there is a dearth of information concerning their distribution, abundance and status. A legal fishery for marine turtles continues to operate in Grenada. Although the fishery has been regulated at least as far back as 1931 and, in their most recent iteration, the regulations provide for full protection of Leatherbacks, there are not major limits on the fishery. A lack of awareness, coupled with insufficient legislation, results in the poaching of nests going largely unnoticed and unaddressed (Lloyd and King, 2000). Nest monitoring has been initiated through NGO efforts in recent years, but has not been conducted for long enough to discern population trends. Further, although the Division of Fisheries is recording marine turtle landings at one of the five major fisheries landing sites in Grenada (Grenville), these are only a fraction of total landings in the country and it appears that the data collected, which indicated a 50% increase in landings from 2000 to 2001, are inadequate to discern population trends. It is in this context that the Division of Fisheries (DOF, 2002) indicates that they do not know whether existing management and monitoring are sufficient to ensure that the fishery is not reducing marine turtle population numbers.

Although there is inadequate information available to determine the status of marine turtles in Grenada, Eckert and Eckert (1990) reported that several fishers interviewed during the course of their surveys on the island of Grenada commented that the number of Leatherbacks coming ashore to nest had declined sharply in recent years. Shirley (2002) reports that a majority of survey respondents in Grenada considered marine turtle populations to have declined, while Fastigi (2002) reports that in Carriacou in recent years, fishers, some of whom continue to take turtles during the open season, have reported noticing a fall in the numbers of marine turtles, both in-water and at nesting sites.

Grenada suffered a major blow to its infrastructure and economy from Hurricane Ivan, which hit the country in September 2004. The devastation wrought by the hurricane was extensive, and will take several years and much foreign assistance to put right. While its impact on marine turtle nesting and foraging habitats has not been assessed, it did cause disruption in population monitoring and other conservation efforts of NGOs and, no doubt, in government management efforts. There is little doubt that marine turtles have been affected in various ways by the disaster and that they may benefit from the country's recovery if their needs are incorporated into those efforts.

Summary of the status of marine turtles in Grenada

Four species of marine turtle are found in the coastal waters of Grenada. The Green Turtle and Hawksbill Turtle are the most common and forage in the islands' waters, while the Leatherback occurs seasonally to nest. The Loggerhead is found further out to sea, although occasional sightings have been made of foraging animals near offshore islands between Grenada and Carriacou (Ocean Spirits, *in litt.*, 24 October 2004). Other than sporadic records of the Olive Ridley in the Grenville turtle landing records, there appears to be no indication that this species is anything but infrequent (see table below).

Occurrence of marine turtles in Grenada

English common name	Scientific name	Occurrence
Loggerhead	<i>Caretta caretta</i>	F?
Green Turtle	<i>Chelonia mydas</i>	N, F
Leatherback	<i>Dermochelys coriacea</i>	N
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	N, F
Kemp's Ridley	<i>Lepidochelys kempii</i>	A
Olive Ridley	<i>Lepidochelys olivacea</i>	I

Key: N=nesting; F= foraging; I=infrequent; A=absent

Carr *et al.* (1982) characterized the extensive shallow waters and reefs of the Grenadines as providing "excellent foraging habitat" for juvenile and adult Green and Hawksbill Turtles and noted that Loggerheads ranked third in abundance, and that Leatherbacks were sighted (at sea) only rarely. They further reported that around Grenada Green Turtles were the most abundant and were, with Hawksbill Turtles, present year-round; that Loggerheads were typically of sub-adult size; and that Leatherback sightings were confined to adults during the nesting season. Finlay (1987) reported the Carriacou–Petit Martinique sector of the country to be the most frequented by marine turtles and that juvenile Hawksbill Turtles were the most abundant.

Bacon (1981) reported occasional nesting by Hawksbill Turtles on and around Grenada. Carr *et al.* (1982) reported that Hawksbill Turtles and Leatherbacks were the predominant nesters in Grenada, that Loggerheads and Green Turtles nested only rarely, and that Hawksbill Turtles were the prevalent nesters in the Grenadines. These authors and Bacon (1981) reported no nesting by Green Turtles in the Grenadines and only at one site on Grenada, Marquis Island. Inexplicably, Finlay (1984) estimated as many as 200 female Green Turtles nesting in 1982. The Division of Fisheries (2002) reports no nesting by Green Turtles in Grenada. According to Shirley (2002), fishers report that Hawksbill Turtles nest in the south of Grenada, on Rhonde Island (Isle de Rhonde), Carriacou, and on Sandy Island. A monitoring programme undertaken in the region in 2004 by the NGO Ocean Spirits confirmed the presence of nesting Hawksbill Turtles on both Caille and Rhonde Islands and the presence of juvenile Green and Hawksbill Turtles (Ocean Spirits, *in litt.*, 3 April 2005). The Leatherback nests in the greatest densities on the island of Grenada (DOF, 2002): Levera and Bathway beaches are the highest-density beaches, and there is occasional nesting at Grande Anse beach and Pink Gin Beach; Hawksbill Turtle hatchlings have also been observed on the latter of these two beaches (Ocean Spirits, *in litt.*, 3 April 2005).

Around the island of Carriacou, according to Fastigi (2002), the primary nesting species are the Hawksbill Turtle and Leatherback, with some rare sightings of nesting Green Turtles. The Loggerhead is still found in-water by Carriacou but is becoming increasingly rare.

The status of marine turtles in Grenada is unknown as, until very recently, there had been little systematic effort to collect relevant population data. An analysis of responses to interviews of fishers and others undertaken in early 2001 indicated that the majority of respondents (76%) believed that fewer turtles were caught today than in years past and (75%) that there were fewer turtles in Grenada than in the past (Shirley, 2002).

Carr *et al.* (1982) reported the capture at Black Bay (Grenada) and at Carriacou of two Green Turtles that had been tagged at Aves Island (Isla de Aves, Venezuela) and the capture around Carriacou of a tagged Green Turtle that had been head-started in Suriname. Tag returns from a saturation-tagging programme for Leatherbacks initiated in 2002 have been from Tobago, Trinidad, Carriacou and Bequia (Saint Vincent and the Grenadines), while a Leatherback that nested in Grenada in 2004 had originally been tagged in Panama (Ocean Spirits, *in litt.*, 24 October 2004).

Several nesting Leatherbacks in Grenada have been fitted with satellite transmitters in recent years by UK researchers, facilitated by the Division of Fisheries and Ocean Spirits: of the three Leatherbacks tagged in 2002, one is thought to have been caught in Saint Vincent in 2002 (along with another female that had been flipper-tagged—Ocean Spirits, *in litt.*, 3 April 2005), while the two others moved out of the Caribbean into the northern Atlantic Ocean. Of eight post-nesting females satellite-tagged in 2003, two travelled north-west, arriving within a few hundred kilometres of Cape Cod and Nova Scotia before turning southwards, while the remaining five that left the Caribbean travelled north-east, reaching latitudes between the Azores and the UK, when some turned south (Hays *et al.*, 2004a; Hays *et al.*, 2004b); the studies could not identify preferred foraging grounds or ultimate destinations.

Overview of the legal framework for marine turtle management

Membership in international and regional treaties

Grenada's membership of international agreements benefiting marine turtles is not comprehensive and there are important gaps at the international level in relation to the Convention on Migratory Species (CMS) and Ramsar Convention and at the regional level in relation to the Protocol Concerning Specially Protected Areas and Wildlife (SPAW Protocol) under the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, or Cartagena Convention, and the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC), which entered into force in May 2001. Grenada acceded to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) relatively recently, in 1999 (see table overleaf).

Membership of Grenada in multilateral agreements relating to marine turtles

Convention	Grenada
Cartagena Convention	17.08.1987 (R)
Protocol Concerning Specially Protected Areas and Wildlife (SPAW)	No
Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region	17.08.1987 (R)
Protocol Concerning Pollution from Land-based Sources and Activities	No
Convention on Biological Diversity (CBD)	11.08.1994 (R)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	28.11.1999 (E)
Convention on Migratory Species (CMS)	No
Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	No
MARPOL 73/78 (Annex I/II)	No
MARPOL 73/78 (Annex III)	No
MARPOL 73/78 (Annex IV)	No
MARPOL 73/78 (Annex V)	No
Convention on Wetlands of International Importance (Ramsar)	No
UN Convention on Law of the Sea (UNCLOS)	25.04.1991 (R)
Western Hemisphere Convention	No
World Heritage Convention	13.08.1998 (Ac)

Key: Date of: Ratification (R); Acceptance (Ac); Entry into force (E)

Laws and regulations relating to marine turtles

A legal fishery operates for marine turtles in Grenada and has been regulated since 1931 when the *Birds and Fish Protection Ordinance* of 1931 established: 1) a five-month closed season for turtles from 1 May to 30 September, during which it was illegal to kill, wound, take, or possess any turtle; 2) a prohibition on the take, destruction, or possession of any turtle or its eggs on land at any time; and 3) a minimum size limit of 25 lb (11.4 kg) for turtles that could be captured, sold or purchased (Groombridge and Luxmoore, 1989). At least some of these provisions (a closed season on the take and possession of turtles and eggs) were taken forward in a revision of this Ordinance via the *Birds and Other Wildlife (Protection Of) Ordinance* (Cap. 36) of 1957.

The *Fisheries Regulations S.R.O. No. 19* of 1987 (Section 17: Turtles), promulgated under the *Fisheries Act No. 15* of 1986, prohibited:

- fishing for, take, sale, purchase or possession of any turtle or part thereof;
- disturbance, take, sale, purchase or possession of any turtle egg, or
- interference with any turtle during the closed season.

The Regulations provided for the Minister to publish in the Gazette any closed season for Green Turtles, Loggerheads, Hawksbill Turtles and Leatherbacks.

The most recent legal provisions pertaining to marine turtles are the *Fisheries Amendment Regulations 1996 SRO24*, Section 16(5) and *Fisheries Amendment Regulation 2001 SRO2*, Section 17 (DOF, 2002). The 1996 *Fisheries Amendment Regulations* required that licences be issued by the Fisheries Officer for fishing for turtles

and they established the legal basis for minimum or maximum size limits. In addition, they provided for the imposition, on conviction, of a fine not exceeding 5000 East Caribbean dollars (XCD5000) or up to two years' imprisonment, or both, for violations of the Regulations.

The 2001 *Fisheries (Amendment) Regulations* provided additional restrictions on the exploitation of marine turtles. As stipulated in Article 17:

“No person shall fish for, take, sell, purchase, have in his possession or disturb the nest of any leatherback of any size at any time.

No person shall disturb, take, sell, purchase or have in his possession any turtle eggs.

No person shall fish for, take, sell, purchase or have in his possession any turtle which is not of harvestable size and weight or any part thereof.

No person shall fish for turtle during the closed season for turtles.

No person shall interfere with any turtle nest during the closed season.

The Minister may by notice published in the *Gazette* and in a newspaper printed or circulated in Grenada prescribe the minimum and maximum harvestable size and weight for any species of turtle other than leatherback turtle.

The Minister may by Notice published in the *Gazette* declare any period as a closed season for turtles other than leatherback turtles.”

The current minimum size limit is 25 lb, and the closed season is 1 May to 31 August.

According to the Division of Fisheries (DOF, 2002), there is not yet legislation in place in Grenada to implement wildlife trade controls. The CITES National Legislation Project assessed Grenada's CITES-implementing legislation as “believed generally not to meet the requirements for implementation” of the Convention (Anon., 2002) and assigned a deadline of 31 December 2003 for adequate legislation to be enacted. This deadline was subsequently extended and, by the time of the 13th meeting of the Conference of the Parties to CITES, Grenada had submitted to the CITES Secretariat a CITES Legislation Plan outlining the process and timetable for enacting this legislation (Anon., 2004). By the 53rd meeting of the CITES Standing Committee (June/July 2005), Grenada had submitted draft CITES-implementing legislation (Anon., 2005).

The *Fisheries Act No. 15* of 1986 provides for the promotion and management of fishing and fisheries in Grenadian waters and includes in Section 23 (Marine Reserves and Conservation Measures) provisions for the relevant minister to declare any area of the “fishery water” and adjacent lands as a marine reserve when it is considered that special measures are necessary, *inter alia*, to “protect and preserve the natural breeding grounds and habitat of aquatic life, with particular regards to flora and fauna in danger of extinction” for several purposes, including the preservation and enhancement of the area's natural beauty (CCA/IRF, 1991). No marine protected area has yet been designated under the Act.

Responsible authorities

The Division of Fisheries is responsible for management, exploitation, conservation and enforcement of regulations relating to the take of marine turtles. The Royal Grenada Police Force is also responsible for enforcement. The National Parks and Wildlife Unit, within the Forestry Department, is responsible for all

protected areas (terrestrial and marine). Where areas are protected for their value as watersheds, management also involves the Central Water Commission (UNEP, 1996).

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective

There are scattered records on the exploitation of marine turtles during the last century. Rebel (1974) wrote:

“Around 1949, 8–10 boats with 32 nets and 92 men fished principally from October to December and to a lesser extent in April. Today [early 1970s], about 20 boats, averaging two men each, fish for sea turtles on a part-time basis from October through May. Over three-fourths of the turtles are caught with nets; the remainder are harpooned or turned on the beach. The eggs are considered a delicacy locally... Duerden [1901] reports production of shell valued at £400 during 1900...

With regard to present-day turtle production, N.M. Greaves (personal communication) states: the fishery division has no statistics on the amount of turtles caught, but we have just completed a survey which revealed that there are 61 turtle nets [in operation],...they should catch approximately 10 turtles each during the open season, and each turtle should give 60 lbs of meat... Turtle turning is practiced during the closed season, which is illegal, and I assume no less than 100 are caught this way...for the year 1969 [estimated] turtles caught in Grenada and Carriacou equalled 710 live, weight—71 000 lbs; 42 600 pounds of meat.”

Rebel (1974) also cited a personal communication from J.L. Dibbs, who estimated that marine turtle landings for 1964, 1965, and 1967 were 25 000, 27 500 and 30 000 lb, respectively.

Carr *et al.* (1982) considered exploitation of marine turtles in Grenada to be moderately intense. They reported that turtles were taken on nesting beaches and in some places caught in trammel nets set on reefs. Finlay (1984) confirmed this latter practice, particularly during the nesting season, and considered it to be a “serious” threat, along with the take of eggs on beaches that were becoming easier to access. In addition, Finlay (1984) reported that turtles were taken by spear-fishers, but he did not view this practice as exerting serious pressure on turtle populations. He further indicated that the meat of all turtle species found in Grenada was eaten locally, with that of Hawksbill and Green Turtles preferred to that of Loggerheads and Leatherbacks, and that Hawksbill and Green Turtles were sought after for their “backs”, understood to be carapaces, with a clear preference for the former.

According to Groombridge and Luxmoore (1989), FAO Fishery Statistics showed minimal catches of marine turtles in Grenada—50 t for the period 1965–1973 and less than 0.5 t for the period 1974–1980. Finlay (1984) noted that turtles could be landed on any beach in Grenada, which made it difficult to monitor and control turtle landings. With that caveat, he estimated from a survey in 1981 that ca. 1000 turtles were caught annually, 70% of them juveniles. From interviews and market surveys, he estimated annual landings, excluding turtles taken incidentally in other fishing operations, for the period 1980–1982 of: 30–50 (1500 kg) Loggerheads; 100–150 (2500 kg) Green Turtles; 5–10 (1000 kg) Leatherbacks; and 100–200 (5000 kg) Hawksbill Turtles. In addition,

he reported the collection of eggs to be “serious”, and estimated 6000–10 000 eggs were taken for subsistence use, along with an estimated 100 nesting females and 50–75 turtles taken at sea. Finally, he estimated that 50 ± 10 fishers were involved in turtle fishing.

Turtle meat was sold on the local market and used for subsistence. Finlay (1984) reported that Green and Hawksbill Turtles and Loggerheads were brought to the major fisheries landing sites—Sauteurs, Grenville, Calliste, Bacolet and Calivigny—and sold for XCD1.75/lb (XCD3.85/kg) for meat and XCD0.90/lb (XCD 1.98/kg) for live turtles. Carr *et al.* (1982) reported an active trade in stuffed turtles and shells, including in the Grenadines, between local fishers and tourists passing through on their yachts and in Grenada in the tourist shops, where one Hawksbill Turtle was priced at XCD750.

In his updated report for the Second Western Atlantic Sea Turtle Symposium, Finlay (1987) presented information from interviews and observations reported by fishers and fisheries extension staff for different sectors of the country:

- Carriacou and Petite Martinique and adjacent islets: marine turtles were the focus of a target fishery deploying turtle set nets, including in the nesting season; the approximate number of turtles caught (period covered not specified) was: 1900 Green Turtles, 1500 Hawksbill Turtles and 196 Loggerheads. Turtle nests were also exploited. Hawksbill and Green Turtle shells, as well as meat from all three species, were used locally and also transported to Grenada, Martinique or Union Island, whence the shells were also exported.
- North Grenada Island, including Rhonde Island and other islets: marine turtles were targeted using set nets, and both females and males were taken in proximity to known nesting sites. The chief fishers in the area estimated catching 10–14 adult Hawksbill Turtles every two weeks, with higher numbers taken when they deployed larger nets. The catch was exported to Union Island and Martinique.
- Eastern coast of Grenada Island: Hawksbill Turtles and Leatherbacks nested along this coast and, thus, were taken on or just off the beach; a “notable turtle hunter for meat and eggs” reported that he and a few others caught 27 nesting Leatherbacks in this area in 1985. Off shore, it was primarily Green Turtles that were taken in set nets. Both the meat and eggs of the turtles were consumed and marketed.
- Southern Triangle/Pointe Salines, Grenada Island: as there were numerous nesting sites for Hawksbill and Green Turtles in this area, fishers reported setting nets in channels that the turtles pass through from feeding grounds or the open ocean in coming to shore to nest. One fisher in this area using set nets reported that 1985 had been a good year in that he had caught 50–60 adult Hawksbill Turtles, all but one females. “Since 1985, [fishers in this sector] have observed that the numbers caught in the nets have dropped markedly but many more plate-size Hawksbill and Green Turtles than usual are seen on dives.” In addition to the meat, eggs were collected, and the shells were sold to “persons who make ornaments or to traders who export them to the North Islands above Grenada”.
- West coast of Grenada Island: this area was reported to be less frequented by marine turtles, although there were known to be foraging sites in the area, where many “plate-size” Hawksbill and Green Turtles were observed.

In reporting for Grenada as a whole, Finlay (1987) expressed particular concern that “especially at Carriacou, where most of the catches are made and it would seem that most of the mature turtles occur, the fishermen set their nets very close to the shore, and this is a serious threat to the females”. Finally, he reported that, in addition to being consumed by fishers in their villages, turtle meat was sold on market days. On these days, turtles were

regularly brought to Grenada Island by fishers from Petit Martinique as live animals to be killed or as fresh meat and weekly during the open season fishers kept turtles alive for days so that they could be killed for market day.

Eckert and Eckert (1990) estimated from their field research in Grenada that 25–50% of the nesting female Leatherbacks were killed each year and that at least 50% of the eggs laid were collected from their nests.

Recent (since 1992) exploitation

Currently, the legal fishery for marine turtles targets species other than the Leatherback, which has been completely protected since February 2001, and operates during eight months of the year. In Grenada, turtle meat is sold in fish markets and from fishing boats (Shirley, 2002) that put in throughout the island; in many instances, fishers catch turtles on request and, thus, sell them in villages rather than at market (Ocean Spirits, *in litt.*, 24 October 2004).

The Division of Fisheries collects data on landings of marine turtles at fish markets: the species and weight of all marine turtles landed is recorded in log books. On the island of Grenada, where the major fisheries landing sites are Grenville, Saint George's, Sauteurs, Gouyave and Woburn, marine turtle landings data appear to have been collected in recent years only at Grenville. Landings data for this site are presented below. Because these

Landings (numbers) of marine turtles at Grenville, Grenada, 1996-2001

Year	Loggerhead	Green Turtle	Hawksbill Turtle	Olive Ridley	Total
1996	9	44	13	0	66
1997	21	20	24	0	65
1998	29	20	10	0	59
1999	26	5	29	1	61
2000	31	10	19	2	62
2001	34	31	32	3	97

Source: Division of Fisheries, Grenada (Ocean Spirits, *in litt.*, 1 November 2002)

Average weight of marine turtles landed at Grenville, Grenada, 1996-2001

Species	Average weight (kg)
Loggerhead	93.5
Green Turtle	50.0
Hawskbill Turtle	41.8
Olive Ridley	33.6

Source: Division of Fisheries, Grenada (Ocean Spirits, *in litt.*, 1 November 2002).

data only cover one landing site and many marine turtles are not landed at markets, these statistics represent only a fraction of the marine turtles landed throughout the country. According to Ocean Spirits (*in litt.*, 24 October 2004), more turtles are reported to be caught in the north of the island, and Sauteurs is reported by many to be the major area for turtle fishing currently. In addition, no data on landings for Carriacou or elsewhere in the Grenadines appear to be available.

Marine turtle landing data from Grenville, Grenada for the period 1996–2001 showed relatively stable catches until 2001, when they increased by 50% to just under 100 turtles with a total weight of over six tonnes.

The Division of Fisheries (2002) reports that 30–40 fishers take turtles in Grenada. However, turtle fishing is “occasional” and not a major source of income. Green Turtle, also called “chicken turtle”, is the most sought-after and the products most in demand are (in declining order of importance): Green Turtle meat, Hawksbill Turtle meat, and eggs; there is little apparent demand for Hawksbill shell (Ocean Spirits, *in litt.*, 3 April 2005). Half of the turtles landed are believed to be shared amongst family and friends, while the other half is sold at fish markets. Rural and urban residents consume turtle products to an equal extent (DOF, 2002).



Credit: WWF-Canon/Roger LeGuen



Credit: WWF-Canon/Hélène Petit

Interviews conducted on Grenada in 2000 and 2001 revealed that 83% of survey respondents ate turtle eggs and meat.

Shirley (2002) provides more information on the use of marine turtles, much of it derived from interviews conducted by Ocean Spirits and the Adventurers Club, a youth group in Grenada, from December 2000 to May 2001. These interviews were conducted in the major fishing localities on Grenada and by students around their home villages. All species of turtle are eaten in Grenada, although the Green Turtle is preferred; in addition to the meat, which is cooked like ordinary meat, other parts of the turtle are used, e.g. the intestines for soup or broth. The meat is more expensive than in previous times, selling for XCD4.50/lb in the north of the island and XCD5.50/lb in Saint George’s. In addition to meat, oil is extracted from the Leatherback by boiling the flippers and liver and then straining it before bottling it for future use and sale; the oil is sometimes mixed with honey, lime and rum and taken to cure colds, cough and other ailments. Some fishers use the oil for their boat engines and to catch flying fish and others use it as they would cod liver oil or shark oil, including for frying or for therapeutic purposes, as a drink or an ointment. Turtle eggs were (and are) also eaten: 83% of survey respondents indicated that they still ate turtle meat and eggs, but for 69% of respondents such consumption was rare (generally only once or twice per year).

Turtle shell products are used in Grenada, although the extent of use does not appear to have been quantified in any way. Shirley (2002) reports that turtle backs are polished and hung on walls in houses, restaurants and bars. Hawksbill shell, although widely used and sold locally as well as to traders in the past, had lost value; it once sold for XCD15/lb, but fishers in Sauteurs reported that the shells were now sold for a very low price or given or thrown away. The loss of a market for Hawksbill shell is attributed to legal prohibitions on international trade in the species.

There continues to be illegal exploitation of marine turtles and turtle eggs in Grenada. The Division of Fisheries (2002) considers this to be a “small problem” that relates primarily to Green Turtles that are taken for meat and shared between family and friends rather than sold in the market. However, other findings suggest that it may be more extensive—and more problematic. Turtle eggs are taken from nesting sites to be sold and distributed through family networks (www.oceanspirits.org, viewed 6 August 2004); in the case of Leatherbacks, poaching of nests at Bathway Beach has at times reached more than 90% and has increased with a rise in nesting to “alarming frequency” (Ocean Spirits, *in litt.*, 3 April 2005). Although not quantified in the same way, there is also clear evidence that turtles are caught during the closed season (Ocean Spirits, *in litt.*, 24 October 2004). With regard to Green and Hawksbill Turtles, the most recent assessment estimated 782 turtles caught annually around Grenada and Carriacou between 1996 and 2001 (Grazette *et al.*, *in press*).

International trade

Historical perspective

Rebel (1974) provided information on exports of marine turtles from Grenada. He reported that during 1948, 694 Green turtles, 279 Hawksbill Turtles and two Loggerheads were exported from Grenada to Barbados and Trinidad and that, prior to World War II, an export trade in live turtles existed with London: “about 180 turtles from 80 pounds upward...were shipped in troughs at freight rate of £15 per ton and were watered and fed while en route”. In addition, he reported that ca. 25 lb of turtle shell were exported annually (presumably at the time of his writing) to both Barbados and Trinidad. Subsequently, Finlay (1987) reported that turtle shells were sold to individuals for crafting “ornaments” or to traders who exported them to the “North Islands above Grenada”.

Grenada did not accede to CITES until 1999. CITES trade statistics derived from the UNEP-WCMC CITES Trade Database document no international trade in marine turtles involving Grenada from 1975, the year that CITES entered into force, until 1981. In the period 1981–1992, a very small number of imports, involving a very small number of items (primarily carapaces, including one recorded as that of a Kemp’s Ridley), were reported by the USA, over half of which were identified as deriving from Hawksbill Turtles and over half of which were recorded as having been seized on entry. By contrast, Grenada was a relatively important source of Hawksbill shell for Japan over the two decades before the closure of that import market in January 1993. Japanese Customs statistics show sporadic imports totalling 3881 kg of Hawksbill shell from Grenada, 1973–1991 (see table).

Japanese imports (kg) of Hawksbill Turtle shell, 1970–1992, from Grenada, as recorded in Japanese Customs statistics

Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
	0	0	0	499	0	132	0	59	0	0	0	0
Year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Total
	0	9	7	0	0	0	472	670	1287	746	0	3881

Sources: Milliken and Tokunaga, 1987; H. Kiyono, TRAFFIC East Asia-Japan Office, *in litt.* to TRAFFIC International, 29 July 2002.

Recent (since 1992) international trade

There is little evidence of significant international trade in marine turtles involving Grenada in recent decades. CITES trade statistics for the years 1993–2004, inclusive, are limited to imports of marine turtle products from Grenada, most of them to the USA, seized on entry, and comprising single items or small numbers of items. Imports over this period included: seven Green Turtle carapaces (including one seized on entry to the UK in 2003); 21 Leatherback eggs, seized on entry to the USA in 2000; one Hawksbill body and one kilogramme of Cheloniidae meat to the USA; and a pre-Convention Hawksbill carapace to Canada in 1996. In 2004, Barbados reported importing 100 Hawksbill specimens from Grenada, for scientific purposes.

The Division of Fisheries (2002) reported having no knowledge of any international trade in marine turtle products from Grenada since the country's accession to CITES in 1999 and did not consider illegal trade to be a management problem.

Enforcement issues

Illegal exploitation of marine turtles in Grenada currently takes the form of collection of turtle eggs and capture of Leatherbacks, both of which are now completely protected by law in Grenada, and capture and sale of marine turtles during the four-month closed season. As it is generally known that the collection and sale of eggs are illegal, these activities are conducted clandestinely and, thus, are difficult to quantify, but information in the form of reports and photographs and, as mentioned above, data from the nest-monitoring activities undertaken by NGOs indicates that eggs are regularly taken, in some instances in large quantities (www.oceanspirits.org, viewed 6 August 2004). There have, however, been no prosecutions (Ocean Spirits, *in litt.*, 24 October 2004). In Carriacou, Fastigi (2002) reports that, on Craigston beaches, nesting turtles have been killed and residents who have complained about this have been threatened.

Lloyd and King (2000) reported on the results of the first year's season (1 March to 31 July 2000) of recording turtle activity on both Levera and Bathway beaches in Grenada. They found the overall percentage of poaching to be 67.5%, with only 30 nests left intact, and estimated that a maximum of 10 Leatherbacks nested successfully at either of these beaches that year. (A total of 111 nests were recorded and divided by an average of six nests per Leatherback female, resulting in a total of 18.5 individuals—Ocean Spirits, *in litt.*, 3 April 2005). Further, they reported that the rate of egg poaching was higher (over 91% in June 2000) on Bathway beach, which is more accessible, than on Levera beach. Although they witnessed poaching activity during the closed season, the frequency fell during the months of May to July, possibly as a result of their efforts to camouflage nests to evade poaching. Finally, they reported that there were only a small number of dedicated egg poachers and it appeared through discussions that their motivation was not financial but rather habitual.

Lloyd and King (2000) raised the possibility of a hatchery at Levera as a possible means to address the egg-poaching issue. However, in subsequent years, it has been shown that the continuation of research (particularly in the form of night-time tagging work) significantly reduces egg collection. While there may still be a theoretical basis for a hatchery, in practical terms, the continuation of research efforts that involve communities is likely to be considerably more effective, less invasive and more sustainable than a hatchery (Ocean Spirits, *in litt.*, 3 April 2005).

The Division of Fisheries (2002) indicates that the sale of marine turtles and products is monitored during the four-month closed season; however, they provide no details, including regarding whether this monitoring is limited only to the designated fisheries landing sites, where, presumably, turtles are not taken during the closed season. Lloyd and King (2000) identified the need for a greater presence by relevant authorities so as to deter offenders and demonstrate that the laws are protection measures established for a specific reason and, thus, should be respected.

In addition, the need has been recognized for more active and effective outreach regarding the laws governing the exploitation of marine turtles. Shirley (2002), for example, reports that a high proportion (65%) of respondents to the 2001 marine turtle survey in Grenada were aware of parts of the law regarding turtles, namely the open and closed seasons and the minimum size limit, but not one respondent was aware of the 2001 prohibitions on hunting Leatherback turtles and collecting eggs. These findings echo those of Lloyd and King (2000), who expressed concern regarding confusion about the legal provisions in effect and the need to communicate “effectively and clearly” revised fisheries restrictions with fishing and other communities.

The Grenada Biological Diversity Strategy and Action Plan (GBSAP) (GOG, 2000), developed by the Government of Grenada in fulfillment of obligations under the Convention on Biological Diversity (CBD), notes that enforcement of many of the laws relevant to biodiversity is either poor or non-existent, owing to a lack of awareness of the legislation, lack of support for enforcement, or unclear jurisdiction, where there is overlap with several agencies or absence of regulations to implement certain Acts. The GBSAP further recognizes the need for revision of legislation to address inadequacies, such as to provide for better enforcement and more realistic, punitive measures and better inter-agency collaboration, which it regards as essential for conservation of terrestrial and marine resources.

The Division of Fisheries (2002) reports that there are no stockpiles of marine turtle products in Grenada.

Marine turtle management

Management of exploitation

Marine turtle management in Grenada currently relies on the restrictions set out in the 1996 and 2001 *Fisheries Amendment Regulations* and collection of marine turtle landing data at some fisheries landing sites. These legal measures include complete protection of the Leatherback, which is represented in the country solely by females visiting seasonally to nest. The Division of Fisheries (2002) indicates that it does not know whether current management measures are sufficient to ensure the fishery does not result in a reduction of turtle numbers but that no actions are currently under way to review the management programme or revise the regulations. An objective analysis of the current regime and these comments suggest a need for a thorough review and revision of the management regime, in particular in relation to the following:

1. Although the closed season covers the peak of the Hawksbill nesting season (DOF, 2002), the eight-month open season includes the end of the Hawksbill nesting season, thus putting at risk some of the reproductive females that are the most important segment of the turtle population to conserve.
2. The 25-lb minimum size limit does not protect the large juvenile and adult turtles that are essential for the viability of populations and population recovery.

3. If carefully formulated, the current licensing requirement for the take of marine turtles could be very useful in restricting the number of fishers taking turtles and the numbers of turtles taken and, thus, contribute significantly to management of the fishery. However, until the details of the licensing system are reviewed, the contribution of this measure to management cannot be assessed.
4. If licences are issued on a *pro forma* basis and not limited, monitored, or reviewed in any way, they contribute nothing to effective management of the fishery.
5. The existing restrictions of minimum size limits and a closed season have been demonstrated by history to be insufficient in preventing population declines and promoting population recovery, particularly as the minimum size limit targets exploitation on the age class that populations can least afford to lose.
6. If the Grenville landing data are indicative of landing trends on Grenada and elsewhere in the country, marine turtle exploitation could be increasing. That there appear to be insufficient data to confirm this trend and to analyse it in relation to marine turtle landing trends over a longer period of time must be considered a shortcoming in management of the fishery.
7. There are inadequate data—and marine turtle population monitoring activities—to enable any scientifically based judgment of the status and trends of marine turtles in Grenada. In the light of continued exploitation and the apparently few limits on that exploitation, this should be considered a serious shortcoming in the management of marine turtles in the country and a serious impediment to the possibility of stock recovery.

Species research and conservation

There has been a great deal of marine turtle research and conservation undertaken in Grenada in the past five years through the efforts of local NGOs in partnership with the Division of Fisheries and benefiting from expertise available through the Wider Caribbean Sea Turtle Conservation Network (WIDECAST). Prior to these initiatives, the most recent scientific study conducted on the island of Grenada had been on Leatherbacks in 1990 (Eckert and Eckert, 1990). The NGO Ocean Spirits has operated, since 1999, an extensive research programme focused primarily on Levera Beach, the main nesting beach for Leatherback turtles on the north-eastern end of Grenada. Beginning in March and continuing through August, the organization undertakes nightly patrols from 7 p.m. to 6 a.m. and morning patrols at a selection of other nesting sites. A saturation-tagging programme initiated in 2002 records every emerging female, along with the location of any nests laid. Ocean Spirits also monitors Leatherback nesting at Grenada Bay (Bathway) and Savan Swazee and has begun fortnightly surveys of Hawksbill nesting grounds on the outer islets to the north of Grenada. The number of Leatherback turtle nests documented at Levera Beach are presented below (Ocean Spirits, unpublished data):

2000:	50–100 nests
2001:	350–400 nests
2002:	150–200 nests
2003:	550–600 nests
2004:	300–350 nests
2005:	300–400 nests

On the island of Carriacou, the KIDO Foundation operates the KIDO Ecological Research Station (KERS), which carries out various activities relating to marine turtles, including monitoring and patrols for nesting Hawksbill Turtles and Leatherbacks and purchase and release of marine turtles caught by fishers. During the May–September nesting season, volunteers working with KIDO/KERS patrol four different beaches at night and

measure, tag and record data on nesting turtles, mark and disguise the location of nests and monitor hatchling activity and survival (kido.optsoftware.com, viewed 12 June 2004). They also undertake daytime beach surveys by boat. From October to January, the main turtle-netting season, the KIDO Foundation purchases live marine turtles from fishers. The turtles—primarily Green and Hawksbill Turtles and the occasional Loggerhead—are treated for injuries, measured, tagged, then released with the understanding of local fishers that, if caught again, the turtles will be recorded and released.

According to Fastigi (2002), 2002 was the first year that a systematic turtle conservation programme was put in place in Carriacou. Conducted by the KIDO Foundation under the guidance of WIDECASST and the University of the West Indies, this programme focuses on the marine turtle nesting beaches—Petit Carenage, Big Field and Anse Laroche—in the proposed National Park of High North, in the northern part of the island. Petit Carenage is the main site for Leatherback nesting and there is occasional Leatherback nesting on the two other beaches. In 2002, the Kido Foundation team, comprising three local nature guides, three foundation staff and several volunteers from abroad, patrolled primarily Petit Carenage beach and occasionally the other beaches, extending operations to Craigston beaches, reportedly the most heavily poached, when personnel were available. These patrols identified nests, covered tracks and disguised nests so as to confound poachers, and verified previously disguised nests. They also tagged several turtles (five Green Turtles purchased at the fish market and one juvenile Hawksbill Turtle freed from captivity). These efforts were considered successful in deterring poaching as they received indirect complaints from poachers that they could not get a turtle or eggs that year. The 2002 patrols recorded: 17 confirmed nests—10 Leatherback and seven Hawksbill—and six more possible nests; although they were notified of many more nests on other beaches, a lack of personnel prevented their verification.

Habitat conservation

The Division of Fisheries (2002) reports that no marine turtle nesting or foraging areas have been specifically designated as protected in Grenada. However, the 123-ha Levera National Park (GOG, 2000) on the north-eastern

coast of the island of Grenada incorporates the highest-density Leatherback nesting beach in the country, Levera Beach, and, one kilometre away, the second-most important, Bathway Beach (Lloyd and King, 2000). Significant destruction has taken place in the Levera National Park since 2003 where an 18-hole golf course has been developed alongside plans for a 650-room resort. Initial stages of this development (clearing, landscaping, construction) have already had significant repercussions on the nesting beach. The future of this development is uncertain, but it is most likely that further development will have significant impact on this nesting population unless effective mitigations are implemented (Ocean Spirits, *in litt.*, 3 April 2005).



Credit: S. Ranger/MCS

The effects of sand-mining, one of the obstacles to marine turtle conservation in Grenada, shown here at Windward Point, Anguilla.

A protected areas review undertaken in the late 1980s (GOG and OAS, 1988) recommended a total of 28 areas in Grenada and 12 in Carriacou for inclusion in a national

protected areas system; these included 10 as protected seascapes, several incorporating significant coral reefs and/or important habitat for both nesting and foraging marine turtles.

CCA/IRF (1991) detailed a number of habitat pressures on marine turtles in Grenada, including destruction of nesting beaches by sand-mining and development; bright lighting along the shoreline disturbing nesting females and disorienting hatchlings; predation on hatchlings by domestic animals such as dogs and pigs; and, particularly for the Hawksbill Turtle, damage to and degradation of coral reef habitats from siltation, pollution and dredging. Lloyd and King (2000) mention the dumping of plastics, glass and other 'party' debris on Bathway Beach and, on Levera Beach, vehicles driving over the popular nesting areas. This continued even after signs were posted during the nesting season advising visitors to avoid disturbing nests and driving on the beach.

Although it makes no specific mention of the impacts on marine turtle nesting habitat, the GBSAP (GOG, 2000) identifies extensive localized beach sand-mining as a problem and expresses concern that "continued growth in the construction industry will impose further pressures on these coastal areas unless alternatives are put in place immediately". In Carriacou, illegal sand-mining was reported as "rampant" by Fastigi (2002), owing to the increase of building activities on the island; an illegal sand-mining operation in early May 2002 in Petit Carenage resulted in the destruction of at least one Leatherback nest.

Education and public awareness

A variety of marine turtle outreach and educational activities has been undertaken in Grenada in recent years through the efforts of NGOs. Ocean Spirits has developed a range of programmes and materials aimed at educating local communities about marine turtles and involving them in conservation efforts. They have conducted school visits, field trips and summer camps and organize an annual Ocean Spirits Festival aimed at increasing understanding and appreciation of marine turtles. Their most recent initiative is E.A.R.T.H (Environmental Academic Resources for Teaching and Higher education), a computer-based, interactive educational tool for students and teachers that includes lesson plans, classroom activities and experiments and a range of resources in the form of video clips, pictures and animations for use in learning more about marine turtles and biodiversity more generally (www.oceanspirits.org, viewed 6 August 2004).

In addition to these initiatives, Lloyd and King (2000) have emphasized the need for improved educational efforts for those who are actively contributing to the heavy losses of nesting turtles. It is along this vein that Ocean Spirits established Grenada's first 'turtle watching' programme, emphasizing best practices as developed by WIDECAST. Run entirely by Grenadians, who escort visitors to the island to Levera Beach to observe the nesting Leatherbacks, and facilitated by Ocean Spirits, employing bus drivers and others from the local community, this programme generated direct income for these communities. Ocean Spirits calculated that, in its first season, one turtle generated XCD8600 for the local economy and local communities, as compared with the XCD200 that would have accrued had the turtle been killed (www.oceanspirits.org, viewed 6 August 2004). This venture is now run by the island's tour operators and, thus, is wholly Grenadian-operated; locally trained guides are hired and a donation per person is contributed to further research efforts.

The KIDO Foundation/Ecological Research Station also undertakes outreach efforts on behalf of marine turtles in Carriacou.

Constraints to marine turtle conservation and management

In addition to limited baseline data and a flawed management regime, the Grenada Division of Fisheries (2002) has identified a number of constraints to managing—and improving the management of—marine turtles, namely limited manpower, lack of trained personnel, and insufficient funding. Lack of public support is a problem for stemming illegal exploitation. In the Division’s judgement, public awareness and enforcement of restrictions, which are “not available owing to lack of funds and personnel”, are the most important ingredients for marine turtle conservation in Grenada.

The GBSAP (GOG, 2000) identifies a range of gaps, including the lack of effective enforcement of existing legislation and the need to revise existing legislation, which must be filled in order to improve the regulation of activities that have adverse impacts on habitats and species. In addition, the GBSAP includes as one of its main objectives the development and encouragement of sustainable use of biological, including fishery, resources essential to the livelihood of local communities.

Summary and recommendations

With the exception of the complete protection afforded the Leatherback, the current management regime for marine turtles in Grenada does not significantly restrict the taking of marine turtles nor contribute to the maintenance of their populations. Particularly problematic are the provisions in the regulations that, in effect: focus legal exploitation on large juvenile and adult turtles, the age classes that are most important for population maintenance and recovery; and permit the take of Hawksbill Turtles during a portion of the species’s nesting season. These provisions should be revised to better account for current understanding of the biology of marine turtles and its implications for sustainable use. In addition, although efforts are being made to monitor at some level the number and composition of turtles taken in the legal fishery, the monitoring programme should be reviewed and revised, as appropriate, to ensure that it is effective in implementing and informing management.

In accordance with the FAO Code of Conduct for Responsible Fisheries (FAO, 1995), an explicitly precautionary code, which states that “the right to fish carries with it the obligation to do so in a responsible manner so as to ensure effective conservation and management of the living aquatic resources”, the management of marine turtle resources in Grenada should seek to maintain the availability of the resource “in sufficient quantities for present and future generations in the context of food security, poverty alleviation and sustainable development”. Management measures should, *inter alia*, prevent over-fishing, rehabilitate depleted populations, incorporate the best scientific evidence (taking into account traditional knowledge, as well as relevant environmental, economic and social factors), assign priority to research and data collection (including at international scales) and promote environmentally safe fishing gear and practices in order to protect both the target resource and the ecosystems upon which it depends.

The lack of a scientifically based stock assessment and limits on the numbers of turtles that may be taken or of fishers licensed to take turtles suggests a need for additional measures that would assist in preventing further population declines and, possibly, promoting population recovery. As far back as the early 1980s, Finlay (1984) recommended measures to enhance the management of marine turtles, namely increased enforcement of the closed season and related regulations, including the use of turtle nets during the closed season, and the protection, as sanctuaries, of turtle nesting beaches on outer islands. Subsequently, Eckert and Eckert (1990), based on their

survey of Grenadian beaches in June 1990, recommended: a short-term moratorium on capture of Hawksbill Turtles to facilitate a stock assessment; extension of the closed season to encompass the breeding season for all species; establishment of a maximum size limit, if exploitation were to continue; strengthening and increasing enforcement efforts to combat egg poaching and violations of the closed season; enhancement of education programmes with schools, restaurants, and tourists; protection of important marine turtle habitats, such as through reducing or eliminating intensive sand-mining of beaches; and conservation of foraging grounds through mooring buoy systems, controlling pollution, and other measures.

These recommendations would appear to be relevant a full 20 and 15 years, respectively, after they were formulated and have been incorporated into the following recommended improvements in Grenada's management regime for these species.

1. In the light of the recognized depleted status of marine turtles in Grenada and the potential for continuing declines resulting from the legally mandated exploitation of large juvenile and adult turtles, and in the absence of systematic population monitoring, there is no discernible basis for the maintenance of a legal fishery for marine turtles in Grenada. The government should move expeditiously on a comprehensive revision of both the regulatory framework and the broader institutional mandates and priorities that provide for the types of activities that form part of a scientifically based management programme. It should consider, in this context, whether a moratorium may be advisable as an interim or longer-term measure.
2. In recognition of the findings of Grazette *et al.* (in press), and in support of a comprehensive review and revision of the legal framework for marine turtle management, a comprehensive frame survey should be undertaken to quantify and characterize exploitation and use of marine turtles at the national level, including:
 - the landing of turtles at sea and hunting on nesting beaches;
 - exchange and marketing of turtles and turtle products;
 - numbers and types of fishers (and gears) involved, including the extent to which marine turtle landings result from incidental or opportunistic take in other fishing operations or from a targeted fishery;
 - processing and marketing patterns; and
 - the importance to livelihoods of the products and income derived from marine turtle exploitation.

This investigation should also aim to establish the nature and extent of illegal exploitation and trade of marine turtles and eggs and marine turtle products, and the extent to which they may negatively impact marine turtle populations and compromise management.

3. If legal exploitation is to continue, the restrictions on this exploitation should reflect the biological parameters of marine turtles, take into account their depleted status and aim, at a minimum, at preventing any further population declines. Any exploitation regime promoting population recovery and maintenance should be established and conducted according to sound management principles and practice, which should include the following:
 - A. Bringing exploitation in line with biological principles, including:
 - complete protection of nesting females, their eggs and young at all times;
 - complete protection of all species during the primary nesting season, 1 March to 30 November;

- as has already been done in Grenada, providing complete protection for the Leatherback, which occurs in the country only as an adult, and typically an egg-bearing female;
 - maximum size limits, based on length (which is easier to undertake in the field) rather than weight, so as to safeguard large juveniles and adults;
 - a conservative limit on the numbers of animals that may be exploited, based on a scientific stock assessment; and
 - a requirement that capture quotas be based, if not on stock assessment, on data derived from national processes and research activities, and that, as far as practicable, these data be collected in such a way as to be compatible with the goal of assessing stocks throughout their full geographic ranges.
- B. Managing the legal fishery through an enforceable, high-compliance monitoring programme aimed at establishing trends and monitoring these over time. A national programme to monitor marine turtle exploitation should document comprehensively and systematically, and in a manner allowing such records to be analysed and compared over time, the following:
- the number of fishers taking marine turtles and by what means;
 - the number, size and species distribution of the marine turtles landed;
 - the localities where turtles are taken;
 - catch-per-unit effort; and
 - the disposition of the marine turtles landed, including value of the animal and/or products if sold or traded.
- In further support of reliable monitoring of the fishery, the following should be considered as requirements for participation:
- that ownership identification tags be installed on approved gear (e.g. nets)
 - that turtles be landed alive or intact; prohibiting, for example, the use of spear guns and extended net sets that can result in drowning, and providing for reliable recording and verification of turtle landings; and
 - that the licensing process include as a criterion full participation in the monitoring programme.
- C. Establishing a systematic marine turtle monitoring programme that will:
- document distribution and abundance of local populations;
 - identify major nesting grounds and foraging areas;
 - designate Index nesting beaches and Index foraging grounds, and document the numbers of marine turtles occurring in these over time;
 - manage data records such that statistically significant trends in abundance can be identified and inform management; and
 - identify and monitor threats and other factors influencing marine turtle survival.
3. Mechanisms to quantify levels of incidental catch of marine turtles should be developed. Measures to reduce or eliminate incidental catch of marine turtles, such as through time–area closures and/or alternative (especially to gill nets) types of gear, should be implemented.

4. The identification and protection of critical habitats, both terrestrial and marine, for marine turtles should be incorporated into broader biodiversity management efforts. Greater attention is needed to the development and implementation of habitat-based measures to protect and reduce adverse impacts on nesting beaches (e.g. from sand-mining) and foraging areas. Recognizing as well the importance of marine turtles and intact marine habitat for the “tourism product”, the following should be considered:
 - protected nesting beaches, including in Levera National Park, which is being impacted by tourism development;
 - enhancing habitat protection measures, including restriction/regulation of tourism and other activities near nesting beaches during the egg-laying season and vigorous enforcement of such measures, such as against vehicles driving on nesting beaches and sand-mining;
 - adopting regulations to prevent or otherwise manage leaving of nets and other debris on the beach;
 - improving coastal zone management (and monitoring) capacity, including through environmental impact assessment, particularly in relation to the construction of beach-front hotels and other tourism infrastructure and sand-mining;
 - expanding the system of protected areas; and
 - strengthening the management framework for protected areas to ensure that these areas fulfill their stated objectives
5. There is need for greater enforcement capacity and effort. This capacity should involve clearer and possibly enhanced authorities for Fisheries and other enforcement personnel and, possibly, dedicated enforcement staff. In addition, it should include training and logistical support, including a mobile enforcement unit, for both on-land and at-sea monitoring efforts. Finally, this capacity should involve outreach and other activities that will engage greater efforts on the part of police for fisheries and broader environmental enforcement. A mutually agreed set of protocols and procedures for these agencies to follow in such circumstances may be an option to consider.
6. The Government of Grenada should move forward expeditiously to enact legislation to enable full implementation and enforcement of CITES provisions, including wildlife trade controls, scientific non-detriment findings and control and monitoring, as appropriate, of stockpiles of CITES species.
7. Increased efforts should be made to engage local communities, including fishers, in marine turtle conservation and management. Fisheries extension efforts should be implemented that involve regular exchanges with fishers of information on marine turtles and their conservation and management needs and the participation of fishers in efforts to manage marine turtles so as to enhance compliance with regulations and support for marine turtle conservation. Support directed towards sustainable fishery practices and/or alternative livelihoods should be provided, as relevant and necessary, to assist fishers meaningfully in their efforts to comply with revised marine turtle regulations.
8. Financial, logistical and political support and encouragement should be extended to relevant government agencies to develop and implement a modern, scientifically based conservation and management regime for nationally depleted marine turtle stocks, including for the revision of the legal framework, scientific studies, monitoring programmes, enforcement capacity and institutional strengthening of government agencies whose mandate includes marine turtles and their habitats. Both private and public foreign investment in the fisheries and tourism sectors in Grenada should take account of the increased responsibilities—and costs—of the

Fisheries Division and other agencies in managing for sustainability the resources concerned and the broader biodiversity impacts that may ensue.

9. Community outreach and population monitoring efforts being undertaken by NGOs in collaboration with the government should be expanded through increased financial commitments from bilateral and multilateral assistance agencies. Co-management agreements between government and NGOs/CBOs, developed by consensus, are encouraged.

References

- Anon. (2002). CITES Document CoP12 Doc. 28. Working document of the 12th meeting of the Conference of the Parties, Santiago (Chile), 3–15 November 2002. Accessible at www.cites.org. Viewed 12 December 2005.
- Anon. (2004). CITES Document CoP13 Doc. 22 (Rev. 2). Working document of the 13th meeting of the Conference of the Parties, Bangkok (Thailand), 2–14 October 2004. Accessible at www.cites.org. Viewed 12 December 2005.
- Anon. (2005). CITES Document SC53 Doc. 31. Working document of the 53rd meeting of the CITES Standing Committee. Accessible at www.cites.org. Viewed 12 December 2005.
- Bacon, P.R. (1981). *The status of sea turtle stocks management in the Western Central Atlantic*. WECAF Studies No. 7. Interregional Fisheries Development and Management Programme (WECAF component), UNDP and FAO, Panama.
- Carr, A., A. Meylan, J. Mortimer, K. Bjorndal and T. Carr. (1982). *Surveys of sea turtle populations and habitats in the Western Atlantic*. NOAA Technical Memorandum NMFS-SEFC-91. US Department of Commerce.
- CCA/IRF. (1991). *Grenada: Environmental Profile*. Caribbean Conservation Association/Island Resources Foundation. St. Michael, Barbados. 276 pp.
- DOF (Division of Fisheries, Government of Grenada). (2002). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of the Marine Turtles of the Lesser Antilles, Central America, Colombia and Venezuela. Completed by Crafton Isaac, Fisheries Officer; Paul Phillip, Acting Chief Fisheries Officer; Rebecca King, Director, Ocean Spirits. Dated 2 August 2002.
- Duerden, J.E. (1901). The marine resources of the British West Indies. *West Indian Bulletin* 2.
- Eckert, K.L and S.A. Eckert. (1990). Leatherback Sea Turtles in Grenada, West Indies: a Survey of Nesting Beaches and Socio-economic Status. Report to Foundation for Field Research and Fisheries Department, Ministry of Agriculture, Lands, Forestry and Fisheries. July 1990. ii + 56 pp. Unpublished.
- FAO. (1995). Code of Conduct for Responsible Fisheries. Adopted by the 28th Session of the FAO Conference. Food and Agriculture Organization of the United Nations, Rome. 34 pp. + annexes. www.fao.org/fi/agreem/codecond/codecon.asp
- Fastigi, M. (2002). WIDECAST Sea Turtle Monitoring and Tagging Programme. Project Report: 22 May–21 October 2002. KIDO Foundation, Carriacou, Grenada. 7 pp. + data sheets. Unpublished.
- Finlay, J. (1984). National Report for Grenada. Submitted 15 February 1983. Pp. 184–196. In: P. Bacon *et al.* (Eds). *Proceedings of the Western Atlantic Turtle Symposium, 17–22 July 1983, San José, Costa Rica*, III. Appendix 7. University of Miami Press, Florida.
- Finlay, J. (1987). National Report for Grenada. 12 October 1987. Prepared for the Second Western Atlantic Turtle Symposium, 12–16 October 1987, Mayagüez, Puerto Rico. WATS2 056. 16 pp. Unpublished.
- GOG [Government of Grenada]. (2000). *Grenada Biological Diversity Strategy and Action Plan*. July 2000. iv + 48 pp. www.biodiv.org/doc/world/gd/gd-nbsap-01-en.pdf.

- GOG [Government of Grenada] and OAS [Organization of American States]. (1988). Plan and policy for a system of national parks and protected areas. Department of Regional Development, OAS. 130 pp.
- Grazette, S., J.A. Horrocks, P.E. Phillip and C.J. Isaac. (In press.) An assessment of the sea turtle fishery in Grenada, West Indies. *Oryx*.
- Groombridge, B. and R. Luxmoore. (1989). *The Green Turtle and Hawksbill (Reptilia: Cheloniidae): World Status, Exploitation and Trade*. Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Lausanne, Switzerland. 601 pp.
- Hays, G.C., J.D.R. Houghton, C. Isaacs, R.S. King, C. Lloyd and P. Lovell. (2004b). First records of oceanic dive profiles for Leatherback turtles, *Dermochelys coriacea*, indicate behavioural plasticity associated with long-distance migration. *Animal Behaviour* 67:733–743.
- Hays, G.C., J.D.R. Houghton and A.E. Myers. (2004a). Pan-Atlantic Leatherback turtle movements. *Nature* 429:522.
- Lloyd, C. and R. King. (2000). Population and regional orientation of Grenada's endangered sea-turtle stocks: a study to investigate the current status of nesting of Leatherback populations. Prepared for Ocean Spirits, Grande Anse, Grenada. 19 pp. Unpublished.
- Milliken, T. and H. Tokunaga. (1987). *The Japanese Sea Turtle Trade 1970–1986*. A special report prepared by TRAFFIC (Japan). Center for Environmental Education, Washington, DC. 171 pp.
- Rebel, T.P. (1974). *Sea Turtles and the Turtle Industry of the West Indies, Florida, and the Gulf of Mexico*, revised edn. University of Miami Press, Coral Gables. 250 pp.
- Shirley, C. (Ed.). (2002). *Turtle Lightening: Sea turtles and the People of Grenada*. Ocean Spirits and the Adventurers Club. Ocean Spirits, Inc., Grenada.
- UNEP (1996). *Status of Protected Area Systems in the Wider Caribbean Region. Country Profile for Grenada*. CEP Technical Report No. 36. UN Environment Programme Caribbean Environment Programme, Kingston, Jamaica. www.cep.unep.org/pubs/Techreports/tr36en/countries/grenada.html

Guadeloupe

Introduction

Guadeloupe is an overseas department of France comprising eight islands and numerous islets: Basse-Terre and Grande-Terre, which constitute Guadeloupe in the strict sense; Marie-Galante, located 43 km to the south of Grande-Terre; the six small islands of the Les Saintes archipelago (Terre-de-Haut and Terre-de-Bas being the only inhabited ones); la Désirade; Petite Terre; and, to the north of the archipelago, the island of Saint Barthélemy and the northern part of the island of Saint Martin (the southern part forms part of the Netherlands Antilles), both of which are surrounded by a number of small uninhabited islands. In addition to a total land area of 1806 km², the archipelago of Guadeloupe comprises an Exclusive Economic Zone of 90 000 km², of which 200 km² are barrier/fringing reef, the longest barrier reef in the Lesser Antilles (IFRECOR, 2005).

After centuries of exploitation (du Tertre, 1667–1671, cited in Chevalier, 2003), and in response to reports (e.g. Kermarrec, 1976; Claro and Lazier, 1983 and 1986, cited in Chevalier, 2003) indicating severe declines in marine turtle populations in the archipelago during the 1970s and 80s, marine turtles were completely protected in Guadeloupe under French law in 1991. In recognition of the need for more effective protection, a conservation programme for marine turtles in Guadeloupe was initiated in 1998 under the auspices of the *Direction Régionale de l'Environnement* (DIREN—the Regional Directorate for the Environment), as a collaborative effort of government agencies, NGOs and other interested parties. Co-ordination of the project and scientific oversight were the primary responsibility of the *Association pour l'Etude et la Protection des Vertébrés des Petites Antilles* (AEVA—the Association for the Study and Protection of Vertebrates of the Lesser Antilles) (Lorvelec *et al.*, 1999) until 2004, when these responsibilities were taken over by a new NGO, Kap Natirel (J. Chevalier, DIREN, *in litt.*, 15 August 2004). These activities have yielded important new information on marine turtle nesting sites, as well as on the status of and threats to these species in the archipelago. They have also laid the groundwork for the development of a marine turtle recovery plan for the French Antilles (*Plan de restauration des tortues marines des Antilles Françaises*), which is currently in draft form (Chevalier, 2003) and expected to begin implementation in 2005.

Since legal protection was afforded marine turtles in Guadeloupe in 1991, the number of turtles killed in the archipelago is thought to have greatly decreased and their status is considered to have improved (Chevalier, 2003). According to Chevalier (*in litt.*, 15 August 2004), “most (if not all)” of the fishers and scuba divers in Guadeloupe (including Saint Martin and Saint Barthélemy—Chevalier *et al.*, 2003) report a very important increase in the number of turtles observed at sea and the number of nests appears also to be on the increase; notwithstanding, experts describe as “probable” the likelihood that “certain sub-populations [of Green and Hawksbill Turtles] are threatened with extinction over the short term” (Chevalier, 2003). There is a need, both in Guadeloupe and throughout the French Antilles, for long-term, accurate monitoring of both nesting and foraging populations to confirm emerging trends.

Incidental capture of marine turtles in fishing operations is thought to be the major threat, and poaching on beaches and the destruction of nesting and feeding habitat are considered the two other major threats for their long-term survival (Chevalier, 2003; Chevalier *et al.*, 2001). However, the conservation programme under way and signs that the cultural relationship between turtles and humans in the French Antilles is in “full evolution” towards an acceptance of complete protection for these species (Chevalier, 2003) would appear to augur well for the future of these animals in the archipelago.

Summary of the status of marine turtles in Guadeloupe

Five marine turtle species occur in the waters of Guadeloupe (see table below). Knowledge of foraging populations is fragmentary (Chevalier, 2003; Pavis, 2002). The Green and Hawksbill Turtles are the most frequently encountered; they forage along the coasts, and certain sites, such as la Côte-sous-le-Vent (Basse-Terre), les Saintes, Marie-Galante, Petite Terre and Saint Barthélemy, appear to harbour particularly important densities of Hawksbill Turtles. La Côte-sous-le-Vent, les Saintes and Petite Terre appear to be especially important for Green Turtles (Chevalier, 2003). The Loggerhead and Leatherback may also forage in the offshore waters but are only seen by fishers and boaters; their principal foraging grounds are not known (DIREN, 2002). The Olive Ridley is only rarely seen (Chevalier, 2003).

Occurrence of marine turtles in Guadeloupe

English common name	Scientific name	Occurrence
Loggerhead	<i>Caretta caretta</i>	I
Green Turtle	<i>Chelonia mydas</i>	F, N
Leatherback	<i>Dermochelys coriacea</i>	F?, N
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	F, N
Kemp's Ridley	<i>Lepidochelys kempii</i>	A
Olive Ridley	<i>Lepidochelys olivacea</i>	I

Key: N=nesting; F= foraging; I=infrequent; A=absent

Three marine turtle species nest in Guadeloupe. Although some coastal zones of “continental” Guadeloupe have yet to be surveyed and information for the northern islands (Saint Barthélemy and Saint Martin) is still fragmentary, the major nesting sites over the entire archipelago have now been documented (Chevalier *et al.*, 2003; Pavis, 2002). The Hawksbill Turtle is the most common nesting species and nests on virtually all the beaches of Guadeloupe, although the major nesting sites are l’Ilet à Fajou, la Côte-sous-le-Vent, Petite Terre, les Saintes and, in particular, Marie-Galante, where the most important nesting beach for this species in the entire French Antilles—Trois Ilets—is found (DIREN, 2002; Pavis 2002; Chevalier *et al.*, 2001). Although investigations prior to 2000 had failed to report any nesting activity on Trois Ilets beach, based on partial surveys during 2000 and intensive surveys during two months of 2001, Chevalier *et al.* (2001) concluded that Trois Ilets beach “appears to host annually about 30–40 adult female [Hawksbill Turtles] and 200 nests” and noted that, if these results were confirmed through future survey work, this remnant nesting population would be of regional importance.

According to Chevalier *et al.* (2001), Green Turtle nesting is more localized on certain beaches, such as Marie-Galante, Petite Terre and in les Saintes islands, while the Leatherback nests in small numbers on the larger beaches of the archipelago, such as Clugny in Sainte Rose (Grande-Terre) and Grande Anse beach at Trois-Rivières and Souffleur beach in Port Louis (both in Basse-Terre).

Although there has been a great deal of information collected in recent years on marine turtles in Guadeloupe, knowledge of their biology and ecology in the archipelago remains limited (Lorvelec *et al.*, 1999), in particular in the north in Saint Barthélemy and Saint Martin, and the absence of historical data, in particular on nesting numbers, precludes a definitive assessment of population trends (Chevalier, 2003). However, some two decades after the reports by Meylan (1983), Kermarrec (1976, cited in Chevalier, 2003) and Claro and Lazier (1983 and 1986, cited in Chevalier, 2003) of alarming declines in marine turtles (which, in the words of Kermarrec, constituted “a veritable genocide”), there is now anecdotal evidence from divers and fishers of an “important” increase of marine turtle numbers at sea (Chevalier, 2003; Chevalier *et al.*, 2003) and personal observations and data from partial surveys of nesting beaches suggesting an increase in nesting, at least in some areas (Chevalier, 2003). The data are as yet insufficient for statistical analysis and observed increases may, in these early years of census, reflect increasing levels of effort rather than true biological realities.

Overview of the legal framework for marine turtle management

Membership in international and regional treaties

As Guadeloupe is a French overseas department, all French national environmental laws and international treaties to which France is a party apply to the archipelago. Guadeloupe also forms part of the European Union (EU). As such, most of the agreements, directives and regulations of the EU apply.

Membership of Guadeloupe in multilateral agreements relating to marine turtles

Convention	Guadeloupe
Cartagena Convention	13.11.1985 (R)
Protocol Concerning Specially Protected Areas and Wildlife (SPAW)	05.04.2002 (R)
Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region	13.11.1985 (R)
Protocol Concerning Pollution from Land-based Sources and Activities	06.10.1999 (S)
Convention on Biological Diversity (CBD)	01.07.1994 (R)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	09.08.1978 (E) [~]
Convention on Migratory Species (CMS)	01.07.1990 (E)
Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	No
MARPOL 73/78 (Annex I/II)	02.10.1983 (Ap) [*]
MARPOL 73/78 (Annex III)	02.10.1983 (Ap) [*]
MARPOL 73/78 (Annex IV)	02.10.1983 (Ap) [*]
MARPOL 73/78 (Annex V)	02.10.1983 (Ap) [*]
Convention on Wetlands of International Importance (Ramsar)	01.12.1986 (E)
UN Convention on Law of the Sea (UNCLOS)	11.04.1996 (Ds)
Western Hemisphere Convention	No
World Heritage Convention	27.06.1975 (Ac)

Key: Date of: Signature (S); Ratification (R); Declaration (Ds); Entry into force (E); Approval (Ap); Acceptance (Ac)

Notes: [~] Reservations entered with respect to *Chelonia mydas* and *Eretmochelys imbricata*; withdrawn in 1984.

^{*} with a reservation, declaration or statement.

Although the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) entered into force in France on 9 August 1978, France had entered reservations with respect to Green and Hawksbill Turtles. These remained in effect until implementation in 1 January 1984 of the European Economic Community (EEC) regulations requiring uniform application of CITES, which nullified CITES reservations of EEC Member States. France formally withdrew its CITES reservations on 10 December 1984 (Groombridge and Luxmoore, 1989).

Because of Guadeloupe's status as an overseas department of France, shipments of CITES species between the archipelago and metropolitan France or other parts of the EU are not considered international and, therefore, not covered by CITES.

Laws and regulations relating to marine turtles

According to Chevalier (2003), the first legal measures protecting marine turtles in Guadeloupe were enacted in 1960 with the *Arrêté préfectoral* (prefectoral decree) *No. 60-2067*, which prohibited the collection and sale of turtle eggs and the capture and sale of female turtles during an annual closed season of about four months, from 5 May to 15 September. These measures were expanded in 1979 via the *Arrêté préfectoral portant réglementation de l'exercice de la pêche maritime côtière dans les eaux du département de la Guadeloupe* (prefectoral decree regulating coastal maritime fishing in the waters of Guadeloupe) *No. 79-6 AD/3/3* of 26 March 1979 (Groombridge and Luxmoore, 1989; Chevalier, 2003). This law prohibited the capture or collection, sale, purchase, import/export, transport and use, for whatever purpose, of:

- eggs of all species of marine turtle;
- Leatherbacks;
- Green and Hawksbill Turtles less than 60 cm in carapace length, and all sizes during a four-month closed season from 15 May to 15 September. This closed season was extended to six months, from 15 April to 15 October, through a modification adopted on 17 August 1983 (Groombridge and Luxmoore, 1989).



Credit: WWF-Canon/Roger LeGuen

Jacques Frétey, marine turtle expert, measures the carapace of a Leatherback.

These advances in the legal framework towards greater protection for marine turtles are understood to have had little on-the-ground effect, as there appears from various reports during the 1980s (e.g. Frétey and Lescure, 1981; Frétey, 1988, cited in Chevalier, 2003; Benito-Espinal, 1987) to have been very little enforcement of existing legislation.

Marine turtles were afforded complete legal protection via the *Arrêté fixant la liste des tortues marines protégées dans le département de la Guadeloupe* (decree listing protected marine turtles in the department of Guadeloupe) of 2 October 1991. This law prohibits at all times the destruction or collection of turtle eggs and nests; and the mutilation, destruction, capture or take, taxidermy, transport, transformation,

use, sale, or purchase of either live or dead marine turtles or specimens thereof, for all six Caribbean species. In accordance with national environmental legislation, violations of this prohibition are punishable by as much as six months of prison and a fine of 60 000 French francs (FF60 000) (Chevalier, 2003), as well as confiscation of all equipment used in committing the infraction, including vehicles (DIREN, 2002).

L'Arrêté fixant la liste des tortues marines protégées sur le territoire national (the decree listing protected marine turtles in national territory) of 9 November 2000 applies throughout French territory, with the exception of Guadeloupe, Martinique and French Guiana. In addition to affording complete protection for the six of the world's seven marine turtle species that occur in French territory (i.e. excluding the Flatback *Natator depressus*, endemic to Australia), this law sets forth the terms and procedures under which certain marine turtle specimens may be held in private possession, used in manufacturing, transported, sold or purchased. These specimens are defined as: Hawksbill Turtles imported into French national territory prior to 1 January 1984 and Green Turtles imported or collected from the wild within national territory prior to 1 January 1984 that are part of declared stocks. (For Hawksbill specimens, these are those registered with the Ministry of Environment before 1 October 1993 and for Green Turtle specimens those registered with the departmental prefecture by 31 December 2001). In addition, this law sets out the terms and procedures for registering these stocks and for marking specimens that derive from these stocks. As this law does not apply to Guadeloupe, the provisions of the 1991 law remain in force.

Several additional pieces of legislation provide aspects of legal conservation and management of marine turtles in Guadeloupe. For example, the *Loi sur la protection de la nature* (Law for the protection of nature) of 1976 provides protection for flora and fauna, regulation of hunting and fishing in freshwater and protection of natural spaces (national parks and nature reserves). The *Loi littoral* of 1986 establishes protection and management of coastal ecosystems.

Guadeloupe's CITES-implementing legislation has been assessed by the CITES National Legislation Project as "believed generally to meet the requirements for implementation of CITES" (Anon., 2005).

Responsible authorities

A number of government agencies are responsible for implementation and enforcement of legislation relevant to marine turtles, namely the police, Customs and the *Office National de la Chasse et de la Faune Sauvage* (ONCFS—the National Office for Hunting and Wildlife) of DIREN. Guards in nature reserves and staff at the *Office National des Forêts* also have enforcement authority in certain areas.

Authorities for CITES implementation (e.g. for the issuance of CITES permits) in Guadeloupe (and Martinique) have been decentralized from Paris to DIREN in Guadeloupe.

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective

Chevalier (2003) provides a review of available literature on marine turtles in the French Antilles, which includes du Tertre's (1667–1671) observations from Guadeloupe of an “inexhaustible” abundance of these animals and Kermarrec's (1976) conclusion that in the French Antilles there was a “clear and present danger” that these animals would disappear unless urgent conservation measures were taken. Meylan (1983) reported that marine turtles were exploited more heavily in Guadeloupe than anywhere else in the Lesser Antilles, with the possible exception of Martinique. Claro and Lazier (1983 and 1986, cited in Chevalier, 2003) reported that “the over-exploitation of marine turtles in Guadeloupe and Martinique and neighbouring islands has led to a considerable decline in numbers of reproductive adults and juveniles” and that “according to certain turtle fishermen, their numbers may have dropped by 70% in the last 10 years”.

Carr *et al.* (1982) described the exploitation of marine turtles in Guadeloupe as “intense” and reported that fisheries statistics for Guadeloupe showed an estimated annual take of 30 t (whole animal weight, all species combined) of marine turtles for the period 1959–1976. This figure included animals taken in Saint Martin and Saint Barthélemy, although these were said to account for a small portion of the total. They observed that, “the meat and eggs of Hawksbill Turtles, Green Turtles and even Leatherbacks are relished by coastal people”. Frétey (1984) stated that the real take was almost certainly considerably higher than the reported take as there was little systematic control and monitoring of the fishery.

Meylan (1983) reported that most marine turtle exploitation in Guadeloupe was directed towards the tourism industry and that although the meat and eggs of all marine turtles were consumed, the largest market for marine turtles was as souvenirs, including stuffed turtles, polished carapaces and tortoiseshell jewellery and artifacts. She further reported that the largest producer of tortoiseshell souvenirs was the prison at Basse-Terre, where prisoners were trained to fashion them for subsequent sale on both wholesale and retail markets.

Available data on exploitation of marine turtles in Guadeloupe prior to the 1991 prohibition are considered unreliable (DIREN, 2002): no “hard” data exist on the legal fishery and any estimates made are not based on any field work (J. Chevalier, *in litt.*, 3 September 2004). However, based on the figures from a study on the legal marine turtle fishery undertaken in Martinique in the 1980s, combined with the fact that Guadeloupe covers a larger area with more good habitat for marine turtles than Martinique and reports from various expert missions, Chevalier (*in litt.*, 3 September 2004) indicates that it is certain that more than 1000 and “probably 2000 turtles” were taken annually prior to 1991.

Recent (since 1992) exploitation

Exploitation levels are thought to have greatly diminished since marine turtles were afforded complete protection in Guadeloupe in 1991 (Chevalier, 2003; DIREN, 2002). Poaching (of eggs, nesting females and juveniles and adults at sea—Chevalier, 2003) remains a major problem (DIREN, 2002; Chevalier, 2003; Chevalier *et al.*, 2003) but is thought to be at low levels (most likely no more than a few hundred) as compared with the number of

animals taken previously in the legal fishery or incidentally in current fishing operations (J. Chevalier, *in litt.*, 3 September 2003). At least some marine turtle consumption is of animals taken incidentally in fishing operations (Chevalier, 2003).

Available data on illegal exploitation derive principally from witness accounts (often reported to the authorities), as well as from some seizures, confiscations and arrests carried out by the police; these indicate that these activities are conducted by local people and aimed at local consumption, of meat and eggs, primarily of Green and Hawksbill Turtles (DIREN, 2002). Local illegal trade appears very limited in meat and virtually non-existent in eggs, turtle shells and Hawksbill shell (DIREN, 2002) and, in stark contrast to the situation prior to 1991, there is no overt marketing of marine turtle products (J. Chevalier, *in litt.*, 27 August 2004).

Although there are no estimates, poaching appears very much reduced in les Saintes islands but is the principal threat at la Désirade, in the north of Basse-Terre, and Marie-Galante (Chevalier, 2003). At Marie-Galante, there appear to be individuals specifically engaged in taking nesting turtles who regularly patrol certain beaches during the nesting season for this purpose (Chevalier, 2003). Although nesting surveys have had some success in deterring poaching on beaches, more effective law enforcement is made difficult by the fact that poachers operate principally at sea and at night and by the fact that the price on the black market for marine turtle meat is 15–30 Euros (EUR15–30)/kg and, thus, creates an incentive to engage in this activity (Chevalier, 2003).

Incidental capture of marine turtles in fisheries operations is considered a major threat in Guadeloupe and may be the most important factor limiting the recovery of marine turtles in the French Antilles (Chevalier, 2003). As such, it has been the focus of specific study in recent years. More than half of marine turtle mortalities or injuries recorded in Guadeloupe in the years 1999–2002 were attributable to fisheries interactions (Lartiges, unpubl. data in Chevalier, 2003) and findings from a recent study (Delcroix, 2003) suggest that this is the single greatest cause of marine turtle mortality, greater than all others combined, probably involving more than 1000 turtles per year (J. Chevalier, *in litt.*, 27 August 2004).

International trade

Historical perspective

The extent of international trade in marine turtles involving Guadeloupe in recent decades is not well quantified, owing to a number of complicating factors, such as: the fact that Guadeloupe itself comprises numerous islands that include Saint Barthélémy and Saint Martin; that trade amongst these islands and between these and other parts of the French Antilles and France (French Guiana to the west and metropolitan France to the east) is internal trade; and that reports by importing countries, in particular Japan (see table overleaf) have specified only the French Antilles (which include Martinique) as the origin of the products imported.

Carr *et al.* (1982) wrote, “A tourist market thrives, especially in the larger towns of Point-à-Pitre and Basse-Terre, for shells, stuffed turtles and jewellery.” Meylan (1983) reported on the heavy trade in tortoiseshell souvenirs in Guadeloupe, including on the fact that some of the tortoiseshell worked there was imported from other islands in the Lesser Antilles (i.e. probably in international trade) and that some of the tortoiseshell was exported to France (internal trade). Some of the tourist trade was undoubtedly international trade, but this trade is impossible to quantify and discernible only through records of seizures.

CITES trade statistics for the period 1976–1992 derived from the UNEP-WCMC CITES Trade Database record only these imports of marine turtle products from Guadeloupe, all to the USA: four Hawksbill carvings recorded as personal specimens and apparently allowed entry in 1980; one Green Turtle body recorded to be for personal purposes and apparently allowed entry in 1981; and one Cheloniidae carapace, seized on entry, in 1983.

According to Ottenwalder (1987), official statistics from the Dominican Republic show the export to Guadeloupe of 1519 kg of turtles during the period 1979–1983.

Japanese Customs statistics for Hawksbill shell imports do not record specific imports from Guadeloupe but, rather, sporadic imports from the French Antilles. During the period 1950–1992, a total of 2107 kg were imported into Japan. These imports took place between 1964 and 1982, beginning with 183 kg recorded in 1964, then continuing with 145 kg recorded imported in 1969 (Groombridge and Luxmoore, 1989). The table below records annual imports from 1970.

Japanese imports (kg) of Hawksbill Turtle shell, 1970–1992, from the French Antilles, as recorded in Japanese Customs statistics

Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
	266	0	0	0	0	122	152	198	276	123	196	231
Year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Total
	215	0	0	0	0	0	0	0	0	0	0	1779

Sources: Milliken and Tokunaga, 1987; H. Kiyono, TRAFFIC East Asia-Japan Office, *in litt.* to TRAFFIC International, 29 July 2002.

Recent (since 1992) international trade

There is very little evidence of international trade in marine turtles involving Guadeloupe since 1992 and of illegal trade since complete protection of these species in 1991. Although there might be some inter-island exchange of marine turtles or products, there is no credible evidence for it, suggesting that, if it exists at all, it must be at very low levels (DIREN, 2002). CITES trade statistics do not record any international trade in marine turtle products involving Guadeloupe for the period 1993–2004, inclusive, other than 83 Hawksbill and 13 Green Turtle specimens reported by the USA as having been imported for scientific purposes, in 2003.

Enforcement issues

While there has been little evidence of a continued market for marine turtles and turtle products in Guadeloupe since these species were fully protected in 1991, poaching of adults and sub-adults at sea and nesting females is considered to be a major threat to marine turtles in the archipelago (DIREN, 2002; Chevalier, 2003). However, current levels of poaching are clearly much lower than domestic levels of exploitation prior to 1991 (DIREN, 2002). Numbers of turtles at sea and on nesting beaches are thought to be increasing, although there is a need for more, more systematic, and longer-term data collection to substantiate this (Chevalier, 2003).

Chevalier (2003) indicates that beach monitoring efforts have had a positive effect in deterring poaching, particularly at night. Nest monitoring at Trois Ilets beach in 2000 recorded two Hawksbill Turtles poached from a total of 17 Hawksbill Turtles recorded, while in 2002, not a single poaching incident was recorded from 80 turtles identified on the beach. Further, the active engagement of the police in Marie-Galante (which has led to two arrests since 2000) has also helped to contain poaching. Finally, where protected areas have dedicated guards, such as in Petite Terre and in the Grand Cul de Sac Marin, this has helped to limit poaching (Chevalier, 2003).

There are not known to be stockpiles of marine turtle products in Guadeloupe (DIREN, 2002). This would appear to include the many marine turtle products that were available at the time of the 1991 prohibition and those from more recent confiscations. Although turtle shells are commonly found as decoration in homes, these are believed to date, for the most part, from the period when exploitation was legal. Most turtle shells obtained before 1991 appear to have been kept by their owners (Pavis, 2002). Because the 1991 *Arrêté* does not specifically prohibit the possession of marine turtle products, these are probably considered legal; however, the extent to which the apparently legal retention of these products serves as a loophole for continued, illegal marketing of marine turtles may merit investigation.

Marine turtle management

There has been no stock assessment in the usual sense for any species of marine turtle in Guadeloupe, and management and monitoring of the legal fishery are recognized as having been insufficient in ensuring that it did not result in a reduction of marine turtle numbers. However, following implementation of complete legal protection for marine turtles in Guadeloupe in 1991, various public awareness and outreach efforts were undertaken, including posters informing of the protection measures displayed in fishing ports, newspaper articles, radio interviews and, later, the participation of the French Antilles in the Wider Caribbean Sea Turtle Conservation Network (WIDECAST).

Active conservation efforts for marine turtles began in 1998, with the programme launched by AEVA and DIREN. The main objective of the initial phase of this programme was the collection of information and observations (e.g. on natural predation of nests, stranded turtles, turtles at sea, nesting turtles); other activities included facilitating and documenting management (e.g. enforcement) actions (Lorvelec *et al.*, 1999) and public awareness activities (Chevalier, 2003). A second phase included specific scientific studies, such as nesting beach surveys and an investigation of incidental take in fishing operations.

The marine turtle conservation programme has greatly increased the knowledge base on these animals and certain of the threats that they face and enabled the articulation of a broader suite of research and management actions in a marine turtle recovery plan for the French Antilles that is currently in draft form (Chevalier, 2003) and expected to be launched in 2005. This plan recognizes as a priority measures that most benefit the large juveniles and adult turtles that are the most important age classes for population recovery. If fully implemented, this recovery plan should yield important benefits not only for the marine turtles of Guadeloupe and the rest of the French Antilles, but also for the entire region.

Management of exploitation

Since marine turtles were afforded complete protection in 1991, exploitation of marine turtles in Guadeloupe has taken the form of incidental take in fishing operations and poaching of adults and sub-adults at sea, nesting females and turtle nests. According to Pavis (2002), poaching activities appear to be specific to certain zones of the archipelago, suggesting that, with appropriate investments of enforcement and other forms of management, they might be brought under effective control. While quantifying poaching levels is inherently difficult, if not impossible, efforts to quantify and characterize incidental mortality of marine turtles in fishing operations (e.g. by Delcroix, 2003) have led to results that suggest that these losses are greater than all others combined.

The draft marine turtle recovery plan (Chevalier, 2003) presents a range of measures to address incidental mortality and poaching, including: developing and promoting fishing gear that is less apt to catch turtles; restricting fishing at certain times or in certain areas, such as through marine reserves; more sustained and vigorous outreach efforts with fishers; and regular meetings with the different agencies involved in law enforcement, so as to exchange information and, where possible, develop collaborative efforts. It is clear that managing exploitation associated with incidental capture is a priority and will be essential to the recovery of marine turtle stocks in the archipelago.

Species research and conservation

The marine turtle conservation programme initiated in Guadeloupe in 1998 has enjoyed a range of achievements over a relatively short period of time, including the:

- establishment of a network of observers (*Réseau Tortues Marines*);
- training of project participants in marine turtle biology and conservation and the legal framework for marine turtle conservation;
- preliminary assessment—qualitative and quantitative—of marine turtle populations;
- documentation and review of threats to marine turtles;
- tagging and taking of tissue samples for genetic analyses; and
- development of a recovery plan.

Although none of the nesting beaches in Guadeloupe have been monitored thoroughly during a full nesting season and many beaches (e.g. the north of Grande-Terre) have not been surveyed for nesting activities (Chevalier *et al.*, 2001), at least three Index beaches are now monitored on a sustained basis: at Trois Ilets on Marie-Galante, regular monitoring has been under way for over three years (DIREN, 2002), while less exhaustive monitoring is undertaken at Ilet à Fajou and Petite Terre (Pavis, 2002). Numerous nesting females have been tagged in the course of these monitoring activities (Chevalier, 2003). Protocols for monitoring over the long term, in order to evaluate population dynamics of nesting turtles, are being developed.

Threats are evaluated through contacts with local people (fishers, boaters, coastal inhabitants, etc.), but no protocol has been put into place to evaluate them quantitatively. One of the conservation actions implemented by the marine turtle conservation programme organized by the staff of the Grand Cul de Sac Marin Nature Reserve has been the eradication of mongooses on Ilet à Fajou, where these animals dug up and destroyed a large portion of the turtle nests laid there (Chevalier, 2003).

The Guadeloupe Aquarium has successfully rehabilitated several Green and Hawksbill Turtles, Loggerheads and Olive Ridleys that have been found ill or injured, all of which have been released after complete recovery (Chevalier *et al.*, 2001).

Habitat conservation

There are a number of protected areas of different types in Guadeloupe, including at least one Ramsar site and a biosphere reserve, and several of these protect marine turtle nesting beaches and foraging areas. In addition, there is strict regulation of activities on much of the coastline, which is managed and protected by the French fisheries office, and this also provides for protection of numerous nesting beaches (J. Chevalier, *in litt.*, 27 August 2004). Four designated nature reserves—Petite Terre, Grand Cul de Sac Marin, Saint Martin and Saint Barthélemy (J. Chevalier, *in litt.*, 27 August 2004)—include marine turtle nesting beaches and, along with a fifth in progress, incorporate an important extent of marine habitat (Chevalier, 2003).

Chevalier (2003) emphasizes the importance of marine reserves (either no-take zones or areas where fishing is heavily restricted) and time–area closures, in particular for mitigating the incidental take of marine turtles. One such no-take zone has been established around Ilet Pigeon in Côte-sous-le-Vent and another is being planned for les Saintes; in addition, there are other areas where certain types of fishing, such as the use of bottom nets that account for a high level of incidental catch, are prohibited during different months of the year (J. Chevalier, *in litt.*, 27 August 2004).

Education and public awareness

A range of public awareness and outreach activities for marine turtle conservation have been undertaken in the past decade by government and non-governmental agencies, through the marine turtle conservation programme but also by others such as the Guadeloupe Aquarium (Lorvelec *et al.*, 1999; Chevalier *et al.*, 2001; Chevalier, 2003). Although eradicating illegal exploitation of marine turtles and eggs will necessitate a change in mentality amongst those long accustomed to using them and dedicated resources and time to affect that change (DIREN, 2002), a heightened awareness amongst the general public, which appears to be discovering turtles through these education and outreach efforts, suggests an increasing appreciation and respect for their protected status (Chevalier, 2003).

Constraints to marine turtle conservation and management

Much of what is needed for marine turtle management in Guadeloupe appears to be in place, including a legal framework that affords complete protection from exploitation as well as the protection of important sites through nature reserves and other forms of protected areas. Taking the present marine turtle programme forward, in particular in the context of the marine turtle recovery plan for the French Antilles, will necessitate significant investments of financial and human resources, with an effective and sustained co-ordinating capacity, access to scientific expertise and training opportunities and effective communication with scientists and other actors outside of the French Antilles, with whom there are currently few exchanges on environmental issues (Pavis, 2002; Chevalier, 2003). According to Pavis (2002), essential capacities that the programme requires over the long term are:

- scientific competence;
- monitoring capacity, in particular for Index beaches, which is difficult to sustain over the long term through nature reserve staff with increasingly heavy work loads;
- policy capacity, in particular to engage government agencies (municipalities, *Conseil régional*, *Conseil Général*, etc.) on relevant issues, such as coastal development projects, improving legislation regulating fishing gear, and pursuing criminal cases.

It is currently envisaged that Kap Natirel, the NGO that has taken over co-ordination of the Guadeloupe marine turtle conservation programme from AEVA, will be the lead agency in co-ordinating implementation of the recovery plan (J. Chevalier, *in litt.*, 18 August 2004). As NGOs, by their nature, rely on external funding, it is hoped that sufficient funding will be made available from government sources not only for implementation of the activities presented in the recovery plan but also for this essential co-ordinating role.

The draft recovery plan for marine turtles of the French Antilles recognizes that virtually all of the marine turtles of Guadeloupe and Martinique are likely to spend either the major part of their life or the crucial reproductive period of their life outside French territory, where they may be subject to quite different threats, and notes that, although the French Antilles may be considered as the region of highest mortalities during the 1970s and 80s, it is quite possible that the major factors limiting the recovery of these animals in the French Antilles are now localized elsewhere, such as in those countries where exploitation of these species is still permitted (Chevalier, 2003).

Summary and recommendations

Complete legal protection afforded marine turtles in Guadeloupe in 1991 ended an era of intensive, minimally regulated, rudimentarily managed and largely uncontrolled exploitation of marine turtles that is universally recognized to have caused a precipitous decline in marine turtle populations. Although continued losses from illegal exploitation and incidental mortality in fishing operations are currently considered the major threats to marine turtles, losses are believed to be lower than those of animals taken prior to 1991, and there are indications that marine turtle numbers have increased. The marine turtle conservation programme that has been under way in Guadeloupe for several years has clearly made significant strides in filling in important information gaps and elucidating threats to be addressed.

The draft recovery plan for marine turtles of the French Antilles (Chevalier, 2003) offers a comprehensive set of measures to be implemented over five years in order to: fill remaining information gaps, address the most important threats to marine turtles and assess the conservation status of different sub-populations and the impact of management measures on this status. In recognition of the fact that a lack of quantitative data on marine turtle populations in Guadeloupe prior to the late 1990s precludes a scientifically based assessment of population trends, the recovery plan includes as important components the adoption of protocols for sustained and systematic monitoring on designated Index beaches so as to establish trends and monitor them over time.

If implemented fully, this recovery plan should yield enormous benefits for the marine turtles in the French Antilles and beyond. The geographic complexity of Guadeloupe and the fact that turtles are found over a large area of both scattered islands and sea, and institutional constraints, in particular an apparently heavy reliance on NGOs, suggest a need for a much greater investment of human, financial and political resources to ensure effective and expeditious implementation of the recovery plan.

References

- Anon. (2005). CITES Document SC53 Doc. 31. Working document of the 53rd meeting of the CITES Standing Committee. Accessible at www.cites.org. Viewed 12 December 2005.
- Benito-Espinal, E. (1987). National Report for Guadeloupe. Submitted 12 October 1987 to the Second Western Turtle Symposium, Mayaquez, Puerto Rico. WATS2 070. 22pp. Unpublished.
- Carr, A., A. Meylan, J. Mortimer, K. Bjorndal and T. Carr. (1982). *Surveys of sea turtle populations and habitats in the Western Atlantic*. NOAA Technical Memorandum NMFS-SEFC-91. US Department of Commerce.
- Chevalier, J. (2003). Plan de restauration des tortues marines des Antilles Françaises. Document de Travail. Septembre 2003. Office National de la Chasse et de la Faune Sauvage (ONCFS), Direction Régionale de l'Environnement (DIREN). www.martinique.ecologie.gouv.fr/rapports.html
- Chevalier, J., E. Boitard, S. Bonbon, J. Boyer, J.M. Cuvillier, P. Deproft, M. Dulorme, F. Giougou, D. Guyader, A. Lartiges, G. Leblond, A. Levesque, O. Lorvelec, C. Pavis-Buissière, C. Rinaldi, R. Rinaldi, M. Roulet and B. Thuair. (2001). Update on the status of marine turtles in the Guadeloupean Archipelago. Poster presented at the 21st Annual Symposium on Sea Turtle Biology and Conservation, Philadelphia, USA, February 2001.
- Chevalier, J., D. Guyader, E. Boitard, F. Créantor, E. Delcroix, M. Deries, T. Deville, X. Deville, S. Guilloux, L. Nelson, C. Pavis, M. Roulet, J. Seman and B. Thuair. (2003). Discovery of an important Hawksbill Turtle (*Eretmochelys imbricata*) nesting site in the Lesser Antilles: Trois Ilets beach in Marie-Galante (Guadeloupean Archipelago/French West Indies). Pp. 279. In: Seminoff, J.A. (Compiler). *Proceedings of the 22nd Annual Symposium on Sea Turtle Biology and Conservation*. NOAA Technical Memorandum NMFS-SEFSC-503. US Department of Commerce.
- Claro, F. and C. Lazier. (1983). Les tortues marines aux Antilles Françaises. Rapport interne Guilde du Raid. 38pp.
- Claro, F. and C. Lazier. (1986). Les tortues marines aux Antilles Françaises I. Répartition Géographique. *Bulletin de la Société Herpétologique de France* 38:13–19.
- Delcroix, E. (2003). Etude des captures accidentelles de tortues marines par la pêche maritime dans les eaux de l'archipel guadeloupéen. Maîtrise des Sciences et Techniques Aménagement et Environnement à Metz. Rapport AEVA. 85pp. Unpublished.
- DIREN (Direction Régionale de l'Environnement). (2002). Response to TRAFFIC International Questionnaire Etude CITES sur l'exploitation, le commerce et la gestion des tortues marines aux Petites Antilles, en Amérique Centrale, en Colombie et au Venezuela. Completed by M. Luc Legendre, Chargé de mission biodiversité, DIREN, Basse-Terre, Guadeloupe. Dated 20 August 2002.
- Frétey, J. (1984). National Report for Guadeloupe. Submitted 1 July 1983. Pp. 197–200. In: P. Bacon *et al.* (Eds). *Proceedings of the Western Atlantic Turtle Symposium, 17–22 July 1983, San José, Costa Rica*, III, Appendix 7. University of Miami Press, Florida.
- Frétey, J. (1988). *Protection des tortues marines de Guadeloupe. Constat de la situation des espèces dans cette région et propositions faites*. Rapport Commission des Communautés Européennes. 36pp.
- Frétey, J. and J. Lescure. (1981). Présence et protection des tortues marines en France métropolitaine et d'Outre-mer. *Bulletin de la Société Herpétologique de France* 19:7–14.
- Groombridge, B. and R. Luxmoore. (1989). *The Green Turtle and Hawksbill (Reptilia: Cheloniidae): World Status, Exploitation and Trade*. Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Lausanne, Switzerland. 601pp.
- IFRECOR. (2005). La Guadeloupe: Résumé. Website of the Ministère de l'écologie et du développement durable. www.ecologie.gouv.fr/article.php3?id_article=791. Viewed December 2005.

- Kermarrec, A. (1976). Le statut des tortues dans les Antilles françaises, une révision urgente. *Nouvelles Agronomiques des Antilles de la Guyane* 2(2):99–108.
- Lorvelec, O., G. Leblond and C. Pavis. (1999). Stratégie de Conservation des Tortues Marines de l'Archipel Guadeloupéen. Phase 1: 1999. Rapport définitif: décembre 1999. Rapport AEVA N° 23. DIREN/UICN/AEVA. 15 pp. Unpublished.
- Meylan, A.B. (1983). Marine turtles of the Leeward Islands, Lesser Antilles. *Atoll Research Bulletin* 278:1–24 + figs.
- Milliken T. and H. Tokunaga. (1987). *The Japanese Sea Turtle Trade 1970–1986*. A special report prepared by TRAFFIC (Japan). Center for Environmental Education, Washington, DC. 171 pp.
- Ottenwalder, J.A. (1987). National Report for the Dominican Republic. Presented to Second Western Atlantic Turtle Symposium, 12–16 October 1987, Mayagüez, Puerto Rico. Paper WATS2 072. 53 pp. Unpublished.
- Pavis, C. Présidente, Association AEVA, Petit-Bourg, Guadeloupe. (2002). Response to TRAFFIC International Questionnaire Etude CITES sur l'exploitation, le commerce et la gestion des tortues marines aux Petites Antilles, en Amérique Centrale, en Colombie et au Venezuela. Dated 19 August 2002.
- du Tertre, R.P. (1667–1671). *Histoire Générale des Antilles Habitées par les Français*. 2 volumes. Editions Horizons, Paris.

Martinique

Introduction

The island of Martinique is an overseas department of France and the southernmost of the French Antilles. In addition to a land area of 1075 km² and 350 km of coastline, Martinique's surrounding waters incorporate somewhat less than 200 km² of coral reefs, including a barrier reef along the west coast of the island, a number of important seagrass beds and coastal mangroves. Approximately 80% of the coral reef ecosystems of the island have been degraded since 1980 (IFRECOR, 2005).

Marine turtles in Martinique, as elsewhere in the French Antilles, were intensively exploited for centuries (du Tertre, 1667–1671, cited in Chevalier, 2003). Although there is very little quantitative data on marine turtle population numbers or the numbers exploited over this time, the available literature documents concern regarding a steady and increasingly alarming decline of marine turtles as a result of this exploitation. Kermarrec (1976, cited in Chevalier, 2003) reported a “veritable genocide” of marine turtles in the French Antilles, while Lescure (1987) reported marine turtles in Martinique to be “gravely threatened” and (1992, cited in Chevalier, 2003), by the unanimous account of the fishers that he interviewed, judged them to have declined dramatically over the previous 15–20 years and to have disappeared completely from certain beaches.

All six Caribbean marine turtle species were completely protected in Martinique under French law in 1993, thus bringing to an end the legal fishery that at the time was estimated to be landing 1400 turtles per year (DIREN/ONCFS, 2002). It also ended a very lucrative trade in marine turtles and turtle products (Carr *et al.*, 1982; Chevalier, 2003). Although there are insufficient data with which to analyse quantitatively marine turtle population trends, based on the observations of divers, fishers and others, their status is considered to have improved in the past decade or so, with “important (to very important)” increases in the foraging population and “suspected” increases in the nesting population (J. Chevalier, DIREN, *in litt.*, 16 August 2004). Notwithstanding, experts describe as “probable” the likelihood that “certain sub-populations [of Green and Hawksbill Turtles] are threatened with extinction over the short term” (Chevalier, 2003).

Currently, the major threats facing marine turtles in Martinique are incidental mortality in fishing operations, illegal exploitation, and destruction and deterioration of habitat (DIREN/ONCFS, 2002). No data are available on the numbers of turtles lost to these threats, but the numbers are believed to be much lower than those taken legally during the period prior to 1993 (Chevalier, 2003).

A marine turtle conservation programme was initiated in Martinique in 1994 but ceased to operate in 1997 (Chevalier, 2003), and no programme then existed until 2002, when a local NGO, the *Société pour l'Etude, la Protection et l'Aménagement de La Nature à la Martinique* (SEPANMAR—Society for the Study, Protection and Management of Nature in Martinique), launched its marine turtle conservation efforts (J. Chevalier, *in litt.*, 16 August 2004). A marine turtle recovery plan for the French Antilles (*Plan de restauration des tortues marines des Antilles Françaises*) is currently in draft form (Chevalier, 2003) and expected to begin implementation in 2005. One component of this plan that is especially important for Martinique—for which so few reliable data exist—is the development of scientific protocols for population monitoring, designation of Index beaches and implementation of systematic population monitoring so as to establish and monitor population trends and confirm the effectiveness of existing and proposed management measures.

Summary of the status of marine turtles in Martinique

Four marine turtle species occur in Martinique (see table below). The Green and Hawksbill Turtles are the most common and forage along the entire coast, with certain sites, such as les Anses d'Arlet and the north-west, appearing to harbour particularly high densities. The Leatherback and Loggerhead are also believed to forage in the waters of Martinique but are observed only by fishers and boaters; important foraging sites for these species are unknown (DIREN/ONCFS, 2002). Carr *et al.* (1982) described the Loggerhead, typically sighted as a sub-adult or adult and "farther offshore" than the other species, as "fairly common". Bacon (1981) indicated foraging by juvenile Olive Ridleys and Chevalier (2003) cites Meylan's observation, reported in Carr *et al.* (1982), of a juvenile Olive Ridley captured at Case-Pilote in Martinique; however, he concludes from his review of the literature that the species is rare in all of the French Antilles.

Occurrence of marine turtles in Martinique

English common name	Scientific name	Occurrence
Loggerhead	<i>Caretta caretta</i>	F
Green Turtle	<i>Chelonia mydas</i>	F
Leatherback	<i>Dermochelys coriacea</i>	N, F?
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	N, F
Kemp's Ridley	<i>Lepidochelys kempii</i>	A
Olive Ridley	<i>Lepidochelys olivacea</i>	I

Key: N=nesting; F= foraging; I=infrequent; A=absent

Only two marine turtle species, the Leatherback and Hawksbill Turtle, currently nest on the beaches of Martinique. Green Turtles may have nested there as recently as 1986 (Dropsy, 1986) but nest no longer (DIREN/ONCFS, 2002). The Hawksbill Turtle is more common and is considered to nest on virtually all the beaches of Martinique, but in relatively low numbers; the principal nesting sites are Plage des Salines in Sainte Anne, the north-west beaches, such as Anse Lévrier and Anse à Voile, and Plage du Diamant, and some nesting has also been observed regularly in Schoelcher (J. Chevalier, *in litt.*, 16 August 2004). The Leatherback nests regularly in Martinique, primarily along the Atlantic coast, but in very small numbers—a few tens per year (DIREN/ONCFS, 2002).

Dropsy (1986) estimated that 56–76 and 245–375 nests were laid annually in Martinique by Green and Hawksbill Turtles, respectively, in the years 1985 and 1986. Owing to the nature of his surveys, these estimates are considered to provide a general idea of numbers rather than a precise figure. More recent surveys undertaken by the NGO *Alizé Martinique* during the period 1994–1997 provided an estimate of ca. 600 Hawksbill nests per year. These results notwithstanding, there has as yet been insufficient monitoring in Martinique to enable a credible estimate of the number of Hawksbill Turtles nesting annually on the island's beaches (Chevalier, 2003).

Chevalier (2003) cites an early report by Carr *et al.* (1982) of the recovery in Martinique of a Green Turtle that had been tagged at Tortuguero, Costa Rica and of three tags from Green Turtles that had nested at Aves Island

(Isla de Aves, Venezuela). Based on this and the results of more recent studies, he indicates that it “seems probable” that the Hawksbill and Green Turtles that forage and nest in the French Antilles form part of populations that extend across the Caribbean, including Antigua, Barbados, Puerto Rico, Tortuguero (Costa Rica), Aves Island, and Nicaragua.

Overview of the legal framework for marine turtle management

Membership in international and regional treaties

As Martinique is a French overseas department, all French national environmental laws and international treaties to which France is a party apply to the island. Martinique also forms part of the European Union (EU). As such, most of the agreements, directives and regulations of the EU apply.

Although the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) entered into force in France on 9 August 1978, France had entered reservations with respect to Green and Hawksbill Turtles. These remained in effect until implementation in 1 January 1984 of the European Economic Community (EEC) regulations requiring uniform application of CITES, which nullified such reservations. France formally withdrew its reservations on 10 December 1984 (Groombridge and Luxmoore, 1989).

Membership of Martinique in multilateral agreements relating to marine turtles

Convention	Martinique
Cartagena Convention	13.11.1985 (R)
Protocol Concerning Specially Protected Areas and Wildlife (SPAW)	05.04.2002 (R)
Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region	13.11.1985 (R)
Protocol Concerning Pollution from Land-based Sources and Activities	06.10.1999 (S)
Convention on Biological Diversity (CBD)	01.07.1994 (R)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	09.08.1978 (E) [~]
Convention on Migratory Species (CMS)	01.07.1990 (E)
Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	No
MARPOL 73/78 (Annex I/II)	02.10.1983 (Ap) [*]
MARPOL 73/78 (Annex III)	02.10.1983 (Ap) [*]
MARPOL 73/78 (Annex IV)	02.10.1983 (Ap) [*]
MARPOL 73/78 (Annex V)	02.10.1983 (Ap) [*]
Convention on Wetlands of International Importance (Ramsar)	01.12.1986 (E)
UN Convention on Law of the Sea (UNCLOS)	11.04.1996 (Ds)
Western Hemisphere Convention	No
World Heritage Convention	27.06.1995 (Ac)

Key: Date of: Signature (S); Ratification (R); Declaration of succession (Ds); Entry into force (E); Approval (Ap); Acceptance (Ac)

Notes: [~] Reservations entered with respect to *Chelonia mydas* and *Eretmochelys imbricata*; withdrawn in 1984.

^{*} with a reservation, declaration or statement.

Because of Martinique's status as an overseas department of France, shipments of CITES species between the island and other parts of the French Antilles, French Guiana and metropolitan France or other parts of the EU are not defined as international and are not covered by CITES.

Laws and regulations relating to marine turtles

Turtle eggs have been protected in Martinique since as early as 1927, but it was not until the adoption of the *Arrêté Préfectoral Martinique No. 496/PMc portant réglementation de l'exercice de la pêche côtière dans les eaux du département de la Martinique et de la protection des tortues marines* (prefectoral decree of Martinique regulating coastal fishing in the waters of Martinique and protection of marine turtles) of 19 March 1983 (Chevalier, 2003) that additional restrictions were established, namely a prohibition on taking, selling, purchasing, consuming, or using for whatever purpose:

- any turtle egg;
- Leatherbacks;
- Green Turtles;
- any other marine turtle of any size during a closed season extending from 15 April to 15 October; or
- any marine turtle smaller than 60 cm in length during the open season.

Chevalier (2003) reports that this law and a subsequent law of 17 August 1983 were not widely implemented.

Complete protection of marine turtles in Martinique was conferred through the *Arrêté fixant la liste des tortues marines protégées dans le département de la Martinique* (decree listing protected marine turtles in the department of Martinique) of 16 March 1993. This law prohibits at all times the destruction or taking of eggs or nests; and mutilation, destruction, capture or take, taxidermy, transport, transformation, use, offer for sale, sale, or purchase of either live or dead turtles or specimens thereof, of all six Caribbean marine turtle species. As provided for in article L.415-3 of the *Code de l'environnement* (Environmental Code) (Chevalier, 2003), violations of this law are punishable by a fine of 9000 Euros (EUR9000), a six-month prison term and confiscation of all equipment, including vehicles, used in committing the infraction (DIREN/ONCFS, 2002).

The *Arrêté fixant la liste des tortues marines protégées sur le territoire national* (decree listing protected marine turtles in national territory) of 9 November 2000 applies throughout French territory, with the exception of Guadeloupe, Martinique and French Guiana. In addition to affording complete protection for the six of the world's seven marine turtle species that occur in French territory (i.e. excluding the Flatback, which is endemic to Australia), this law sets forth the terms and procedures under which certain marine turtle specimens may be held in private possession, used in manufacturing, transported, sold or purchased. These specimens are defined as: Hawksbill Turtles imported into French national territory prior to 1 January 1984 and Green Turtles imported or collected from the wild within national territory prior to 1 January 1984 that are part of declared stocks. (For Hawksbill specimens, these are those registered with the *Ministère de l'Environnement* (Ministry of the Environment) before 1 October 1993; for Green Turtle specimens, those registered with the departmental prefecture by 31 December 2001). In addition, this law sets forth the terms and procedures for registering these stocks and for marking specimens that derive from these stocks. As this law does not apply to Martinique, the provisions of the 1993 law remain in force.

Several additional pieces of national legislation provide for aspects of conservation and management of marine turtles in Martinique. For example, the *Loi sur la protection de la nature* of 1976 provides for the protection of flora and fauna, regulation of hunting and fishing in freshwater and the protection of natural spaces (national parks and nature reserves). The *Loi littoral* of 1986 provides for the protection and management of coastal ecosystems.

Martinique's CITES-implementing legislation was assessed by the CITES National Legislation Project as "believed generally to meet the requirements for implementation of CITES" (Anon., 2005b).

Responsible authorities

A number of government agencies are responsible for implementation and enforcement of legislation relevant to marine turtles, namely the police, Customs and the national wildlife agency, the *Office National de la Chasse et de la Faune Sauvage* (ONCFS) of the *Direction Régionale de l'Environnement* (DIREN). Guards in nature reserves and staff at the *Office National des Forêts* also have enforcement authority in certain areas.

In so far as CITES is concerned, responsible authorities have been decentralized from the *Ministère de l'Environnement* in Paris to DIREN in Guadeloupe (J. Chevalier, *in litt.*, 16 August 2004).

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective

Marine turtles have long played an important role in the culture of the French Antilles, gastronomically as well as for traditional medicinal and analogous uses (Chevalier, 2003).

Carr *et al.* (1982) reported on the use of Green and Hawksbill Turtles in Martinique, which included local consumption of both meat and eggs and the sale of shells, jewellery and stuffed turtles. Citing fisheries statistics showing annual catches of 20–40 t (all species, whole turtle weights) for the period 1959–1976, they considered levels of exploitation of marine turtles in Martinique to be higher than anywhere else in the Lesser Antilles. FAO fisheries statistics, as reported by Groombridge and Luxmoore (1989), showed catches of "marine turtles, not elsewhere specified" in Martinique at similar levels to those reported by Carr *et al.* (1982); these totalled 397 t for the period 1974–1984.

Dropsy (1986) provided the first quantitative data on marine turtle nesting and exploitation in Martinique, including estimates of the mean annual catch of turtles in the years 1985 and 1986 of 437–529 Hawksbill Turtles and 595–685 Green Turtles, or an annual total of 1032–1214 turtles. He noted that turtles were taken while nesting (and eggs collected



Credit: Scott A. Eckert/WIDECAS

Nesting Hawksbill Turtle

opportunistically) and at sea, with large mesh tangle nets or by hand, and that perhaps 10 of the 1000 fishers in Martinique at the time of his writing specialized in catching turtles. Lescure (1992, cited in Chevalier, 2003) estimated at least 1500 turtles to be taken each year. ONCFS (DIREN/ONCFS, 2002) estimates that 1400 turtles—as many Green as Hawksbill Turtles—were taken annually in the years just prior to the 1993 prohibition.

Carr *et al.* (1982) considered the tourist trade in shell, stuffed turtles and jewellery in Martinique to be “monumental” and observed boxes-full of juvenile Hawksbill Turtles for sale in souvenir markets in Fort de France. As was the case in Guadeloupe, some Hawksbill shell was worked locally by inmates in the Fort de France prison. In addition to tourist souvenirs, live turtles and turtle meat were sold, including in local restaurants. Both Dropsy (1986) and Le Serrec (1987, cited in Groombridge and Luxmoore, 1989) reported that the prohibition on sale of turtles and turtle products during the six-month closed season was openly ignored.

Recent (since 1992) exploitation

As indicated above, the legal fishery for marine turtles operated in Martinique until March 1993 and, although few data are available, it was estimated by informed observers to involve the take of ca. 1400–1500 turtles per year. Exploitation since then has involved incidental mortality in fishing operations and poaching, primarily for meat and eggs, for local consumption. There appears to be little illegal trade in meat and virtually no illegal trade in shells or tortoiseshell. The only data available on this exploitation are first-hand accounts and reports from observers; virtually no formal data exist and there have been few, if any, seizures (DIREN/ONCFS, 2002).

It is known that a portion of the marine turtles consumed illegally have been caught incidentally in fishing operations. Although many fishers claim to release the marine turtles that are alive when captured, they often also report retaining those that have drowned in their nets, which they use for their personal consumption or sell to others (Chevalier, 2003). The tradition of turtle consumption persists in some rural areas and amongst certain fishers or older inhabitants, but appears to have sharply receded in the cities and amongst younger generations. An increase in the price for turtle meat, believed to be EUR15–30/kg, has, however, made that trade more profitable and increased the incentive to engage in it (Chevalier, 2003).

International trade

Historical perspective

There are few formal datasets on international trade in marine turtles involving Martinique and these are limited by a number of factors. Most noteworthy is the fact that trade from Martinique to other parts of the French Antilles, French Guiana and metropolitan France is domestic. While this enabled easy movement of both commercial and personal quantities of turtle products into other parts of France, it undoubtedly provided a conduit for their movement outside France to other parts of Europe, for instance. Further, based on reports of the volume of tourist souvenirs fashioned from turtles and turtle products on sale in Martinique, it seems probable that much international trade involved these souvenirs and was undetected.

CITES trade statistics derived from the UNEP-WCMC CITES Trade Database for the period 1975–1992 record two separate seizures of single carapaces imported into the USA from Martinique and the export in 1985 from Martinique to Saint Lucia of 14 carvings made from Hawksbill shell. Japanese Customs statistics on imports of

Hawksbill shell provide more insight into possible levels of international trade in marine turtles from Martinique, although these are reported as imports from the French Antilles and their origin is not specified further. These statistics document sporadic imports into Japan of a total of 2107 kg of Hawksbill shell during the period 1950–1992 (see table below).

Japanese imports (kg) of Hawksbill Turtle shell, 1970–1992, from the French Antilles, as recorded in Japanese Customs statistics

Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
	266	0	0	0	0	122	152	198	276	123	196	231
Year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Total
	215	0	0	0	0	0	0	0	0	0	0	1779

Sources: Milliken and Tokunaga, 1987; H. Kiyono, TRAFFIC East Asia-Japan Office, *in litt.* to TRAFFIC International, 29 July 2002.

There is additional evidence of international trade in marine turtles involving Martinique, namely:

- Frétey's (1984) report of statistics that he obtained from the Préfecture showing the import in 1979 of 89 kg of raw marine turtle shell and 1214 kg of polished turtle shell; and
- Ottenwalder's (1987) report of records in the Dominican Republic indicating the export to Martinique of 6332 kg of marine turtle between 1980 and 1983.

Also, Carr *et al.* (1982) reported that a shell dealer from Martinique was active in purchasing tortoiseshell for export from many other Eastern Caribbean islands. This trade is not, however, documented in CITES statistics.

Recent (since 1992) international trade

There is very little evidence of international trade in marine turtles involving Martinique since 1992. CITES trade statistics for the period 1993–2004, inclusive, record only 1994 imports into the USA of three carapaces, of two Olive Ridleys and one Green Turtle, which, although recorded as wild-collected, were apparently not seized on entry.

According to DIREN/ONCFS (2002), illegal exploitation is directed primarily for local consumption not international trade. If there is any illegal trade, it is at a very small scale, involving a few fishers and neighbouring islands. There are no specific credible data to confirm this. This is also the case with respect to any illegal imports: there are no data, but if such trade exists, it is believed to be at a very low level and not a problem for marine turtle conservation in Martinique.

Enforcement issues

Illegal exploitation of marine turtles continues in Martinique and is considered an important factor to be addressed in restoring marine turtle populations (Chevalier, 2003). This exploitation is linked to local

consumption by Martiniquais of meat and turtle eggs, and illegal trade appears to be limited in meat and very limited, even non-existent, in turtle shells and Hawksbill shell products (DIREN/ONCFS, 2002).

Although important, illegal exploitation is not considered serious relative to exploitation levels prior to the 1993 prohibition (DIREN/ONCFS, 2002). Nevertheless, in the absence of quantitative information, it cannot be known whether illegal activity is so high as to compromise marine turtle population recovery. Nature reserve status and the presence of reserve guards have helped to limit poaching at some nesting sites, such as Presqu'île de la Caravelle (Chevalier, 2003). Reducing poaching, including through increased enforcement effort, is one of the components of the draft marine turtle recovery plan for the French Antilles (Chevalier, 2003).

According to DIREN/ONCFS (2002), there are not known to be stockpiles of marine turtle products in Martinique. This would appear to include the many marine turtle products that were available at the time of the 1993 prohibition and from more recent confiscations. Although turtle shells and stuffed marine turtles are very commonly held by individuals (e.g. as decorative objects), these date for the most part from the time when exploitation was legal. Because the *Arrêté* of 1993 does not specifically prohibit the possession of marine turtle products, these are probably considered legal; however, the extent to which the apparently legal retention of these products serves as a cover for continued, illegal marketing of marine turtles may merit investigation.

Marine turtle management

Management of exploitation

Although it is believed that the legal protection conferred on marine turtles in Martinique in 1993 has afforded these animals a reprieve from the heavy levels of exploitation of the preceding centuries, the extent to which this is the case can only be determined by anecdotal evidence, such as observations of divers and fishers, as the number of animals taken illegally or killed incidentally in fishing operations is not known and cannot be estimated and no systematic, comprehensive population studies have yet been initiated. That there are so few data available on the extent of marine turtle losses to these pressures should be considered a shortcoming in management and point to the need to establish systems for recording data on enforcement-related incidents as well as incidental take and, as has been the case with incidental take in Guadeloupe, to undertake in-depth investigations to ascertain how serious a problem these pressures are. In the case of incidental take, mitigating measures can draw on some of the findings from work undertaken in Guadeloupe (Delcroix, 2003).

Species research and conservation

A marine turtle conservation programme was initiated in 1994 under the auspices of the NGO *Alizé Martinique* but ceased to operate in 1997 (Chevalier, 2003). This programme focused on two areas of activity: public awareness (primarily through print and broadcast media) and the protection of turtle nests, such as through nightly monitoring of nesting beaches and artificial incubation of eggs. An expert mission was undertaken in 1998 with the aim of identifying and articulating the measures to be implemented through a marine turtle programme (Chevalier, 2003). It was not, however, until 2002 that marine turtle conservation efforts were re-initiated, through a programme launched by SEPANMAR that has initially focused on public awareness (Chevalier, 2003) and identifying the most important nesting beaches for each species. The next step will be the development and implementation of a scientific protocol for monitoring these as Index beaches so as to discern population trends over time (J. Chevalier, *in litt.*, 16 August 2004).

While these efforts have facilitated conservation, few actions have been taken directly to reduce the impact of the principal threats (Chevalier, 2003). As mentioned above, there is a particular need to document and develop and implement techniques and other measures to mitigate incidental take of marine turtles in fishing operations (DIREN/ONCFS, 2002).

Habitat conservation

Although no areas have been protected specifically for marine turtles in Martinique, DIREN/ONCFS (2002) indicates that numerous sites of interest to marine turtles have been protected to different degrees, including no-take zones, beaches designated as nature reserves and purchased by coastal conservators or managed by the *Office National des Forêts*. Much of the coastline, for example, is strictly regulated under coastal zone legislation, thus benefiting nesting habitat (Chevalier, 2003).

No marine protected areas have yet been established in Martinique; currently, all protected areas are exclusively terrestrial. However, the implementation of time–area closures through fisheries regulations has been beneficial in reducing incidental take of marine turtles in fishing operations (Chevalier, 2003).

Chevalier (2003) notes a number of habitat-related issues affecting marine turtles in the French Antilles (such as sand-mining for construction, destruction of natural vegetation on nesting beaches, and beach fortifications) and expresses concern at the speed of marine habitat destruction, suggesting that the absence of essential developmental habitat for marine turtles may become a major problem over the medium term.

Education and public awareness

As indicated above, much of the effort oriented towards marine turtle conservation in Martinique has focused on heightening public awareness and it appears that these efforts have met with success. However, that continued, illegal exploitation of marine turtles is one of the major threats to these animals in Martinique suggests a need for continued efforts along these lines. Such efforts should address threats to habitats, recognized as an impediment to the recovery of marine turtles in Martinique.

Constraints to marine turtle conservation and management

Although DIREN/ONCFS (2002) does not consider there to be any impediment to the development and implementation of a marine turtle conservation programme in Martinique, an objective assessment suggests that some challenges do exist. While the legal framework for marine turtle conservation and management appears to be in place, there is clearly a paucity of quantitative data and overall knowledge of marine turtles and a sporadic—and only quite recent—history of marine turtle conservation efforts. The almost complete absence (DIREN/ONCFS, 2002) of data on illegal activities involving marine turtles, including seizures and other enforcement-related incidents, after a decade of complete protection suggests a need for greater enforcement effort and, in turn, for greater support for the importance of these efforts. In addition, the fact that the sole existing marine turtle conservation programme in Martinique, run through SEPANMAR, has only been operational for one year, suggests a limited capacity in Martinique to move forward the range of activities proposed in the draft recovery plan (Chevalier, 2003). It also suggests a need to provide support to and enhance, as necessary, this particular NGO's capacity to sustain and expand these efforts, in particular in co-ordinating, as is envisaged, the activities proposed in the recovery plan.

The draft recovery plan (Chevalier, 2003) recognizes that virtually all of the marine turtles of Guadeloupe and Martinique are likely to spend either the major part of their life or the crucial reproductive period of their life outside of French territory, where they may be subject to quite different threats, and notes that although the French Antilles may be considered as the region of highest marine turtle mortalities during the 1970s and 1980s, it is quite possible that the major factors limiting the recovery of these animals in the French Antilles are now localized elsewhere, such as in those countries where exploitation of these species is still permitted (Chevalier, 2003).

Summary and recommendations

Complete legal protection conferred on marine turtles in Martinique in 1993 ended centuries of intensive exploitation, which in the preceding decades was minimally regulated, rudimentarily managed and largely uncontrolled. It also brought to an end a widespread and lucrative trade in marine turtles and turtle products that extended to neighbouring islands (and, with little doubt, to mainland Europe). Although few quantitative data on marine turtle populations exist, this exploitation is universally understood to have greatly depleted marine turtle numbers and to have caused the extinction of the local nesting population of Green Turtles (J. Chevalier, *in litt.*, 16 August 2004). While marine turtle conservation efforts in Martinique have been sporadic and focused primarily on communications and public awareness, they appear to have been successful in justifying the protective measures and otherwise sensitizing the public to the importance of marine turtle conservation.

The combination of these efforts—legal protection with a public awareness campaign—are considered to have had an important positive impact on the status of marine turtles: an increase in numbers of foraging Green and Hawksbill Turtles is reported based on observations and an increase in the number of nests is “suspected” (J. Chevalier, *in litt.*, 16 August 2004). There is, however, a need to confirm these trends scientifically.

Marine turtles in Martinique currently face three major threats and an array of lesser threats. Incidental mortality in fishing operations is by far the most important factor limiting their recovery, followed by poaching and destruction and deterioration of both marine and terrestrial habitats. The draft recovery plan for marine turtles of the French Antilles (Chevalier, 2003) offers a comprehensive set of measures to address these and other issues, including: filling important information gaps; mitigating the major threats, in particular as they affect sub-adults and adult turtles; evaluating the conservation status of different sub-populations; assessing the effectiveness of management actions; and collaborating with other Caribbean States in sharing information on the results of research and monitoring initiatives and developing and implementing specific research and conservation actions. Particularly noteworthy is the development of a scientifically based population monitoring programme to establish marine turtle population trends and monitor these over time.

If implemented fully, this recovery plan should yield enormous benefits for the marine turtles of Martinique, the French Antilles and beyond. However, it should be noted that Martinique lags behind Guadeloupe, as well as many other islands in the Caribbean, in its marine turtle conservation efforts and, it would appear, in the infrastructure (e.g. protected areas, human resources) for marine turtle conservation. An apparently heavy reliance by DIREN on SEPANMAR, which launched Martinique’s only existing marine turtle conservation programme in 2002, to implement the recovery plan (J. Chevalier, *in litt.*, 18 August 2004) should be predicated on the provision of adequate and sustained funding and technical and other support so as to ensure the recovery plan’s success. Much of this support should be made available through DIREN and other government agencies.

One particular area that would appear to merit in-depth investigation in Martinique is the extent of marine turtle products held by individuals around the island. No inventory of marine turtle products appears to have been undertaken subsequent to the 1993 prohibition and, although such items are commonly seen as decorative objects and believed to pre-date the prohibition, their existence may provide a cover for more recently obtained items. In addition, although stockpiles of marine turtle products are not known to exist, it appears that there has not been any systematic effort to ascertain this. An inventory aimed at documenting the number of products legally held by individuals might be a solid first step in filling in these information gaps and laying the basis for more vigorous enforcement efforts.

References

- Anon. (2005). CITES Document SC53 Doc. 31. Working document of the 53rd meeting of the CITES Standing Committee. Accessible at www.cites.org. Viewed 12 December 2005.
- Bacon, P. (1981). *The Status of Sea Turtle Stocks Management in the Western Central Atlantic*. Western Central Atlantic Fishery Commission. WECAF Studies No. 7. Panama. 38 pp.
- Carr, A., A. Meylan, J. Mortimer, K. Bjorndal and T. Carr. (1982). *Surveys of sea turtle populations and habitats in the Western Atlantic*. NOAA Technical Memorandum NMFS-SEFC-91. US Department of Commerce.
- Chevalier, J. (2003). Plan de restauration des tortues marines des Antilles Françaises. Document de Travail. Septembre 2003. Office National de la Chasse et de la Faune Sauvage (ONCFS), Direction Régionale de l'Environnement (DIREN). www.martinique.ecologie.gouv.fr/rapports.html
- Delcroix, E. (2003). Etude des captures accidentelles de tortues marines par la pêche maritime dans les eaux de l'archipel guadeloupéen. Maîtrise des Sciences et Techniques Aménagement et Environnement à Metz. Rapport AEVA. 85 pp. Unpublished.
- DIREN/ONCFS (Direction Régionale de l'Environnement/Office National de la Chasse et de la Faune Sauvage). (2002). Response to TRAFFIC International Questionnaire Etude CITES sur l'exploitation, le commerce et la gestion des tortues marines aux Petites Antilles, en Amérique Centrale, en Colombie et au Venezuela. Completed by M. Johan Chevalier, Chargé de mission tortues marines, DIREN/ONCFS, Basse-Terre, Guadeloupe. Dated 17 August 2002.
- Dropsy, B. (1986). Tortues marines: étude préliminaire à la Martinique. Contrat WATS. ADAM, Fort de France. 18 pp. Unpublished.
- Frétey, J. (1984). National Report for Martinique. Submitted 1 July 1983. Pp. 296–299. In: Bacon *et al.* (Eds). *Proceedings of the Second Western Atlantic Turtle Symposium, 17–22 July 1983, San José, Costa Rica*, III, Appendix 7. University of Miami Press, Florida.
- Groombridge, B. and R. Luxmoore. (1989). *The Green Turtle and Hawksbill (Reptilia: Cheloniidae): World Status, Exploitation and Trade*. Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Lausanne, Switzerland. 601 pp.
- IFRECOR. (2005). La Martinique: Résumé. Website of the Ministère de l'écologie et du développement durable. www.ecologie.gouv.fr/article.php3?id_article=783. Viewed 21 December 2005.
- Kermarrec, A. (1976). Le statut des tortues dans les Antilles françaises, une révision urgente. *Nouvelles Agronomiques des Antilles et de la Guyane* 2(2): 99–108.
- Lescure, J. (1987). National Report for Martinique. Submitted 15 October 1987 to the Second Western Turtle Symposium, Mayaquëz, Puerto Rico. WATS2 085. 27 pp. Unpublished.
- Lescure, J. (1992). Conservation des Tortues Marines dans les Départements Français d'Outre-mer et en Méditerranée. Rapport final. AGEOTMG/DC XI CE. 84 pp.

- Le Serrec, G. (1987). *Importations et Commercialisations des Produits à Base de Tortues Marines en France*. Rapport TRAFFIC(France) No. 1.
- Ottenwalder, J.A. (1987). National Report for the Dominican Republic. Presented to the Second Western Atlantic Turtle Symposium, 12–16 October 1987, Mayagüez, Puerto Rico. Paper WATS2 072. 53pp. Unpublished.
- du Tertre, R.P. (1667–1671). *Histoire Générale des Antilles Habitées par les Français*. 2 volumes. Editions Horizons, Paris.

Montserrat

Introduction

The island of Montserrat, an overseas territory of the UK, lies in the Leeward Islands of the Lesser Antilles, 64 km north-west of Guadeloupe. A volcanic island totalling 102 km² in land area with 49 km of coastline, it was once heavily forested but is now very much denuded, after having been devastated by a series of eruptions between 1995 and 1997 of the Soufriere Hills volcano. The most recent eruption, in 1997, ravaged the island and caused a major exodus of the island's inhabitants. An Exclusion Zone—illegal to enter—covers the southern two-thirds of the island.



Credit: Montserrat Volcano Observatory/Government of Montserrat and British Geological Survey

The island of Montserrat, British overseas territory. An estimated 8000 refugees left the island following the resumption of volcanic activity in the late 1990s; in 1997 pyroclastic flows from the Soufriere Hills volcano killed 20 people and destroyed the south, centre and east of the island, including the main town, Plymouth, and the airport. Data on marine turtles were lost in the destruction of government offices.

Although monitoring of marine turtle populations has been under way through the Montserrat Department of Fisheries since the late 1980s and records have been kept of voluntary reports from fishers of marine turtle landings, few formal data are available on marine turtles in Montserrat, and many of the data that did exist were lost with the destruction of government offices in Plymouth, the former capital of Montserrat, in the last volcanic

eruption (Godley *et al.*, 2004). However, work by the Department of Fisheries and a range of activities undertaken as part of a three-year, UK Government-funded project, Turtles of the Caribbean Overseas Territories (TCOT), has provided important, although in many respects preliminary, findings about the status and exploitation of marine turtles in the island. Small, quite possibly remnant, nesting populations of Hawksbill and Green Turtles persist in Montserrat but are considered to be at “critically low levels,” and there is believed to be occasional nesting by Leatherbacks and Loggerheads. Less is known of the status of marine turtles foraging in the waters around the island, although Green and Hawksbill Turtles are recognized as the most numerous (Godley *et al.*, 2004).

The TCOT project also concluded that although exploitation of both nesting turtles (including turtle eggs) and foraging populations of marine turtles in Montserrat occurs at low levels, the controls on this exploitation, which are set out in legislation that dates from 1951, “do not facilitate...sustainable management”. In apparent recognition of this, the Government of Montserrat has proposed revisions to these controls in the Turtle Act 2002, which has yet to be made into law. Although these revised provisions represent a step forward for marine turtle management, such as by protecting marine turtles during the nesting season, major shortcomings persist, most notably in the retention of minimum size limits rather than adoption of maximum size limits to protect the large juveniles and adult turtles that are the most important age classes to conserve in order to maintain and recover marine turtle populations.

On the basis of these and other findings of the TCOT project, Godley *et al.* (2004) present a suite of recommendations aimed at fostering the recovery marine turtles in Montserrat. These include: amending legislation and policy to facilitate marine turtle population recovery; enhancing the capacity for marine turtle management; establishing systematic monitoring of marine turtle populations; establishing additional conservation and awareness programmes on behalf of marine turtles; designating marine and other protected areas; and enhancing standards for environmental impact assessment and other processes to inform and control development. Many of these recommendations are being taken forward through a successor project, Turtles in the UK Overseas Territories (TUKOT), which is being funded by the UK Overseas Territories Environment Programme (OTEP).

Summary of the status of marine turtles in Montserrat

Four marine turtle species have been recorded in Montserrat (see table overleaf). Green and Hawksbill Turtles are the most frequently recorded: adults and juveniles of both species are found year-round in the island’s waters, particularly off the lower south-western coast (Meylan, 1983; Jeffers, 1987). The Loggerhead and Leatherback are primarily seen offshore (Jeffers, 1987), although the former is occasionally observed inshore.

Jeffers and Meylan (1984) reported marine turtle nesting in Montserrat to be “very sparse” and “sporadic”. Although they reported little hard evidence of nesting by Green Turtles, and Meylan (1983) considered that the incidental nesting that occurred on the island could most likely be attributed to Hawksbill Turtles, field surveys undertaken in the context of the TCOT project (Godley *et al.*, 2004) have led to the conclusion that the island hosts small yet “regionally important” nesting populations of both Green and Hawksbill Turtles, with Leatherbacks and Loggerheads nesting rarely, but reportedly occasionally. Jeffers (1987) reported that nesting had been observed at a number of beaches, but that most nesting took place at Rendezvous Bay, where the beach is less accessible. The other major nesting beaches are Bunkum Bay, Woodlands, Lime Kiln and Fox’s Bay. The TCOT surveys found the most nesting at Woodlands Beach but noted that this was the most heavily monitored

of the beaches they investigated; three other key nesting beaches appeared to be Rendezvous, Fox's Beach/Bransby Point and Old Road/Iles Bay.

Occurrence of marine turtles in Montserrat

English common name	Scientific name	Occurrence
Loggerhead	<i>Caretta caretta</i>	I
Green Turtle	<i>Chelonia mydas</i>	N, F
Leatherback	<i>Dermochelys coriacea</i>	I
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	N, F
Kemp's Ridley	<i>Lepidochelys kempii</i>	A
Olive Ridley	<i>Lepidochelys olivacea</i>	A

Key: N=nesting; F= foraging; I=infrequent; A=absent

Little is known about the movements of marine turtles between Montserrat and other countries, although genetic studies initiated as part of the TCOT project and taken forward through its successor project, TUKOT, aim at clarifying this question. On 16 September 2004, an adult Green Turtle weighing 150 lb was fitted with a satellite transmitter whilst nesting at Woodlands Beach; this animal then travelled to Saint Kitts and Nevis (www.seaturtle.org/tracking/, 18 April 2005).

Overview of the legal framework for marine turtle management

Membership in international and regional treaties

As an overseas territory of the UK, Montserrat's membership in international agreements is dependent on UK membership, but membership is not automatic. Montserrat participates in several of the international environmental agreements to which the UK is party, including the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) but excluding the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, or Cartagena Convention, which the UK ratified on 28 February 1986 (see table overleaf). The UK has not ratified the Protocol Concerning Specially Protected Areas and Wildlife (SPA Protocol) under the Cartagena Convention, which it signed on 18 January 1990, nor has it acceded to the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC).

In September 2001, the UK Government and the Government of Montserrat concluded an Environment Charter as the basis for collaborative efforts in planning for and implementing biodiversity conservation and environmental management in Montserrat.

Membership of Montserrat in multilateral agreements relating to marine turtles

Convention	Montserrat
Cartagena Convention	No
Protocol Concerning Specially Protected Areas and Wildlife (SPAW)	No
Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region	No
Protocol Concerning Pollution from Land-based Sources and Activities	No
Convention on Biological Diversity (CBD)	No
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	31.10.1976 (R)
Convention on Migratory Species (CMS)	1.10.1985
Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	No
MARPOL 73/78 (Annex I/II)	No
MARPOL 73/78 (Annex III)	No
MARPOL 73/78 (Annex IV)	No
MARPOL 73/78 (Annex V)	No
Convention on Wetlands of International Importance (Ramsar)	05.05.1976 (E)
UN Convention on Law of the Sea (UNCLOS)	25.07.1997 (A)
Western Hemisphere Convention	No
World Heritage Convention	Yes

Key: Date of: Ratification (R); Accession (A); Entry into force (E)

Laws and regulations relating to marine turtles

The *Turtle Ordinance Cap. 112* of 24 September 1951, which applies to all species of marine turtle, established the following:

- a four-month closed season of 1 June to 30 September, inclusive, during which it is illegal to capture or attempt to capture, take or attempt to take, kill, buy, sell, expose for sale, or have in one's possession turtles or their eggs or meat; and
- a minimum size limit of 20 lb (nine kilogrammes) for turtles "at any time".

This Ordinance further stipulates that any public officer may arrest without warrant any individual believed "on reasonable grounds" to be committing or attempting to commit a violation of the Ordinance; that any police officer may seize any turtle or turtle product, including eggs, during the closed season and any nets or other instruments used in committing a violation; and that those found guilty of violations of the Ordinance are subject to a fine not exceeding 48 East Caribbean dollars (XCD48.00) and forfeiture of any seized turtle or turtle product or net or other instrument.

Godley *et al.* (2004) express "great concern" that the open season for exploitation of marine turtles in Montserrat overlaps significantly with the nesting season, particularly in the light of evidence that adult, potentially breeding, animals are being captured. This and other shortcomings in the legal framework appear to have long been recognized by the Government of Montserrat. As far back as 1987, Jeffers (1987) indicated that the legislation was to be revised to: increase the minimum weight to 30 lb and extend the closed season to six months; prohibit the removal of any turtle egg or interference with a turtle nest; prohibit interference with a turtle while on land

except for research purposes; prohibit the import and export of turtle parts; and increase the penalty from XCD40 to XCD500. In addition, he noted, a moratorium on the taking of turtles was being considered, as was protection of certain nesting beaches from sand-mining. Over the next 15 years, the Government of Montserrat drafted revised legislation—the Turtle Act 2002—but this has not yet made it into law. This revised legislation completely protects turtles on land, including their nests; extends the closed season for capture, killing, sale, purchase and possession of marine turtles to nine months, from 1 March to 1 December; and increases the minimum size limit of turtles to 50 lb (22.68 kg). In addition, this draft legislation increases the fine for violations of the laws protecting turtle eggs to XCD5000 or three months' imprisonment.

The *Endangered Animals and Plants Ordinance No. 10, 1976 amended No. 19, 1982* is the enabling legislation for CITES. All marine turtle species are listed in Schedule 1 of this Ordinance and, therefore, the import and export of live and dead marine turtles are specifically prohibited. This Ordinance also states that the import and export of articles listed in Schedule 3 are prohibited. Schedule 3 includes “the shell and scales, whether unworked or simply prepared but not if cut to shape, the waste of the shell and scales, and the claws of any animal of the family Cheloniidae” and, thus, is interpreted by Godley *et al.* (2004) as not prohibiting the import or export of turtle products that are cut to shape (e.g. tortoiseshell jewellery). Montserrat's CITES-implementing legislation was assessed by the CITES National Legislation Project as “believed generally not to meet all requirements for the implementation of CITES”. It has been assigned a deadline of 30 September 2006 by which to enact adequate legislation, and progress towards this end will be reviewed at the 54th meeting of the CITES Standing Committee in October 2006 (Anon., 2005).

The Convention on Migratory Species (CMS) is implemented in Montserrat through the *Convention on Migratory Species of Wild Animals Ordinance 1985* (JNCC, 1999).

Responsible authorities

The Ministry of Agriculture, Lands, Housing and Environment has statutory responsibility for natural resource conservation in Montserrat. The Division of Forestry is responsible for terrestrial resources and the Division of Fisheries for marine resources. The Montserrat National Trust was established under the *Montserrat National Trust Ordinance (No. 11, 1969)* to promote the conservation and enhancement of the island's natural and historical resources and to increase the level of environmental awareness in government and among the general public. Although it functions as an NGO, it receives some funding from the government and falls under the administration of the Ministry of Agriculture (Anon., 1993).

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective

There does not appear to be a great deal of information available on marine turtle exploitation in Montserrat. Godley *et al.* (2004) cite evidence reported by Steadman *et al.* (1984) of Hawksbill Turtle exploitation by the Saladoid culture, established in the Lesser Antilles some two thousand years ago. Rebel (1974) reported that the turtle “industry” in the island was irregular, but in 1948, 12 turtle nets were in use in the northern district and four

at Plymouth, with fishing carried out from April to November, the months of calm weather. Seventy turtles were landed at Plymouth during 1948, but no statistics were available from the northern district.

Jeffers and Meylan (1984) reported that, at the time of their writing, there were several landing sites for Green and Hawksbill Turtles and four to five turtle nets were still in use, along with spear guns, which Meylan (1983) noted were increasingly in use, particularly among young divers. However, no one was exclusively dependent on turtles for their livelihood. Subsequently, Jeffers (1987) reported that turtles were caught in the water with spear guns, gill nets and turtle nets and while nesting, but at that time, there was only one turtle net operating on the island and Jeffers wrote that “there [had] been a dramatic decline in the availability of carapaces offered for sale”. In addition, he indicated that, in 1986, nine turtles were recorded as captured—five from Corr’s Bay, three from Plymouth and one from Fox’s Bay—but, based on other reports, as many as 15 might have been caught intentionally; at least two of the turtles caught were egg-bearing females. In addition, there were incidental catches of turtles in gill nets, which resulted in the taking of some juveniles.

Meylan (1983) and Jeffers and Meylan (1984) reported on use of turtles in Montserrat, indicating that the main commodities were meat (Green Turtle being preferred) and shell products, including polished carapaces of Green and Hawksbill Turtles and tortoiseshell jewellery, an unknown proportion of which was sold as souvenirs in local shops (Jeffers and Meylan, 1984). Meylan (1983) also noted the production of turtle oil. Meylan (1983) provided information on domestic trade: turtle meat was usually sold privately, although, during the open season, it could be found at the public market and in restaurants in Plymouth; there was an active trade in turtle curios and almost all the tourist shops in Plymouth, and even some bars, sold polished Green Turtle and Hawksbill carapaces, most of which were from juvenile or sub-adults; some tortoiseshell was worked locally, including by prisoners at the local gaol, and sold in local shops. In 1980, tortoiseshell was selling for 13 US dollars (USD13)/kg. By 1983, however, this latter trade was considered to have declined, possibly as a result of the US ban on imports of turtle products.

Jeffers (1987) reported that there were still “problems regarding the closed season” and that, on one occasion, one offender was found with 30 fully mature eggs and 254 immature eggs; these were seized, but the offender was not prosecuted “because of the low penalty of EC\$48.00”.

Recent (since 1992) exploitation

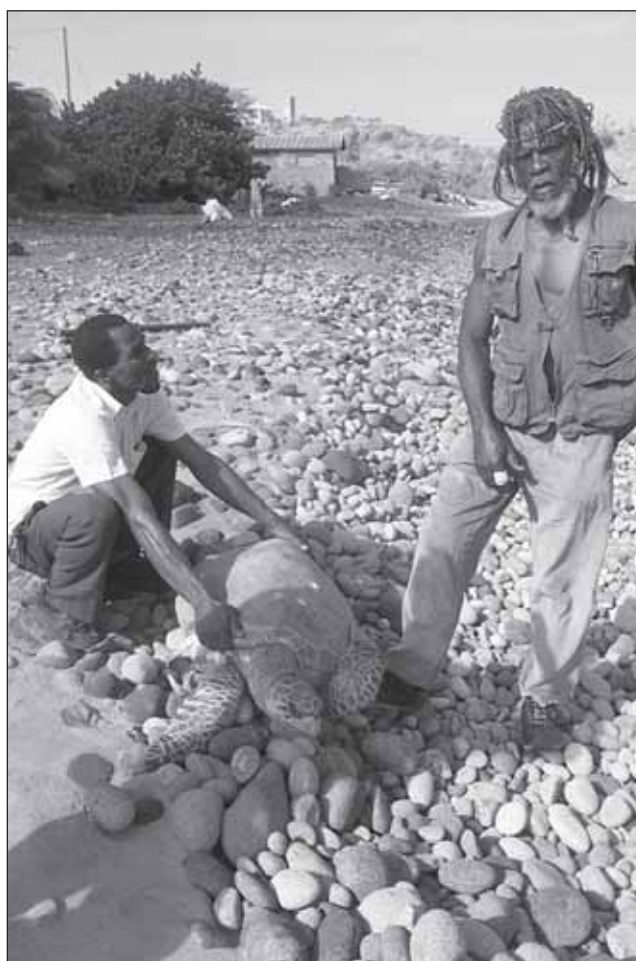
Marine turtles continue to be legally exploited in Montserrat during eight months of the year. Actual numbers are believed to be low but are unknown. Only 10 individual turtles (one Green, Turtle, seven Hawksbill Turtles, two unspecified) were (voluntarily) reported to the Department of Fisheries as having been captured during the period 1993–2003. However, popular accounts and the results of the socio-economic survey conducted in the context of the TCOT project suggest that this low level is an artifact of significant under-reporting and that clandestine exploitation is conducted during the closed season. Godley *et al.* (2004) estimate that the total marine turtle catch is “likely to be” between 10 and 30 animals per year, with an additional one or two nesting females taken annually—and very opportunistically—from nesting beaches (J. Jeffers, Montserrat Department of Fisheries, pers. comm., 2004). In addition, turtle eggs are collected, including illegally during the summer months of the closed season, but the number of nests taken is believed to be small, possibly around five to 10 per year (Buley, 2001, cited in Godley *et al.*, 2004).

The TCOT socio-economic survey included interviews with three fishers who continue to capture turtles, two who do so opportunistically and one who does so more purposefully. Two of these stated a preference for Green Turtles; all three use spear guns. Rates of capture were reported to be low (between one and five turtles per season) and the only fisher who offered an assessment of economic importance ranked turtle fishing as not important. Only one fisher reporting selling the meat—directly to the consumer—at a price of XCD5/lb. Godley *et al.* (2004) also report having observed turtle meat on sale occasionally at one and possibly two restaurants, but this seemed to be on an “*ad hoc*” occasional basis and very much for local consumption”.

Godley *et al.* (2004) report that “it is thought” that the turtle fishery in Montserrat has declined “significantly” in magnitude since the extensive emigration from the island in recent years: all but one meat consumer interviewed as part of the TCOT socio-economic survey

believed that the availability of turtle meat had decreased in the past five years and since they could remember. Similarly, there appears to have been a marked decline in the sale of polished shells and worked items: Godley *et al.* (2004) found no marine turtle shell products on sale during recent field visits, although they were shown examples by local people. Neither of the two artisans who were once involved in the turtle shell industry (and who could be traced for an interview) makes turtle shell products any longer, as there is no local demand. Others involved in the industry appear to have emigrated from Montserrat as a result of the recent volcanic eruption.

Finally, Godley *et al.* (2004) confirm from interviews that there is some incidental capture of marine turtles in the course of other, artisanal fishing operations. Gill nets are the most likely gear to catch turtles. Turtles were released in the closed season but landed (for use, sale or gift) during the open season (depending on the state of the turtle).



Credit: J. Jeffers, Montserrat Department of Fisheries

Recording a turtle capture with a fisherman, Montserrat

International trade

Historical perspective

There is little evidence of international trade in marine turtles or turtle products involving Montserrat. Rebel (1974) reported the export in 1948 of shell “valued at 96 dollars,” representing ca. 100 lb, to the Leeward Islands.

Montserrat was included in the UK’s CITES ratification, yet CITES trade statistics derived from the UNEP-WCMC CITES Trade Database record the export of only a single turtle carapace for the years 1975–1992, seized on entry into the USA in 1987. No imports of Hawksbill shell from the island were recorded in Japanese Customs statistics during the years up to 1993, when Japan closed that import market (Milliken and Tokunaga, 1987; H. Kiyono, TRAFFIC East Asia-Japan Office, *in litt.* to TRAFFIC International, 29 July 2002).

Recent (since 1992) international trade

There is very little evidence of international trade in marine turtles from Montserrat, the only documented trade being of scientific specimens exported to the UK, presumably as part of the TCOT project. CITES trade statistics for the period 1993–2004, inclusive, record these as 50 specimens each of Green Turtle, Hawksbill Turtle, Loggerhead and Leatherback, exported in 2004.

Enforcement issues

Jeffers and Meylan (1984) reported that the closed season was fully enforced but that the size limit and taking of eggs were not fully enforced. Results from Godley *et al.* (2004) indicate that there is still some illegal take of eggs during the closed season but little evidence of other illegal activity. Given the relatively few legal restrictions on marine turtle exploitation and use in Montserrat, this latter finding is not surprising. The extent to which illegal activity is compromising the potential for stock recovery is unknown.

Marine turtle management

Management of exploitation

Management of marine turtle exploitation in Montserrat consists only of a four-month closed season, minimum size limits and voluntary reporting of turtles taken, a regime that has been unchanged for over 50 years. There are numerous problems with this regime, not the least of which is its failure to take account of major advancements in marine turtle conservation biology that were made decades ago. These findings emphasize the importance of protecting large juvenile and adult marine turtles in order to promote population recovery and maintenance most effectively. The few restrictions in place in Montserrat have targeted exploitation on the age classes that marine turtle populations can least afford to lose: the minimum size limit protects only young turtles, and the eight-month open season that extends from 1 October to 31 May allows the capture of nesting turtles in October and November and the capture of female turtles arriving in Montserrat’s waters to mate in May, prior to nesting in June.

As noted above, Jeffers (1987) reported on revisions that were under consideration in Montserrat to improve the management of marine turtles, but have not been enacted. Several years later, the Montserrat Environmental Profile (Anon., 1993) recommended the establishment of a moratorium on exploitation of all marine turtle species for an initial period of five years or until data on nesting frequency could be collected and a monitoring programme put in place. Godley *et al.* (2004) provide details of the proposed Turtle Act 2002, which addresses some of the shortcomings in the legal framework but requires significant revisions if it is to meet “best practice” standards for managing the exploitation of marine turtles. In addition to recommending specific revisions to the Turtle Act 2002, Godley *et al.* (2004) rightly point to the need for “any continuing turtle fishery [to] be accompanied with systematic monitoring regimes...along with a programme to monitor the Catch per Unit Effort of licensed fishers and biometrics of turtle catch”.

Species research and conservation

Until recently, there has been little research undertaken on marine turtles in Montserrat and few specific conservation efforts. Marine turtle monitoring has been under way in Montserrat since studies in the 1980s (e.g. Jeffers and Meylan, 1984 and Meylan, 1983) and included tagging efforts initiated in 1987 (Jeffers, 1987). However, almost all relevant data were lost along with many government records in the destruction of Plymouth by volcanic activity in 1997 (Godley *et al.*, 2004).



Credit: Montserrat Volcano Observatory/Government of Montserrat and British Geological Survey.

Plymouth, one-time capital of Montserrat, is buried by mudflows, August 1997

The Fisheries Department has been co-ordinating daytime monitoring of the island’s beaches for turtle activities since 1999 and, although some of the work has been conducted by volunteers, the Department (J. Jeffers) has



Credit: TCOT

Turtlewatch poster. Such posters were given to dive operators in Montserrat, to assist them with encouraging recreational divers and snorkellers to participate in a programme to gather data on the in-water abundance of marine turtles. Limited, yet useful data were collected by the programme.

conducted most of this work. These efforts were assisted and expanded (e.g. to include night-time monitoring and data collection on nesting turtles) as part of the three-year TCOT project that was initiated in 2002 and conducted by the UK Marine Turtle Research Group, Marine Conservation Society and collaborators with funding from the UK Government (Godley *et al.*, 2004). In addition, nesting turtles were tagged: nine Hawksbill Turtles (eight in 2002 and one in 2003) and 13 Green Turtles (11 in 2002 and two in 2003).

Owing to personnel and logistical constraints, no in-water monitoring of marine turtles has been carried out in Montserrat other than the recording of marine turtle capture data (Godley *et al.*, 2004). A questionnaire survey of divers and snorkellers was undertaken during January–September 2003 as part of the TCOT project in an effort to discern the abundance of foraging turtles.

The TCOT project, completed in 2004, has laid the basis for future research and conservation efforts in Montserrat, much of which is being taken forward by the TUKOT project, which is being funded by OTEP, administered by the UK Government. One follow-up activity has been the satellite-tracking of a nesting female Green Turtle from Montserrat, as mentioned earlier in this chapter.

Habitat conservation

Jeffers (1987) reported that the loss and degradation of marine turtle nesting habitat were, in addition to exploitation, affecting turtle populations in Montserrat. The Montserrat Environmental Profile (Anon., 1993) identified “unregulated removal of sand and vegetation” as having increased the rate of coastal erosion and elevated risks of storm damage and reported that, despite the limited boating industry, anchor damage, especially to seagrass beds, was said to have increased in recent years. Godley *et al.* (2004) note that the quality of Montserrat’s beaches as marine turtle nesting habitat appears to be naturally poor and ash deposits from volcanic activity can periodically render them less suitable, or wholly unsuitable, for nesting. In that light, they point to the need for expanded efforts to protect nesting beaches from the adverse effects of beach-front development and for greater attention to the needs of marine turtles in beach management of activities, such as beach sediment extraction projects that have been carried out in support of the island’s reconstruction.

There are currently no marine protected areas in Montserrat.

Education and public awareness

Jeffers (1987) reported on some of the activities that had been undertaken by the Department of Fisheries to increase awareness of marine turtles; these included radio programmes, posters, and efforts to engage certain stakeholder groups, such as local turtle fishers. The Montserrat National Trust has also featured marine turtles in awareness-raising materials, although none of their staff is actively involved in marine turtle work, and the TCOT project incorporated several activities aimed at increasing awareness of and appreciation for marine turtle and broader biodiversity conservation issues (Godley *et al.*, 2004). A variety of scientific and technical resources, as well as education and outreach materials (e.g. species identification sheets, a narrated slide show, classroom curriculum tools, posters and leaflets), have been made available through Montserrat's affiliation with the Wider Caribbean Sea Turtle Conservation Network (WIDECAST).

Constraints to marine turtle conservation and management

The devastation and disruption brought on by the volcanic activity of the late 1990s and the naturally dynamic, erosion-prone beaches of the island are among many constraints to marine turtle conservation and management in Montserrat. The Department of Fisheries, which is the primary agency responsible for marine turtles, currently has a staff of four and access to road vehicles but no marine vessel, such that marine surveillance is possible only occasionally through the use of a police launch. Hence, the Department's ability to enforce the relevant laws, conduct research and monitoring, and discharge other resource management responsibilities are compromised by "an extreme shortage of staff, equipment, and a very limited budget" (Godley *et al.*, 2004). Compounding this problem are the difficulties caused by an inadequate legal framework, insufficient knowledge of the marine turtle populations that occur there, lack of awareness, and the absence of systems to support sustainable management. It is in this light that Godley *et al.* (2004) identify increasing capacity—of the Government of Montserrat, the Montserrat National Trust and biodiversity stakeholder groups—as an essential element in facilitating the recovery of the island's marine turtles.

Summary and recommendations

There has been no systematic population monitoring of marine turtle populations in Montserrat until very recently and there has been no systematic monitoring of legal or illegal marine turtle exploitation. Hence, overall numbers and trends over time are unknown. Although exploitation of marine turtles in Montserrat is thought to be at low levels, nesting marine turtle populations are judged to be at "critically low levels", while the status of foraging turtle populations is unknown. The framework in place in Montserrat for the legal exploitation of marine turtles, as stipulated in the fisheries regulations for turtles, targets large juvenile and adult turtles, which would include nesting females at the extremes of the open season, and the illegal take of turtles and eggs persists at unknown levels. Because large juvenile and adult turtles are the most important age groups of the population to protect in order to maintain population numbers and promote population recovery, the regulatory regime is likely to have facilitated rather than stemmed population declines.

In accordance with the FAO Code of Conduct for Responsible Fisheries (FAO, 1995), an explicitly precautionary code, which states that "the right to fish carries with it the obligation to do so in a responsible manner so as to ensure effective conservation and management of the living aquatic resources", the management of marine turtle resources in Montserrat should seek to maintain the availability of the resource "in sufficient quantities for

present and future generations in the context of food security, poverty alleviation and sustainable development”. Management measures should, *inter alia*, prevent over-fishing, rehabilitate depleted populations, incorporate the best scientific evidence (taking into account traditional knowledge, as well as relevant environmental, economic and social factors), assign priority to research and data collection (including at international scales) and promote environmentally safe fishing gear and practices in order to protect both the target resource and the ecosystems upon which it depends.

Among the fundamental components of any regime aimed at management of wild populations are: restrictions on exploitation that are consistent with the species’ biological requirements; a monitoring programme—systematic, sustained, and rigorous collection and review of data—either on the specifics of exploitation or of wild populations so as to discern trends that can inform management; mechanisms to identify, monitor and address other threats to the species being exploited, so that these threats can be factored with exploitation to assess what level of overall mortality the species might sustain; and a high level of compliance (sometimes achievable only through vigorous enforcement) with the restrictions put in place to ensure that management goals are achieved.

It is noted that the Government of Montserrat, in particular the Department of Fisheries, has been remarkably dedicated and persistent in its attempts to monitor nesting populations, identify priority threats, quantify levels of legal and illegal harvest, involve the fisher community in marine turtle management (e.g. encouraging voluntary reporting) and facilitate public awareness of the issues. It is also noted that discussions are under way in Montserrat regarding a revision in the regulatory framework for marine turtle management. These efforts are encouraged—and encouraged to move forward expeditiously and to take note of the conclusions and recommendations set out below.

1. Although statistical trends cannot be known in the absence of baseline data, there is nothing to suggest that there has been anything but a downward trend in the numbers of marine turtles in Montserrat. The management regime in place for more than 50 years has targeted juvenile and adult turtles and has not included systematic monitoring of the fishery or of target populations. As such, the regime falls short of what would be considered consistent with the principles of sustainable use and does not serve as a rational basis for continuing a legal fishery.
2. Based on existing information pointing to a decline in the fishery that quite possibly results from depleted foraging populations, the admittedly inadequate national capacity for enforcing a regime of open and closed seasons, and the notably small number of fishers participating in the fishery (who consider it not of economic importance), a moratorium on the capture of marine turtles should be seriously considered. This is consistent with the 1993 Montserrat Environmental Profile, which recommended the establishment of a moratorium on exploitation of all marine turtle species for an initial period of five years or until data on nesting frequency could be collected and a monitoring programme put in place, and with discussions that were reportedly under way almost 20 years ago.
3. If any legal exploitation is to continue, the restrictions on this exploitation should reflect the biological parameters of marine turtles, take into account their depleted status and aim, at a minimum, at preventing any further population declines. Any exploitation regimen promoting population recovery and maintenance should be established and conducted according to sound management principles and practice, which should include the following:

- A. Bringing exploitation in line with biological principles, including:
- complete protection of nesting females, their eggs and young at all times;
 - complete protection of all species during the primary nesting season, 1 March to 30 November;
 - complete protection of the Leatherback, which occurs in the country only as an adult, and typically an egg-bearing female;
 - maximum size limits, based on length (which is easier to undertake in the field) rather than weight, so as to safeguard large juveniles and adults;
 - a conservative limit on the numbers of animals that may be exploited, based on a scientific stock assessment; and
 - a requirement that capture quotas be based, if not on stock assessment, on data derived from national processes and research activities, and that, as far as practicable, these data be collected in such a way as to be compatible with the goal of assessing stocks throughout their full geographic ranges.
- B. Managing the legal fishery through an enforceable, high-compliance monitoring programme aimed at establishing trends and monitoring these over time. A national programme to monitor marine turtle exploitation should document comprehensively and systematically, and in a manner allowing such records to be analysed and compared over time, the following:
- the number of fishers taking marine turtles and by what means;
 - the number, size and species distribution of the marine turtles landed;
 - the localities where turtles were taken;
 - catch-per-unit effort; and
 - the disposition of the marine turtles landed, including value of the animal and/or products if sold or traded.
- In further support of reliable monitoring of the fishery, the following should be considered as requirements for participation:
- that ownership identification tags be installed on approved gear (e.g. nets)
 - that turtles be landed alive or intact; prohibiting, for example, the use of spear guns and extended net sets that can result in drowning, and providing for reliable recording and verification of turtle landings; and
 - that the licensing process include as a criterion full participation in the monitoring programme.
- C. Establishing a systematic marine turtle monitoring programme that will:
- document distribution and abundance of local populations;
 - identify major nesting grounds and foraging areas;
 - designate Index nesting beaches and Index foraging grounds, and document the numbers of marine turtles occurring in these over time;
 - manage data records such that statistically significant trends in abundance can be identified and inform management; and
 - identify and monitor threats and other factors influencing marine turtle survival.
4. Mechanisms to quantify levels of incidental catch of marine turtles should be developed. Measures to reduce or eliminate incidental catch of marine turtles, such as through time–area closures and/or alternative (especially to gill nets) types of gear, should be implemented.

5. Critical habitats, both terrestrial and marine, should be identified and protected, and incorporated into broader biodiversity management programmes. The government should consider:
 - expanding the number of protected nesting beaches;
 - enhancing habitat protection measures, including restriction/regulation of tourism and other activities near nesting beaches during the egg-laying season and vigorous enforcement of such measures, such as against vehicles driving on nesting beaches and sand-mining;
 - adopting regulations to prevent or otherwise manage leaving of nets and other debris on the beach;
 - improving coastal zone management (and monitoring capacity), including through environmental impact assessment, particularly in relation to sand-mining and beach-front construction;
 - expanding the system of protected areas; and
 - strengthening the management framework for protected areas to ensure that these areas fulfill their stated objectives.
6. There is a need for greater enforcement capacity and effort. This capacity should involve clearer and possibly enhanced authorities for Fisheries and other enforcement personnel, and, possibly dedicated enforcement staff. In addition, it should include training and logistical support, including a mobile enforcement unit, for both on-land and at-sea monitoring efforts. Finally, this capacity should involve outreach and other activities that will engage greater efforts on the part of police for fisheries and broader environmental enforcement. A mutually agreed set of protocols and procedures for these agencies to follow in such circumstances may be an option to consider.
7. Increased efforts should be made to engage local communities, including fishers, in marine turtle conservation and management. Fisheries extension efforts should be implemented that involve regular exchanges with fishers of information on marine turtles and their conservation and management needs and the participation of fishers in efforts to manage marine turtles so as to enhance compliance with regulations and support for marine turtle conservation. Support directed towards sustainable fishery practices and/or alternative livelihoods should be provided, as relevant and necessary, to assist fishers meaningfully in their efforts to comply with revised marine turtle regulations.
8. Increased and sustained funding, including through UK and multilateral assistance agencies, should be provided to improve fisheries management, including stock assessments of relevant species (marine turtles, reef fishes, etc.), establishment of monitoring programmes, increased capacity for fisheries agencies, and greater and more effective enforcement capacity. Both private and public foreign investment in the fisheries sector in Montserrat should take account of the increased responsibilities—and costs—of the Department of Fisheries in managing for sustainability the resources concerned and the broader biodiversity impacts that may ensue.
9. Financial, logistical and political support and encouragement should also be extended to active research by NGOs, conservation, monitoring and public outreach efforts. Partnerships between the government and relevant NGOs should benefit from increased financial commitments on the part of bilateral and multilateral assistance agencies; co-management agreements, developed by consensus, are encouraged.
10. Consistent with Godley *et al.* (2004), this report recommends that the *Endangered Animals and Plants Ordinance, 1976* should be revised to prohibit commercial import and export of wild turtles and all wild turtle products of all marine turtle species, so that this legislation fully transposes CITES to domestic law.

References

- Anon. (1993). *Montserrat Environmental Profile*. Prepared for the Government of Montserrat with the technical support of Island Resources Foundation and assistance of the Montserrat National Trust. United Nations Development Programme Project no. MOT/92/002/A/01/99. x + 124 pp.
- Anon. (2005). SC53 Summary Record. Official report of the 53rd meeting of the CITES Standing Committee. Accessible at www.cites.org. Viewed 12 December 2005.
- Buley, K.R. (2001). *Montserrat Mountain Chicken Population and Habitat Assessment and a Preliminary Assessment of the Other Herpetofauna of Montserrat*. Herpetology Department, Durrell Wildlife Conservation Trust. 26 pp.
- FAO. (1995). Code of Conduct for Responsible Fisheries. Adopted by the 28th Session of the FAO Conference. Food and Agriculture Organization of the United Nations, Rome. 34 pp. + annexes. www.fao.org/fi/agreem/codecond/codecon.asp
- Godley, B.J., A.C. Broderick, L.M. Campbell, S. Ranger, P.B. Richardson. (2004). An assessment of the status and exploitation of marine turtles in Montserrat. Pp. 155–179. In: *An Assessment of the Status and Exploitation of Marine Turtles in the UK Overseas Territories in the Wider Caribbean*. Final project report for the Department of Environment, Food and Rural Affairs and the Foreign and Commonwealth Office. 253 pp. www.seaturtle.org/mtrg/projects/tcot/finalreport
- Jeffers, J. (1987). Report for Marine Sea Turtle Survey in Montserrat 1986–1987. 12 October 1987. Prepared for the Second Western Atlantic Turtle Symposium, 12–16 October 1987, Mayagüez, Puerto Rico. WATS2 059. 15 pp. Unpublished.
- Jeffers, J. and A.B. Meylan. (1984). Western Atlantic Turtle Symposium National Report for Montserrat. Submitted 24 May 1983. Pp. 322–328. In: P. Bacon *et al.* (Eds). *Proceedings of the Western Atlantic Turtle Symposium, 17–22 July 1983, San José, Costa Rica*, III, Appendix 7. University of Miami Press, Florida.
- JNCC (Joint Nature Conservation Committee). (1999). *Biodiversity: the UK Overseas Territories*. Compiled by S. Oldfield. Edited by D. Procter and L.V. Fleming. Joint Nature Conservation Committee, Peterborough, UK.
- Meylan, A.B. (1983). Marine turtles of the Leeward Islands, Lesser Antilles. *Atoll Research Bulletin* 278:124 + figs.
- Milliken, T. and H. Tokunaga. (1987). *The Japanese Sea Turtle Trade 1970–1986*. A special report prepared by TRAFFIC (Japan). Center for Environmental Education, Washington, DC. 171 pp.
- Rebel, T.P. (1974). *Sea Turtles and the Turtle Industry of the West Indies, Florida, and the Gulf of Mexico*, revised edn. University of Miami Press, Coral Gables. 250 pp.
- Steadman, D.W., D.R. Watters, E.J. Reitz and G.K. Pregill. (1984). Vertebrates from archaeological sites on Montserrat, West Indies. *Annals of the Carnegie Museum* 53:1–29.

Netherlands Antilles: Bonaire, Curaçao, Saba, Sint Eustatius, Sint Maarten

Introduction

The Netherlands Antilles comprises five islands: the Leeward Islands of Curaçao and Bonaire, which lie close to the coast of Venezuela, and the Windward Islands of Sint Maarten (which shares its island with Saint Martin, part of the French overseas department of Guadeloupe), Sint Eustatius and Saba. The island of Aruba, lying west of Curaçao, formed part of the Netherlands Antilles until 1 January 1986, when it acquired a *Status Aparte* (separate status) within the Kingdom of the Netherlands.

Zoogeographically, the Leeward Islands of the Netherlands Antilles are grouped with the Guianas, Venezuela, Colombia and the other islands lying off the mainland of north-eastern South America. The Windward Islands are grouped with the north-eastern islands of the Lesser Antilles. This factor and the distance between these two sets of islands suggest that the marine turtles associated with them are from different and distinct populations (Sybesma, 1992); however, the satellite-tracking of marine turtles from Bonaire in recent years, which has followed at least one animal from Bonaire towards the Virgin Islands/Saba before contact with the animal was lost, has provided some indication that the two sets of islands share some marine turtle populations (I. Esser, Sea Turtle Conservation Bonaire, *in litt.*, 4 April 2005).

A Sea Turtle Recovery Action Plan (STRAP) for the Netherlands Antilles was developed under the auspices of the Wider Caribbean Sea Turtle Conservation Network (WIDECAST) and the United Nations Caribbean Environment Programme and published in 1992 (Sybesma, 1992). In addition to documenting available information on the status and trade of marine turtles in these five islands, the STRAP identified a number of threats to marine turtles in the islands and proposed a range of actions to address them. The most problematic issue was the lack of overarching legislation in the Netherlands Antilles for the protection and management of marine turtles. As a result, marine turtles were subject to different legal protection regimes in the different islands. Only Bonaire offered full protection to marine turtles in its waters; Saba placed some restrictions on exploitation; but the three other jurisdictions had no marine turtle conservation legislation whatsoever. This problem also obtained at the international level: although the Netherlands had ratified the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1984 for the Netherlands, at the time the STRAP was published this ratification did not extend to the Netherlands Antilles because there was no national legislation in place for implementation.

In addition to problems with the legal framework and the continued exploitation of marine turtles that resulted, the STRAP identified the increasingly heavy use of beaches for recreation and tourism and extensive beach-front development as major factors limiting marine turtle nesting in the Netherlands Antilles. In addition, the mining of sand for construction had degraded beaches on Curaçao and Bonaire. Finally, the STRAP cited Wagenaar Hummelinck (1977) in documenting the loss of entire coastal ecosystems in the Netherlands Antilles to construction and development projects: for example, the Schottegat, formerly the largest inland bay of Curaçao, became one of the largest seaports in the Western Hemisphere and the site of a large Shell oil refinery, while in Sint Maarten, the spacious Simpson Bay Lagoon became hyper-saline after its narrow entrance became closed during the construction of a new bridge and was reconfigured several times, including with a second opening that enhanced its use for recreational purposes.

There have been significant developments for marine turtles in the Netherlands Antilles in the decade since the STRAP was published. At the island level, marine turtles were fully protected by law in Curaçao in 1996. In addition, a revised national (Netherlands Antilles) nature conservation ordinance entered into effect in 2001 to implement CITES, which was ratified for the Netherlands Antilles by the Netherlands in 1999, and other international mandates, most notably the Protocol Concerning Specially Protected Areas and Wildlife (SPAW Protocol) of the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, or Cartagena Convention, the Convention on Migratory Species (CMS), and the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC). Marine turtles and their habitats, listed under all of these international agreements, are afforded complete protection through the ordinance and this is understood to apply throughout the Netherlands Antilles, including in Saba and Sint Eustatius, where local legislation permits the take of marine turtles. These are concrete, positive developments, but there is evidence that, in addition to illegal exploitation and ubiquitously inadequate law enforcement, the habitat degradation issues identified by the 1992 STRAP continue to present obstacles to the recovery of marine turtle populations.

Perhaps the most pressing challenge for marine turtle conservation and management in the Netherlands Antilles has been securing sustainable financing for their world-class marine parks and the NGOs that manage them and the natural resources that occur there. At least two of these, in Sint Maarten and Sint Eustatius, were threatened with imminent closure in 2003; closure, entirely because of funding shortfalls, became a reality in Sint Eustatius in late 2003 (K. De Meyer, Dutch Caribbean Nature Alliance, *in litt.*, 12 April 2005). These agencies are, if not solely, at least the most active in marine turtle conservation activities and, thus, fundamental to the continuation and expansion of these efforts. The launch in June 2004 of the Dutch Caribbean Nature Alliance (DCNA), an umbrella organization for the six park organizations of the Netherlands Antilles and Aruba, and successful fundraising for the Sint Eustatius and Sint Maarten nature organizations and DCNA from the Netherlands, are encouraging recent developments that offer a great deal of promise that these efforts will be sustained in the coming years.

Summary of the status of marine turtles in the Netherlands Antilles

Four species of marine turtle have been recorded with some regularity in the Netherlands Antilles (see table overleaf). The Green Turtle is the most frequently encountered, followed by the Hawksbill Turtle. The Loggerhead is less common and usually encountered further offshore, although it is present in some inner bays, and the Leatherback is less common, occurring only seasonally to nest on some islands. The Olive Ridley has been sighted on rare occasions and Kemp's Ridley has never been documented in all of the Netherlands Antilles (DOAF, 2002).

The same four marine turtle species recorded as most common in the waters of the Netherlands Antilles have been documented to nest there. Sybesma (1992) reported that "with relatively few exceptions, sea turtle nesting is no longer reported in the Netherlands Antilles", in part because marine turtle densities were so low that systematic monitoring could not productively be undertaken and so the precise distribution and abundance of nesting activity had not been quantified. Debrot *et al.* (2005), provide the results of recent surveys of marine turtle nesting in three of the the five island jurisdictions (Curaçao, Sint Eustatius, and Sint Maarten) of the Netherlands Antilles, which indicate significant levels of marine turtle nesting activity and identify several new nesting beaches for conservation. Although these populations are relatively small, the authors emphasize that small, scattered nesting beaches may be important in contributing cumulatively to both reproductive output and recovery potential for

these species at the regional level. Sites with the highest-density nesting are located along the north coast of Curaçao, on Klein Curaçao, on Klein Bonaire, and on some other beaches, particularly in Bonaire and Sint Eustatius.

Occurrence of marine turtles in the Netherlands Antilles

English common name	Scientific name	Occurrence
Loggerhead	<i>Caretta caretta</i>	N, F
Green Turtle	<i>Chelonia mydas</i>	N, F
Leatherback	<i>Dermochelys coriacea</i>	N
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	N, F
Kemp's Ridley	<i>Lepidochelys kempii</i>	A
Olive Ridley	<i>Lepidochelys olivacea</i>	I

Key: N=nesting; F= foraging; I=infrequent; A=absent

The overall principal foraging areas for marine turtles in the Netherlands Antilles are not known (DOAF, 2002). The availability of suitable foraging habitat varies: seagrass meadows are rare around Saba and Curaçao, for example, although isolated grass beds occur; by contrast, seagrass cover is extensive around the north coast of Sint Maarten (with some on the south coast, south of Simpson Bay) and Green Turtles have been reported foraging throughout this area. The north-eastern Saba Bank and Lac Bay, Bonaire are also known to comprise good marine turtle foraging habitat. Foraging habitat for Hawksbill Turtles is considered to be extensive, being more or less coincident with living coral reef.

Marine turtles have never been described as abundant in the Netherlands Antilles; notwithstanding, Sybesma (1992) summarized information from all five islands and concluded, "We are certain only that levels of nesting are much reduced from what they were a century ago." A decade later, DOAF (2002) observed that turtles were definitely more common than "some years ago". Whether this is a real or perceived trend is unclear, but with complete protection in place, the status of local stocks seems destined to improve.

Until recently, there have been few records of international movements of marine turtles in the Netherlands Antilles. The only flipper-tagging undertaken in the Netherlands Antilles has been through a programme initiated in Bonaire in October 2002. Satellite tracking of turtles in Bonaire has documented the movements of a number of turtles (several Hawksbill Turtles, one Green Turtle and one Loggerhead) from that jurisdiction through and to some seven countries in the region, including Venezuela, Colombia, the Dominican Republic, Honduras, Nicaragua, Panama, Puerto Rico (USA) and the Virgin Islands (www.bonairereturtles.org).

Overview of the legal framework for marine turtle management

Membership in international and regional treaties

The Netherlands Antilles is not automatically party to the international agreements to which the Netherlands accedes but must accede to them separately and specifically. The *Landsverordening Grondslagen Natuurbeheer*

en-bescherming (National Nature Conservation Ordinance) sets out regulations to implement the treaties to which the Netherlands Antilles adheres, including CITES, which entered into force there in 1999. The Netherlands signed IAC on 24 December 1998 and entered its ratification on 29 November 2000; the Netherlands Antilles became a Party in 2001 (see table below).

In 1984, the Netherlands Antilles ratified the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, or Cartagena Convention, and its Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region. In 1992, the Netherlands Antilles ratified the SPAW Protocol to the Cartagena Convention.

Membership of the Netherlands Antilles in multilateral agreements relating to marine turtles

Convention	Netherlands Antilles
Cartagena Convention	16.04.1984 (R)
Protocol Concerning Specially Protected Areas and Wildlife (SPAW)	02.03.1992 (R)
Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region	16.04.1984 (R)
Protocol Concerning Pollution from Land-based Sources and Activities	06.10.1999 (S)
Convention on Biological Diversity (CBD)	04.06.1999 (R)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	06.07.1999 (E)
Convention on Migratory Species (CMS)	01.11.1983 (R)
Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	02.05.2001 (R)
MARPOL 73/78 (Annex I/II)	30.10.1983 (Ap)
MARPOL 73/78 (Annex III)	19.04.1988 (S)
MARPOL 73/78 (Annex IV)	No
MARPOL 73/78 (Annex V)	19.04.1988 (S)
Convention on Wetlands of International Importance (Ramsar)	23.09.1980 (R)
UN Convention on Law of the Sea (UNCLOS)	No
Western Hemisphere Convention	No
World Heritage Convention	26.08.1992 (Ac)

Key: Date of: Signature (S); Ratification (R); Entry into force (E); Approval (Ap); Acceptance (Ac)

Laws and regulations relating to marine turtles

Sybesma (1992) identified an inherent difficulty in the legislative framework of the Netherlands Antilles in that legislation exists on three different levels, i.e. that of the Kingdom of the Netherlands, of the central government of the Netherlands Antilles, and of each of the five islands. Although he noted that tasks and responsibilities are assigned in the laws that are passed, it is sometimes difficult to interpret what level of government is responsible for what. In addition, he noted that the “ever-changing” political ideas on the status of the different islands within the Netherlands Antilles and their relationship with the Netherlands created a certain degree of inertia at all levels. Although this situation appears to have been clarified in recent years with the adoption of significant pieces of

legislation in the Netherlands Antilles and the development and implementation of the *Natuurbeleid van de Nederlandse Antillen* (National Nature Conservation Policy of the Netherlands Antilles) (www.mina.vomil.an/), the increasing decentralization of authorities and responsibilities to island governments raises questions about the islands' capacities to deliver on a growing number of mandates. Debrot and Sybesma (2000) provide a comprehensive update on the status of marine environmental legislation in the Netherlands Antilles and Aruba, including that pertaining to marine turtles.

Sybesma (1992) reported that, at the time of publication of the STRAP, national-level legislation in the Netherlands Antilles relating to marine turtles was limited to a fisheries law that prohibited fishing of all marine turtles and marine mammals in territorial waters (12-mile limit) by commercial ships (defined as larger than 12 m or weighing more than six tonnes) but delegated restrictions on these fisheries by smaller fishing vessels to local (= island) legislation. Island legislation completely protected marine turtles on Bonaire (protection of nests and eggs since 1961; protection of all life stages since 1991) and restricted it on Saba, but it set no limits on the take of marine turtles in Sint Maarten, Sint Eustatius or Curaçao (see island sections). In 1996, the take of marine turtles was prohibited through island legislation in Curaçao (see section on Curaçao).

The National Nature Conservation Ordinance provides for biodiversity protection on land and in territorial waters and implements all CITES regulations, as well as other international treaties to which the Netherlands Antilles is a party. It was first enacted on 9 February 1998 (*PB 1998, 49*) but underwent extensive revision. The revised bill was published on 15 March 2001 (*PB 2001, 41*) and entered into effect 30 days later, in April 2001. Hence, the law has been fully implemented only since that date (DOAF, 2002). In addition to prohibiting the import and export of marine turtles and their products, except under the exemptions permitted under CITES, the ordinance completely protects all CITES Appendix-I animals. Although the CITES obligations of the Netherlands Antilles do not include prohibiting exploitation and trade of Appendix-I species within jurisdictional boundaries, the complete protection conferred under the ordinance would be consistent with the provisions of both the SPAW Protocol and IAC.

The CITES-implementing legislation of the Netherlands Antilles is under review within the framework of the CITES National Legislation Project, and any deficiencies are required to be corrected by 30 September 2006 (Anon., 2005).

Implementation of nature conservation in the Netherlands Antilles is the responsibility of the individual islands. The central government oversees the implementation of the different treaties and conventions pertaining to nature conservation and sets the overall policy framework for nature conservation and environmental management but, as set out in the National Nature Conservation Ordinance, actual implementation, including the revision of environmental legislation to fulfill the various policy mandates, is delegated to the island governments.

Responsible authorities

In accordance with the National Conservation Ordinance and national policy, the individual island governments are responsible for marine turtle management in the Netherlands Antilles. In addition to the local police, certain individuals, such as the managers and rangers of three of the marine parks (Curaçao, Bonaire, Saba) may be conferred special police enforcement authority (Sybesma, 1992). In the case of Saba, this authority has yet to be granted by the Lt. Governor (D. Kooistra, Director, Saba Nature Foundation, *in litt.*, 25 October 2004); in the case

of Sint Maarten, the Assistant Marine Park Manager is a Special Agent of the Police (A. Caballero, Nature Foundation of Sint Maarten, *in litt.*, 12 April 2005). Marine turtle protections are also enforced by Customs and the Coast Guard. The *Afdeling Milieu en Natuur* (MINA—the Department of Environment and Nature), which is part of the *Ministerie van Volksgezondheid en Sociale Ontwikkeling* (VSO—the Ministry of Public Health and Social Development) in Curaçao, handles CITES permits and requests.

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective

Although there is no evidence that there was ever a great abundance of marine turtles in the Netherlands Antilles, a body of documentation that includes reference to marine turtle remains in Indian middens on the island of Aruba, a ban of October 1737 on the killing of marine turtles in the streets of Curaçao (Hermans, 1961, cited in Sybesma, 1992) and 17th century reports and more recent records of exports of marine turtles from Aves Island (Isla de Aves, Venezuela), which lies south-west of Guadeloupe, and the Las Aves and Los Roques archipelagos (Venezuela), which lie south-east of Bonaire, to islands in the Netherlands Antilles suggests that they have provided an important source of protein in the form of meat and eggs over many centuries. The legacy of persistent exploitation is the fact that there are many places where turtles could once be found but today are either absent or rare. By the middle of the 20th century, turtles were considerably harder to find than they had been in the past; Hermans (1961, cited in Sybesma, 1992) considered it “rather miraculous” that they survived at all.

Based on his review of historical reports, Sybesma (1992) indicated that turtles brought back from the Las Aves Archipelago in the 17th and 18th centuries were likely to have been breeding animals, but it appears that by the mid-1900s the catch was primarily composed of juveniles and sub-adults. Some of the animals may well have been destined for captive rearing, as Sybesma uncovered evidence of efforts in the 20th century (and possibly earlier) to rear turtles in captivity: a 1915 colonial report cited (but unreferenced) in Hermans (1961, cited in Sybesma (1992) indicates that part of Spaanse Bay in Curaçao was closed off to retain captive Green Turtles for experimental breeding purposes, but the animals were subsequently released when they ran out of food. Subsequent efforts were made in Curaçao and Bonaire to rear captive turtles to meet a continued demand for meat, in particular in Bonaire, but these too failed to progress beyond an initial phase.

Rebel (1974) provided information from two informants, H. Grigoire and Dr Ingvar Kristensen, that there were no specific marine turtle fisheries operating in the Netherlands Antilles and, thus, no formal statistics, although there were some data for landings in Curaçao. Eggs of the three nesting species—Green and Hawksbill Turtles and the Loggerhead—were taken from nests, and turtles were captured in tangle nets and incidentally in other fisheries and used locally, except for Hawksbill shell, which was exported.

Sybesma (1992) indicated that exploitation of marine turtles in the Netherlands Antilles varied in nature and extent between the five islands. He reported that the take of nesting females occurred on an opportunistic basis at low levels, since nesting was so rare, and that most turtles were caught by fishers at sea. Bonaire had the largest fishery, with some 500 Green and Hawksbill Turtles (in total) estimated taken annually in the 1970s and 250 annually in the early 1980s. By the time of his report to the Second Western Atlantic Sea Turtle Symposium in

1987, Sybesma (1987) reported that Bonaire was the only island in the Netherlands Antilles that caught turtles in “relative big numbers”. In Curaçao, although there was no directed turtle fishery in the late 1980s, turtles were taken regularly as by-catch and consumed or, in some instances, sold to a few local restaurants.

Sybesma (1992) found the situation in the early 1990s to have changed somewhat from Meylan’s (1983) findings: in Sint Maarten, Saba, and Sint Eustatius, exploitation was at low levels and strictly local and, in Sint Maarten, the demand for marine turtle products from the tourist trade had slowed significantly, with no evidence of meat being sold in markets or restaurants and smaller numbers of shell objects on sale, all of them reported to have been imported from outside the country.

Recent (since 1992) exploitation

There are no formal statistics on exploitation of marine turtles in the Netherlands Antilles in the last decade. No records appear to have been made of legal landings and illegal exploitation since protection measures were put in place is difficult to quantify. As was the case historically with respect to legal landings, the highest level of illegal take of marine turtles may be in Bonaire, where informed observers estimate that 20–40 turtles, most of them Green Turtles, were killed per month in Lac Bay as recently as the late 1990s. This situation is thought to have improved owing to the presence of marine turtle research in the bay, which employs local fishers (I. Esser, Sea Turtle Conservation Bonaire, pers. comm., 2005).

International trade

Historical perspective

The Netherlands Antilles is not known to have played a major role in international trade in marine turtles and turtle products, according to information from Meylan (1983), Groombridge and Luxmoore (1989) and Sybesma (1992). Possible exceptions are Saba and Curaçao, which have had centuries-long links with Aves Island and the Las Aves and Los Roques archipelagos (all under the jurisdiction of Venezuela). Fishers from Saba and Curaçao are known to have visited these islands, respectively, to capture turtles. Sint Maarten’s role appears primarily to have been in relation to the local tourist market (as both importer and exporter).

The Netherlands Antilles is a recent Party to CITES (1999). CITES-reported trade involving the Netherlands Antilles and marine turtles, as recorded in statistics derived from the UNEP-WCMC CITES Trade Database, consists of only 15 shipments for the period 1984–1992 (there are no recorded exports for 1975–1983, inclusive). Eleven of these shipments were seized on entry, three into the Netherlands, the remainder into the USA.

No imports of Hawksbill shell from the Netherlands Antilles were recorded in Japanese Customs statistics from 1970 to 1992, the last year that Japan permitted such imports (Milliken and Tokunaga, 1987; H. Kiyono, TRAFFIC East Asia-Japan Office, *in litt.* to TRAFFIC International, 29 July 2002). The Netherlands, by contrast, was a major exporter of Hawksbill shell to Japan during that period, of no less than 14 285 kg from 1970 up to and throughout 1984, the year that the Netherlands acceded to CITES. The extent to which any of that shell originated in or passed through the Netherlands Antilles is unknown.

Recent (since 1992) international trade

There is very little evidence of international trade in marine turtles from the Netherlands Antilles in the last decade. CITES-reported international trade from 1993 to 2004, inclusive, is limited to two turtle carapaces seized on entry into the USA. Illegal trade is known to persist, although levels are unknown (see island sections): for example, there is still some inter-island sale of turtle meat, namely from Anguilla to Sint Maarten, if there is by-catch during fishing activities (A. Caballero, *in litt.*, 23 March 2005).

Enforcement issues

As indicated in the sections that follow and confirmed by DOAF (2002), illegal take of marine turtles continues in the Netherlands Antilles. Enforcement is variable between the islands, but there have been prosecutions in both Curaçao and Bonaire of local fishers who have illegally taken turtles (DOAF, 2002) and confiscations of illegal imports of marine turtle products into Sint Maarten (A. Caballero, Nature Foundation of Sint Maarten, pers. comm., 29 March 2005).

There are no stockpiles of marine turtle products in the Netherlands Antilles (DOAF, 2002). Under the National Nature Conservation Ordinance, all CITES Appendix-I specimens in private possession at the time of entry into force of the Convention were required to be registered with the central authorities. If this did not happen during the time period provided, the specimens were prohibited from sale and subject to confiscation. Whether and to what extent confiscations have been made has not been documented in the course of this review.

Marine turtle management

The National Nature Conservation Policy of the Netherlands Antilles 2000–2005 reaffirms the decentralization of authorities and responsibilities in this arena to the individual island governments, while at the same time recognizing the support role of central government through guidelines and assistance, co-ordination of research and development of methods. Each island was expected to produce an Island Nature Plan that would be analogous to and eventually incorporated into the National Nature Policy Plan. The nature conservation component of the earlier Outlines of Nature Conservation and Environmental Policy of the Netherlands Antilles 1996–2000 included the expansion of the network of national parks, both terrestrial and marine, and the development of management plans, including financing mechanisms. It also called for increased efforts on behalf of species, including biological research to establish the status of endemic species, legal protection of threatened species, and management of trade in endangered species, such as through CITES and the SPAW Protocol.

Species research and conservation

The first efforts to assess the status of marine turtles in the Netherlands Antilles systematically were initiated in 1986 through the *Caraïbisch Marien-Biologisch Instituut*—now the CARMABI (Caribbean Research and Management of Biodiversity) Foundation—in Curaçao. This enabled the development of a network of volunteers to collect data on marine turtles, including through interviews with fishers, for preparation of the WIDECAS STRAP for the Netherlands Antilles (Sybesma, 1992). A number of initiatives, including intensive Index site monitoring in some locations, have been launched in recent years to collect data on marine turtle nesting and other

activities and document important sites, develop the dataset for documenting population trends, and document marine turtle movements. These are most advanced in Bonaire.

Habitat conservation

The Netherlands Antilles has been a leader and innovator in the development and management of marine protected areas. One of the first effective marine parks to be established globally was in Bonaire; not only does it continue to set a world example, it has also recently been expanded to include the uninhabited island of Klein Bonaire, an important nesting site for marine turtles in the Netherlands Antilles. In addition, the Saba Marine Park was established in 1987 and the Sint Eustatius (Statia) Marine Park in 1996. Curaçao has protected the most frequented nesting beaches, and, although the Sint Maarten Marine Park has not yet been legally established, the zoning plan has been completed and enabled a significant degree of implementation of marine park management (A. Caballero, pers. comm., 2005).

Progress notwithstanding, habitat issues continue to be a problem, in particular related to the loss of nesting habitat to beach-front development and sand-mining and degradation and disturbance through the effects of artificial lighting and recreational and other activities. Curaçao remains the only island with a land-use zoning law (Debrot and Sybsma, 2000). A general lack of capacity, primarily pertaining to human and financial resources, hinders management and enforcement authorities from fully pursuing their habitat protection mandates.

Education and public awareness

A range of activities (see island sections) have been undertaken to heighten appreciation for the conservation of marine turtles in the Netherlands Antilles and engage stakeholders in these efforts and these have clearly yielded



Credit: Sea Turtle Conservation Bonaire

Sea Turtle Conservation Bonaire staff and a volunteer place a satellite transmitter on a turtle.

positive results. Satellite-tracking of turtles in Bonaire, led by the NGO Sea Turtle Conservation Bonaire (STCB), appears, for example, to have stimulated enormous interest in marine turtle conservation, not only through internet updates at www.bonaireturtles.org but also through regular features in local newspapers.

A one-year environmental education and awareness campaign focusing on marine turtles in the Netherlands Antilles, which includes one environmental education officer shared between the three northern

islands (Saba, Sint Maarten, Sint Eustatius) and a second one based in Bonaire, was launched in November 2004 by DCNA. The campaign is modelled on the Pride Program of the RARE Center for Tropical Conservation

(www.rareconservation.org/rare_pride_inside.htm), to target all sectors of the local community with turtle conservation information under the banner *Protega nos Turtuganan* (Protect our Turtles) and features songs, puppet shows, media articles posters, fliers, buttons, stickers, sermons and school visits.



Credit: Sea Turtle Conservation Bonaire

Children's artwork activity, Bonaire, part of the process of engaging the local community in appreciation of marine turtle conservation.

Constraints to marine turtle conservation and management

Decentralization of authority in the management of natural resources reflects the political realities of the Netherlands Antilles but clearly presents challenges to management, especially related to the limited capacities—legal, personnel, financial, logistical—of the individual islands. That all active marine turtle conservation is being undertaken by NGOs, including the foundations that have been established to run several of the islands' marine parks, whose operations depend on outside funding, raises serious questions about these activities' sustainability and the capacity of these agencies to address—and adapt in addressing—the range of issues facing the recovery of marine turtle populations in the Netherlands Antilles.

The Netherlands Antilles country report to the first CITES Hawksbill Dialogue (Government of the Netherlands Antilles, 2001) reaffirmed these challenges, noting in particular the following:

- the government is having difficulty funding, and securing funding, for operating the management agencies on the islands, whose continued existence is “absolutely necessary” for adequate enforcement of marine turtle protections;

- there is a need to increase public awareness and support for nature conservation generally and, marine turtle conservation in particular;
- there is a need to collect more data on marine turtle populations, in particular those foraging on the Saba Bank; and
- enforcement of marine turtle protections remains a problem and will be more so if there is any weakening in the protections afforded to them elsewhere in the Caribbean.

In the judgement of DOAF (2002), the major constraint to marine turtle conservation in the Netherlands Antilles has been an inadequate legal framework and this problem has largely been rectified; yet to be addressed, however, is the need for lighting regulations in order to protect some of the remaining nesting beaches. Information from the individual islands (see following sections) presents a somewhat conflicting view: despite the legal protections conferred on marine turtles through the National Nature Conservation Ordinance, enforcement is afforded low priority on some islands and there is insufficient interest on the part of the police to enforce directly or, in the case of Saba and Sint Eustatius, to confer enforcement authority on the nature conservation agency most involved in marine turtle conservation activities. This suggests a continued need to generate greater political will on behalf of marine turtle conservation. In Sint Maarten, the absence of specific provisions for marine turtles in the island nature ordinance, adopted in 2003, and the fact that the marine park ordinance is still in draft form, are viewed as impediments to effective marine turtle management, in particular in relation to habitat issues.

In addition, the funding challenges noted by the Government of the Netherlands Antilles in 2001 persist for the island nature conservation agencies, in particular the marine parks of Sint Maarten, Saba, Sint Eustatius and Bonaire, which do not receive government funding but depend on fees, donations, and grants for their operation (D. Kooistra, *in litt.*, 25 October 2004). Given their role as the—or one of the (in the case of Bonaire)—main actors on behalf of marine turtles, there is a need for sustained and adequate funding for these efforts.

The recently launched DCNA, a foundation representing the interests of the nature conservation and management organizations of the Netherlands Antilles and Aruba, is working to ensure that funding constraints will lessen in the near future. Funding obtained through The Netherlands Committee for IUCN and *Stichting DOEN*, both originating with the National Post Code Lottery in the Netherlands, has enabled the continued operation of the nature foundations in Sint Eustatius and Sint Maarten and provided for a co-ordinator for the DCNA (K. de Meyer, *in litt.*, 12 April 2005).

Summary and recommendations

The regulatory framework in place in the Netherlands Antilles for marine turtles would appear to be in compliance with the FAO Code of Conduct for Responsible Fisheries (FAO, 1995), an explicitly precautionary code, which states that “the right to fish carries with it the obligation to do so in a responsible manner so as to ensure effective conservation and management of the living aquatic resources”, implying that the management of marine turtle resources should seek to maintain the availability of the resource “in sufficient quantities for present and future generations in the context of food security, poverty alleviation and sustainable development”. Management measures should, *inter alia*, prevent over-fishing, rehabilitate depleted populations, incorporate the best scientific evidence (taking into account traditional knowledge, as well as relevant environmental, economic and social factors), assign priority to research and data collection (including at international scales), and promote environmentally safe fishing gear and practices in order to protect both the target resource and the ecosystems upon which it depends.

Significant progress has been made for marine turtles in the Netherlands Antilles, on a variety of fronts, and most of these are detailed in the island sections that follow. In addition to the island-specific recommendations, the following are noted:

1. Despite the existence of national legislation conferring complete protection of marine turtles in the Netherlands Antilles, the absence of specific legal provisions for marine turtles on some of the islands poses a serious impediment to enforcement of prohibitions on take and, more importantly, to efforts to protect habitats (e.g. restrictions on sand-mining, beach-front lighting, construction, dredging) of particular importance to nesting or foraging turtles. The adoption of such legislation by the individual island governments should be considered a high priority.
2. The marine environmental ordinances of Saba and Sint Eustatius should be revised in conjunction with the development and adoption of island nature conservation ordinances so as to ensure congruity in their provisions and to bring marine turtle protections in line with those conferred by the National Nature Conservation Ordinance.
3. The variability of enforcement effort on the individual islands should be addressed through review and possible revision of authorities, enhanced logistical support, training, and political support.
4. The tenuous financial situation of the nature conservation foundations on the islands and important role of these and the broader NGO community as the primary (in some instances sole) actors in marine turtle conservation must be recognized as a major impediment to improved marine turtle conservation and management in the Netherlands Antilles. The central government should be encouraged to continue its efforts to raise funds and foster structural change on behalf of these agencies, but should also move forward with its decentralization plans in the light of these constraints. Increased and continued support to the DCNA to support the work of these conservation agencies is strongly encouraged.
5. Mechanisms to quantify levels of incidental catch of marine turtles should be developed. Measures to reduce or eliminate incidental catch of marine turtles, such as through time–area closures and/or alternative types of gear, should be implemented, as necessary.

References

- Anon. (2005). CITES Document SC53 Doc. 31. Working document of the 53rd meeting of the CITES Standing Committee. Accessible at www.cites.org. Viewed 12 December 2005.
- Debrot, A.O. and J. Sybesma. (2000). The Dutch Antilles. Chapter 38. Pp. 595-614. In: C.R.C. Sheppard (Ed.). *Seas at the Millennium: an Environmental Evaluation. Vol. I. Regional Chapters: Europe, the Americas and West Africa*. Elsevier, Amsterdam.
- Debrot, A.O., N. Esteban, R. Le Scao, A. Caballero and P.C. Hoetjes. (2005). New sea turtle records for the Netherlands Antilles provide impetus to conservation action. *Caribbean Journal of Science* 41(2):334–339.
- DOAF [Department of Agriculture and Fisheries, Netherlands Antilles]. (2002). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of Marine Turtles in the Lesser Antilles, Central America, Colombia and Venezuela. Completed by Gerard van Buurt, Head, Fisheries Section, Curaçao. Dated 18 July 2002.

- FAO. (1995). Code of Conduct for Responsible Fisheries. Adopted by the 28th Session of the FAO Conference. Food and Agriculture Organization of the United Nations, Rome. 34 pp. + annexes. www.fao.org/fi/agreem/codecond/codecon.asp
- Government of the Netherlands Antilles. (2001). *Netherlands Antilles: Hawksbill Turtles, Outline of Present Situation*. Country report submitted for the First CITES Hawksbill Dialogue Meeting (15–17 May 2001, Mexico City). www.cites.org.
- Groombridge, B. and R. Luxmoore. (1989). *The Green Turtle and Hawksbill (Reptilia: Cheloniidae): World Status, Exploitation and Trade*. Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Lausanne, Switzerland. 601 pp.
- Hermans, I.J. (1961). *Schildpadden en hun betekenis voor de Nederlandse Antillen*. Report to Caraïbisch Marien-Biologisch Instituut (CARMABI). Curaçao, Netherlands Antilles. 71 pp.
- Meylan, A.B. (1983). Marine Turtles of the Leeward Islands, Lesser Antilles. *Atoll Research Bulletin* 278: 3–6.
- Milliken, T. and H. Tokunaga. (1987). *The Japanese Sea Turtle Trade 1970–1986*. A special report prepared by TRAFFIC (Japan). Center for Environmental Education, Washington, DC. 171 pp.
- Rebel, T.P. (1974). *Sea Turtles and the Turtle Industry of the West Indies, Florida, and the Gulf of Mexico*, revised edn. University of Miami Press, Coral Gables. 250 pp.
- Sybesma, J. (1987). National Report for the Netherlands Antilles. Prepared for the Second Western Atlantic Sea Turtle Symposium, 11–16 October 1987, Mayagüez, Puerto Rico. WATS2 057. 28 pp. Unpublished.
- Sybesma, J. (1992). *WIDECAST Sea Turtle Recovery Action Plan for the Netherlands Antilles* (Karen L. Eckert, Ed.). CEP Technical Report No. 11. UNEP Caribbean Environment Programme, Kingston, Jamaica. 63 pp.
- Wagenaar Hummelink, P. (1977). Marine Localities. Studies on the Fauna of Curaçao and other Caribbean Islands: No. 167. *Uitgaven Natuurwetenschappelijke Studiekring voor Suriname en de Nederlandse Antillen*, No. 87.

Netherlands Antilles: Bonaire

Introduction

Bonaire forms part of the Leeward Islands and, with the island of Curaçao, Netherlands Antilles South. Totalling 288 km² in land area and very similar to Curaçao both physically and culturally, Bonaire has a small oil terminal for trans-shipment, a salt-mining facility (International Salt Company/AKZO), and a well-developed dive-tourism industry. The coral reefs are among the best developed in the Caribbean Sea and the island has several sandy beaches (Sybesma, 1992).

Bonaire has a decades-long history of environmental protection. The *Stichting Nationale Parken* (the National Parks Foundation) for Bonaire—STINAPA Bonaire—was established in 1969 to protect and conserve the land and waters on and around Bonaire. The Bonaire National Marine Park was established in 1979 and encompasses the entire coast of the island, including the sea bottom and overlying waters from the high-water tide mark down to the 60-m depth contour. In 2002, the park was expanded to include the offshore, uninhabited island of Klein Bonaire, which is the most important nesting site for marine turtles in Bonaire (STCB, 2002).

Bonaire was the first of the five islands of the Netherlands Antilles to protect marine turtles completely, in 1991. Since that time, there have been great advancements for marine turtles in Bonaire, largely through the education, conservation and research efforts of STCB, an NGO established in 1991 to implement, in Bonaire, the WIDECAST STRAP for the Netherlands Antilles (Sybesma, 1992).

Summary of the status of marine turtles in Bonaire

Four species of marine turtle occur in the waters of Bonaire, of which three—the Loggerhead, Green Turtle and Hawksbill Turtle—have long been known to nest (STCB, 2002; see table below). The Hawksbill Turtle is the major nesting species (www.bonaireturtles.org, viewed 3 March 2005), depositing more than 50 nests island-wide, while Green Turtles and Loggerheads lay a smaller number of nests, perhaps fewer than 20 for each species. Nesting by the Leatherback was confirmed in 2004 (A.O. Debrot, CARMABI Foundation, *in litt.*, 7 September 2005). In addition to No Name beach on Klein Bonaire, which is visited by Hawksbill Turtles and Loggerheads, Playa Benge and Playa Chikitu in the north of the island are the main nesting sites; a few Hawksbill nests have also been recorded on Windsack Beach on the west coast of the island.

Occurrence of marine turtles in Bonaire

English common name	Scientific name	Occurrence
Loggerhead	<i>Caretta caretta</i>	N
Green Turtle	<i>Chelonia mydas</i>	N, F
Leatherback	<i>Dermochelys coriacea</i>	I?
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	N, F
Kemp's Ridley	<i>Lepidochelys kempii</i>	A
Olive Ridley	<i>Lepidochelys olivacea</i>	A

Key: N=nesting; F= foraging; I=infrequent; A=absent

The major marine foraging grounds for marine turtles in Bonaire have been identified as Lac Bay and Lagun for Green Turtles and the reefs along the west coast of Bonaire and surrounding Klein Bonaire for Hawksbill Turtles (STCB, 2002).

Understanding of the international movements of marine turtles occurring in Bonaire is increasing rapidly through the deployment of satellite-tracking technology. By the time of writing, six turtles had been fitted with satellite transmitters in Bonaire and their movements recorded, clearly identifying the following as range States: Venezuela, Colombia, Panama, Honduras, Nicaragua, Dominican Republic, Puerto Rico (USA) and the Virgin Islands.

Overview of the legal framework for marine turtle management

Laws and regulations relating to marine turtles

Marine turtle nests and eggs have been protected in Bonaire since 1961 by the *Eilandsverordening tot bescherming van de zeeschildpadden en kreeften* (Island Ordinance for the Conservation of Marine Turtles and Lobsters), and spear-fishing has been prohibited in Bonaire since 1971.

In June 1991, more comprehensive marine turtle legislation was enacted when the Island Council amended the *Verordening Marien Milieu* (Marine Environment Ordinance) of 1984, making it an offence to catch, kill, sell, purchase or possess marine turtles, including their parts and products. The *Verordening Marien Milieu* (Marine Environment Ordinance) A.B. 1991 Nr. 8 of 27 June 1991 specifies in Article 14 that:

- it is prohibited to disturb or destroy marine turtle nests or to remove eggs from the nests; it is prohibited to be in possession of, to have for sale or delivery, to offer for sale, to see, to buy, to trade in, to donate or to transport eggs of marine turtles.
- it is prohibited to kill, catch or be in possession of marine turtles.
- it is prohibited to offer for sale, sell, buy, trade in, donate, or offer as a dish in any way in public, marine turtles, marine turtle meat or other products of marine turtles.
- marine turtles are understood to comprise the following species: the Green Turtle (*Tortuga blanku*), the Loggerhead (*Kawama*), the Hawksbill Turtle (*Karet*), the Leatherback (*Drikil*), and Kemp's Ridley.

The Ordinance states that the prohibition set out in sub-paragraph 2 may be suspended for periods of “up to one year (renewable as necessary), after a hearing by the Marine Environment Commission and provided that the condition of the marine turtle population permits such a measure”. This action would be administered through an Executive Council decree, which would provide regulations for the catch of marine turtles, the species, the season, quota, and minimum and maximum sizes, and the gear allowed to be used.

The penalty for violation of this law is a maximum of 5000 Netherlands Antillian guilders (ANG5000) and/or one month in gaol; relevant equipment (spear guns, cars, boats, etc.) may be confiscated.

Responsible authorities

STINAPA Bonaire is responsible for protecting and conserving the land and waters around Bonaire, that are of common interest either for their natural beauty, scientific and historical value, or overall natural value, in order to make them appropriately subservient to the general benefit of all the inhabitants or visitors of Bonaire; for protecting and conserving the plant and animal life on and around Bonaire; and for advising in matters concerning the conservation and protection of nature and of the environment in general (E. Beukenboom, Director, STINAPA Bonaire, *in litt.*, 13 April 2005). STINAPA is the management authority for all protected areas in Bonaire, including the Bonaire National Marine Park. Various police authorities also have jurisdiction and enforcement authority for the *Verordening Marien Milieu*, including the *Servisio Sentral di Vigilansia* (SSV—the government's security agency), the police and Customs officers (STCB, 2002).

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective

There is a long-standing local tradition of turtle meat consumption in Bonaire. Sybesma (1987) reported that by the time of his writing this was the only island in the Netherlands Antilles where marine turtles were caught “professionally in relative big numbers” and that the size of the catch had declined in the last few years, possibly

an indication of over-exploitation of populations. Sybesma (1992) summarized all available information on marine turtle exploitation and use in Bonaire prior to the 1991 revision of the *Verordening Marien Milieu*, which conferred complete protection on marine turtles. Both Green and Hawksbill Turtles were net-caught, primarily during the period June–December. According to a fisher’s report, annual catch in the late 1970s was ca. 40–50 turtles per month or ca. 500 per year (Green Turtles and Hawksbill Turtles combined) but had declined by the late 1980s to ca. 20 turtles per month or ca. 250 per year. All turtles caught were used locally, including through sale in restaurants, where it was comparatively expensive. There was no longer a trade in marine turtle ornaments; however, the shells from turtles caught for food were often sold.

Particularly noteworthy among Sybesma’s (1987) findings was the observation that, although the total catch of turtles in Bonaire had stayed of the “order of 250” turtles per year, the size of all turtles being taken by fishers had decreased “considerably” in the previous decade or so, to an average length of ca. 40 cm (turtles smaller than that size were reportedly released).

Recent (since 1992) exploitation

Since marine turtles were conferred complete protection in 1991, all exploitation since then has been illegal. There is documented evidence and information from local fishers indicating continued, illegal take of marine turtles by local residents, primarily Green Turtles for meat and eggs, which are generally shared amongst family and friends rather than marketed (STCB, 2002). No statistics exist and there are no estimates of the numbers of individuals involved in this illegal fishery. Although STCB (STCB, 2002) suggested an estimate of ca. 300 turtles caught illegally in Bonaire per year, a more recent estimate (R. van Dam, Project Director, STCB, *in litt.*, 12 March 2004) suggests a steady decline in illegal activity, presently estimated to involve perhaps 20–40 animals per year.

International trade

Historical perspective

Available information on international trade in marine turtles involving the Netherlands Antilles does not include reports of Bonaire. Sybesma (1987) suggested that, “if any”, export of turtle meat was to Curaçao, where “seafood prices are higher”. He reported that there was no import except for the occasional Venezuelan fisher who might offer turtles caught in the *Islas las Aves*, which lie south-east of the island.

Recent (since 1992) international trade

STCB (2002) reports no knowledge of exports of marine turtles or turtle products from Bonaire but notes that there are illegal imports of eggs, from Venezuela, for domestic use. The full extent of parts and products arriving from nearby Venezuela is not known; there have been no seizures or arrests.

Enforcement issues

Neither STCB (2002) nor van Dam (2004) considers illegal exploitation of marine turtles to be a severe problem in Bonaire; notwithstanding, the level of suspected take may be significant in the context of locally depleted stocks. Stock assessment data are needed.

There are no stockpiles of marine turtle products in Bonaire (STCB, 2002).

Marine turtle management

Following centuries of an unregulated and unmonitored marine turtle fishery, Bonaire is now assuming a leadership role in marine turtle research and management in the Netherlands Antilles. Recommendations from the 1992 STRAP for the Netherlands Antilles (Sybems, 1992) have been implemented through the Bonaire National Marine Park, STINAPA Bonaire, and STCB. The last-mentioned reported that marine turtle management on Bonaire “has a very bright future”, particularly in the light of an intensified research programme designed in partnership with WIDECAS and initiated in October 2002 (STCB, 2002). The programme includes at-sea population census, genetic sampling, satellite-tracking, and Index nesting beach surveys of Klein Bonaire, Bonaire’s most important nesting colony (I. Esser, pers. comm., 2005).

Species research and conservation

Since its founding in 1991, STCB has conducted several research projects on both nesting and foraging marine turtles. It began beach patrols in 1993 and these have continued. With tags and equipment donated by the WIDECAS Marine Turtle Tagging Centre in Barbados, flipper-tagging started in October 2002. In addition to systematic nest monitoring on Klein Bonaire and selected beaches on Bonaire, aimed at determining long-term population trends, the STCB project is now tagging foraging turtles so as to assess and monitor numbers and



Credit: Sea Turtle Conservation Bonaire

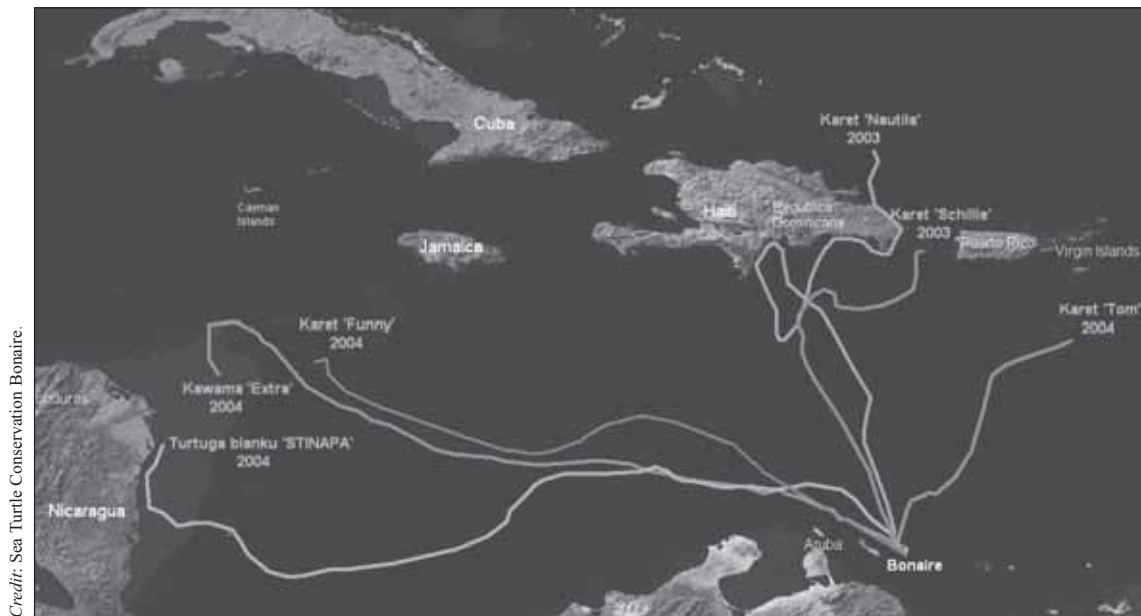
Staff of Sea Turtle Conservation Bonaire tag a turtle.

record growth and other parameters; turtles are being caught with nets fashioned by a former turtle fisher and poacher employed to this end (van Dam, 2004).

Nesting beach surveys have been conducted annually by STCB staff, community volunteers and international interns for over a decade. These surveys in 1998 documented 27 nests on Klein Bonaire and 12 on Bonaire, a “dramatic” increase from the six nests recorded in 1993 (den Haring and Renshoff, 1999). Surveys in 2002 on the designated Index beach (No Name Beach on Klein Bonaire) resulted in an estimate of 40 to 50 nests deposited during the full nesting season (STCB, 2002). In 2004, 78 nests were recorded on Klein Bonaire (50 of which were Hawksbill), with the second-highest count recorded at Playa Chikitu (10 nests, nine of which were Green Turtle), in Washington Slagbaai National Park (van Dam, 2004). While some percentage of the increase is a function of increasing vigilance, there appears no doubt that natural increases are evident, perhaps reflective of decreasing pressure on local stocks following the 1991 moratorium.

Monitoring of foraging turtle populations in the Bonaire National Marine Park was initiated in 2002. During almost 50 hours of in-water survey time, project staff caught, tagged, measured and examined 61 immature turtles: 33 Hawksbill and 28 Green Turtles (STCB, 2003); similarly, 84 turtles were caught by the research team in 2004, 15 of which were recaptures from 2003 (van Dam, 2004). The objectives of the work are, *inter alia*, to evaluate habitat use, growth rates and the occurrence of fibropapillomatosis disease.

Also in progress is the application of satellite technology to monitor the movements of marine turtles from Bonaire. By the time of writing, six marine turtles, mostly adult female Hawksbill Turtles but including one male Hawksbill Turtle and one Loggerhead, had been tracked beyond the waters of the Netherlands Antilles into those of numerous other countries in the region (see **map** below).



Movements of adult Hawksbill Turtles (three female and one male), one female adult Loggerhead, one female adult Green Turtle and one adult male Hawksbill Turtle satellite-tagged in Bonaire in 2003 and 2004.

In addition to these monitoring activities, STCB organizes regular patrols to safeguard nesting beaches; collects turtle sighting data through its website, email and phone (Sea Turtle Hotline); provides assistance when anyone finds a turtle in trouble and makes recommendations to the island government concerning marine turtle issues.

Habitat conservation

STINAPA Bonaire has a leadership role in habitat protection in Bonaire. The organization manages the Bonaire National Marine Park, Washington Slagbaai National Park, Klein Bonaire (also a Ramsar site) and the caves at Barcadera. Two additional Ramsar sites (internationally recognized wetlands)—Lac Bay and Boca Slagbaai—are managed by STINAPA Bonaire; a fourth, the Gotomeer (Goto Lake), lies within the Washington Slagbaai National Park and a fifth, the Pekelmeer/Flamingo Reserve, is co-operatively managed (see www.bonairenature.com/stinapa/stinapa.html). Lac Bay, the largest inland bay in the Netherlands Antilles, supports Bonaire's only significant mangrove and seagrass ecosystems and is the island's most important Green Turtle foraging habitat (STCB, 2002).

The Bonaire National Marine Park was established in 1979 and today incorporates the coasts of Bonaire and Klein Bonaire and surrounding waters to 60 m in depth. Except for a hiatus in the late 1980s, during which self-financing mechanisms were developed, the marine park has operated effectively as a model for marine parks elsewhere in the world. Noteworthy is the fact that the island's primary marine turtle nesting sites are all within protected areas: No Name Beach on the fully protected, undeveloped island of Klein Bonaire, and Playa Bengé and Playa Chikitu in Washington Slagbaai National Park.

Education and public awareness

STCB has long been involved in public awareness and education activities relating to marine turtles and these have included: slide-show presentations for residents and tourists, facilitating visits by school children to nesting

beaches and involving local people in beach and in-water surveys, including in collaboration with the youth organization Jong Bonaire (STCB, 2003). The recent satellite-tracking project has generated enormous public interest, facilitated by dedicated space in the local daily newspaper and features in others.

A year-long information, education and outreach campaign for the protection of marine turtles and their habitat was launched in Bonaire in November 2004 as a collaborative effort of STINAPA Bonaire, STCB and the NGO Coral Resource Management. This project is an initiative of DCNA, a

recently established foundation that represents the interests of the nature conservation and management organizations of the Netherlands Antilles and Aruba. The campaign is running simultaneously on Bonaire, Sint



Credit: Sea Turtle Conservation Bonaire

The bi-weekly presentation of Sea Turtle Conservation Bonaire for tourists visiting the island.



Credit: Sea Turtle Conservation Bonaire

Children on Bonaire are taken to see turtles hatching as part of public awareness and education activities relating to marine turtles.

Maarten, Saba and Sint Eustatius but is tailored to each individual island's situation. Although school children are a major focus of the campaign on Bonaire, the aim is to reach all sectors of the community, including local businesses and the media, so as to educate, change attitudes and build support for marine turtle conservation. In addition to a poster, brochure, bumper stickers and buttons, the campaign's outputs include a "rap song" for play in schools and on local radio, a school visiting programme and a monthly newsletter (www.bonaireturtles.org, viewed 3 March 2005).

Lac Bay, a Ramsar wetlands site protected within the Bonaire National Marine Park, features signs asking visitors not to walk on seagrass beds and offers information on endangered marine turtles (E. Beukenboom, *in litt.*, 13 April 2005).



Credit: Sea Turtle Conservation Bonaire

Community involvement in beach cleaning in Bonaire.

Constraints to marine turtle conservation and management

Taking into account the constraints articulated in **Netherlands Antilles *Introduction***, all of which are important for Bonaire, STCB indicates inadequate law enforcement as the major constraint to marine turtle management and conservation in Bonaire (STCB, 2002). While increased staffing and better training for law enforcement agencies may improve effectiveness, the strategy of STCB has been to expand efforts to engage and involve local people in marine turtle conservation. With regard to safeguarding habitat, current regulatory regimes are insufficient for adequate protection of Lac Bay, where the island's largest assemblages of foraging marine turtles are threatened by increasing levels of watersports activities (e.g. windsurfing, kayaking, snorkelling) (I. Esser, STCB, pers. comm., 2005).

Summary and recommendations

Marine turtle conservation in Bonaire is relatively well-advanced and the efforts of STCB are impressive in their conceptualization, scope and effectiveness, including in engaging the public in the cause of marine turtle conservation. These efforts should be encouraged, including through financial support to enable regular marine turtle population monitoring on a sustained basis in order to monitor trends over the long term. Full advantage should be taken of regional expertise, such as through WIDECAST and other entities, in research design and the incorporation of best practices.

Perhaps notable is the fact that the continued take of marine turtles in Lac Bay and elsewhere is unquantified and cannot be ruled out as a survival threat to remnant marine turtle stocks. While some of this take is purposeful, some is described as accidental. Mechanisms to quantify levels of incidental catch of marine turtles should be developed. Measures to reduce or eliminate incidental catch of marine turtles, such as through time–area closures and/or alternative types of gear, should be implemented.

There is a need for greater enforcement capacity and effort, including training, logistical support and a mobile enforcement unit. This capacity should involve outreach and other activities that will engage greater efforts on the part of police for fisheries and broader environmental enforcement. A mutually agreed set of protocols and procedures for these agencies to follow in such circumstances may be an option to consider.

Increased efforts should be made to engage local communities, including fishers, in marine turtle conservation and management. Fisheries extension efforts should be implemented that involve regular exchanges with fishers of information on marine turtles and their conservation and management needs and the participation of fishers in efforts to manage marine turtles so as to enhance compliance with regulations and support for marine turtle conservation. Support directed towards sustainable fishery practices and/or alternative livelihoods should be provided, as relevant and necessary, to assist fishers meaningfully in their efforts to comply with the closure of the marine turtle fishery.

Finally, recognizing the importance of marine turtles and intact marine turtle habitat for the tourism product of Bonaire, efforts should be made to enhance protection and management of nesting and foraging habitats, including through more effective environmental impact assessment as regards infrastructure development and regulation of land-based activities that affect not only terrestrial but also nearshore habitats.

References

- van Dam, R. (2004). Country Report: Bonaire. Invited oral presentation to the 2004 Annual General Meeting of the Wider Caribbean Sea Turtle Conservation Network (WIDECASST), 21 February 2004, San José, Costa Rica.
- den Haring, S.D. and S. Renshoff. (1999). Sea Turtle Conservation Bonaire. *1998 Project Report Part I*. (N.P. Valkering, Ed.). Sea Turtle Conservation Bonaire/Zoological Museum Amsterdam, University of Amsterdam, the Netherlands. 84 pp. + appendices.
- STCB. (2002). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of Marine Turtles of the Lesser Antilles, Central America, Colombia and Venezuela. Completed by Imre Esser, Kitty Handshuh and Kalli de Meyer, Sea Turtle Conservation Bonaire (STCB). Dated 15 September 2002.
- STCB. (2003). Sea Turtle Conservation Bonaire: Progress report to April 2003. 6 pp. www.bonairenature.com/turtles/.

Netherlands Antilles: Curaçao

Introduction

The island of Curaçao lies in the Leeward islands of the Netherlands Antilles. The largest of the Netherlands Antilles islands, with a land area of 444 km², it is also the most populous. It is the centre of government for the Netherlands Antilles and generates income through oil-refining, harbour activities (container movements, drydock facilities), offshore banking and finance, and tourism. The entire coast supports healthy fringing reefs that are best developed along the south coast; there are comparatively few sandy beaches. Lying 10 km to the south-east of the island is the small, uninhabited island of Klein Curaçao; the islet features a long sandy beach that is the oldest documented and most important marine turtle nesting beach of Curaçao (Debrot *et al.*, 2005) and is frequently visited by fishers (Sybesma, 1992).

According to Sybesma (1992), records of marine turtle exploitation in Curaçao date back to the 17th century. Records of the capture of turtles in the Las Aves and Los Roques archipelagos off Venezuela also date back to that time. Sporadic records of turtles processed at the abattoir on Curaçao until 1981 indicate a decline in numbers, from ca. 100 animals per year in the 1950s, to a few tens in the 1970s, and only seven in 1981, the last year for which these data are available. Marine turtles were completely protected by law in Curaçao in 1996. Foraging populations are presumed to benefit from management regimes associated with the Curaçao Underwater Park and Shete Boka National Park, as well as zoning implemented under the Island Development Plan.

Summary of the status of marine turtles in Curaçao

There is not a great deal of information on the status of marine turtles in Curaçao, as there has been no sustained research effort on behalf of these animals. Noting that most beaches in Curaçao had been degraded by tourism development, high visitation, sand-mining or industrial processes, Sybesma (1992) nonetheless found evidence of low-density nesting on north coast beaches by Loggerheads and, on Klein Curaçao, by Green Turtles; “no documented records of nesting [by Hawksbill Turtles] are available for the past decade, although a low level of nesting surely continues”. Debrot and Pors (1995) later confirmed nesting by all three species on seven small,

north-east coast beaches; Boca Braun and Boca Mansaliña were the most heavily used, with 12 and 19 crawls, respectively, counted during daily surveys from 31 March to 26 November 1993. They estimated a reproductively active population of fewer than 10 females in 1993, of all species combined. Several areas of the island, such as at Klein Curaçao, are experiencing noticeable increases in marine turtle presence (A.O. Debrot, CARMABI, pers. comm., 2005). This is proving to be a valuable new tourist product (Debrot *et al.*, 2005).

Occurrence of marine turtles in Curaçao

English common name	Scientific name	Occurrence
Loggerhead	<i>Caretta caretta</i>	N, F
Green Turtle	<i>Chelonia mydas</i>	N, F
Leatherback	<i>Dermochelys coriacea</i>	N, I
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	N, F
Kemp's Ridley	<i>Lepidochelys kempii</i>	A
Olive Ridley	<i>Lepidochelys olivacea</i>	I

Key: N=nesting; F= foraging; I=infrequent; A=absent

Foraging has not been specifically documented, but both Hawksbill and Green Turtles were present and captured in nearshore waters when the harvest was legal. Sybesma (1992) notes that Green Turtles were preferred and comprised the majority of turtles brought to the abattoir during the 1950s and 1970s. A sub-adult (30-kg) Olive Ridley turtle was caught on a hand-line baited with fish, on the north coast of Curaçao in July 1991 (Sybesma and Hoetjes, 1992). Current levels of nesting and foraging by marine turtles in Curaçao are unknown.

Overview of the legal framework for marine turtle management

Laws and regulations relating to marine turtles

The *Rifbeheerverordening Curaçao* (A.B. 1976 no. 48) (Curaçao Reef Management Ordinance) prohibits spear-fishing and the breaking and removal of live coral. According to Sybesma (1992), in 1989, STINAPA—the National Parks Foundation for the Netherlands Antilles, known by the acronym for its Dutch name—proposed to the Island Council the granting of protection to all marine turtles, the Spiny Lobster, and Queen Conch (by means of a concept decree under Article 3 of the Curaçao Reef Management Ordinance). The action was never taken.

The *Eilandelijke Ontwikkelingsplan* (or EOP—Island Development Plan) (A.B. 1995, Nr:36) is a land-use zoning plan that legally designates large tracts of natural coastline as conservation habitat. This places almost full restriction on coastal development and any activity such as biological collection, hunting, digging into the substrate or removal of materials requires a permit.

The *Eilandsbesluit bescherming zeeschildpadden* of 19 June 1996 (A.B. 1996 Nr:8), issued under the *Rifbeheerverordening Curaçao*, confers complete protection on all marine turtles occurring in Curaçao. According to DOAF (2002), the latter law applies only to waters up to 60 m in depth (as the reef zone has been

defined), thus suggesting that these protections do not apply in deeper waters. This omission was to be addressed in revised fisheries regulations covering the full 12-mile zone.

Responsible authorities

STINAPA administers protected areas in Curaçao, including the Curaçao Underwater Park. In 1999, STINAPA merged with its “parent” organization, the CARMABI Foundation. The staff of the Underwater Park obtained enforcement authority in 1983 (Sybesma and van’t Hof, 1989). In addition, the Coast Guard of the Netherlands Antilles and Aruba, Public Prosecutor’s office and Customs have enforcement authority. CITES permits and requests are handled at central government level by MINA, which is part of VSO, in close co-operation with the island’s *Dienst Landbouw, Veeteelt en Visserija* (LVV—the Agriculture, Husbandry and Fisheries Service). The CARMABI Foundation is the CITES Scientific Authority for Curaçao.

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective

Historical records recount extensive marine turtle fisheries in the Netherlands Antilles in former times (Boeke 1907a and b; Eeuwens, 1907). Rebel (1974) provided information on catches of marine turtles in Curaçao, as provided to him in a personal communication from Dr Ingvar Kristensen; these are presented in the table below. Sybesma (1992) presented information from Hermans (1961) on use of marine turtles in Curaçao and noted that this exploitation was so persistent over centuries that Hermans considered it “rather miraculous” that marine turtles survived at all.

Catch of marine turtles (99% Green Turtles, 1% Hawksbill Turtles) in Curaçao, 1949–1981

Year	Number	Year	Number	Year	Number
1949	232	1960	88	1977	(16)
1950	160	1961	64	1978	(31)
1951	133	1962	58	1979	(13)
1952	152	1963	72	1980	(14)
1953	143	1964	54	1981	(7)
1954	140	1965	24		
1955	117 (116)	1966	32		
1956	117 (105)	1967	86		
1957	104	1968	77		
1958	100	1969	17		
1959	105	1970–1976	No data		

Notes: The number of marine turtles killed at the Curaçao abattoir, 1955–1959 (Hermans, 1961) and 1977–1981 (van Buurt, 1984) are in parentheses. It is not clear why the data for 1955 and 1956 differ between sources.

Sources: van Buurt, 1984; Hermans, 1961; Rebel, 1974.

By the mid-20th century, Hermans (1961) reported that most turtles consumed in the island were being taken from Venezuela, probably Islas los Roques. He collected data on the numbers of turtles processed in the Curaçao abattoir—ca. 100 animals per year in the 1950s, declining to a few tens in the 1970s. Green Turtles were generally preferred for consumption, although young Hawksbill Turtles were considered better eating in some areas. In a letter of 29 December 1982 to Fred Berry (US National Marine Fisheries Service), van Buurt (cited in Sybesma, 1992) noted that, at Wacawa, an inner bay on the north coast of Curaçao, “more than 30 Hawksbill Turtles were caught [a few years ago] using a beach seine”. In an effort to address declining stocks, some efforts were made in the 20th century to assess the feasibility of captive-rearing, but these did not go beyond the initial phase.

By 1987, Sybesma reported, there was no longer a directed commercial marine turtle fishery in Curaçao, but turtles were taken quite regularly as by-catch by fishers. There was one specialized dealer on the island who kept the turtles alive until they were sold, but demand was not high. Green and Hawksbill Turtles were caught in roughly even numbers and the two species appear to have been valued equally. Turtle meat and soup were offered at a few restaurants on Curaçao, but consumption was not very high. Finally, there was no demand for eggs.

Recent (since 1992) exploitation

There appear to be no data on the exploitation of marine turtles up to the time that they were fully protected by law in 1996, nor on illegal exploitation since that time. There is no targeted turtle catch and incidental by-catch is described as occasional. According to DOAF (2002), illegal exploitation of marine turtle occurs but is not considered a problem for management. This assessment is echoed by Debrot (pers. comm., 2005), who reports that even though enforcement is far from perfect, it has been effective in that the taking and consumption of turtles have declined drastically in Curaçao to incidental levels since 1996.

International trade

Historical perspective

International trade in marine turtles involving Curaçao appears to have been largely restricted to turtles from Venezuela, imported by fishers from Curaçao who travelled to the Las Aves and Los Roques archipelagos as far back as the 17th century. This trade continued through the preparation phases of the STRAP for the Netherlands Antilles (Sybesma, 1992), which reported some import of turtle meat and shells from Venezuela via Venezuelan fishers who regularly came to Curaçao to sell their catch. The fishers knew these transactions were illegal, as they violated Venezuela’s membership of CITES.

Recent (since 1992) international trade

There is no information concerning international trade in marine turtles or their products involving Curaçao at the present time.

Enforcement issues

There is no evidence of illegal trade or importation of marine turtles or their products and there are no indications that this might constitute any problem. Although there may rare instances of illegal importation by Venezuelan

fishers, they know that this is illegal and that Customs officials and the Coast Guard are on alert for such incidences.

Debrot and Nagelkerken (2000) have found high levels of public support for marine turtle protection among coastal user groups such as divers, boaters and even fishers (90 ±6%) who, until 1996, could legally take and kill marine turtles. The wide availability of wireless telephones has further made it particularly easy for the public to report marine turtle violations to the authorities rapidly and has increased the risk of prosecution (B. Leysner, Curaçao Underwater Park Manager, pers. comm., 2005).

Marine turtle management

Management of exploitation

Prior to the prohibition on marine turtle exploitation enacted in 1996, no measures were in place to ensure that traditionally unregulated levels of exploitation would not result in the depletion and decline of local marine turtle populations.

Species research and conservation

The CARMABI Foundation, founded in 1955, was the first institution in Curaçao involved in efforts to elucidate the status of marine turtles in Curaçao and elsewhere in the Netherlands Antilles, first through the work of Hermans (1961), and later in the mid-1980s, through collaborative efforts with WIDECAS. These efforts focused on information-gathering and consultation throughout the Netherlands Antilles, for preparation of the Netherlands Antilles STRAP, published by UNEP and WIDECAS (Sybesma, 1992).

The NGO Reef Care Curaçao (RCC) has been working since 1992 on nature conservation and education in Curaçao, with a main focus on engaging participation by volunteers. A turtle working group has been operational since 1993 and has involved divers, fishers and tourists. Despite periodic observations of successful nesting or hatching activity, regular beach monitoring by RCC volunteers of nine beaches along the south-western coast from May to November 1993 showed no evidence of nesting; Debrot and Pors (1995) speculate that this “may be related with the long-time intensive recreational and artisanal use of these wave-sheltered beaches”. Nevertheless, marine turtle nesting on these beaches appears to be on the rise (Debrot *et al.*, 2005). RCC has developed a marine turtle sighting form and identification sheet for divers to report sightings.

During the eight-month nesting season in 1993, rangers of the Christoffel National Park conducted daily nest patrols of beaches most likely to be suitable for nesting along the western sector of the north-east coast, “an area indicated as a traditional nesting place by local elders”. They reported 42 crawls, including nine confirmed nests, on seven beaches by Loggerheads (primarily), Hawksbill and Green Turtles. All eggs were reburied along the gully walls in areas less likely to be lost to erosion; ca. 50% of all eggs safely completed their incubation and released hatchlings (Debrot and Pors, 1995). Since then, nesting in the park, though not quantitatively monitored, has been verified every year (W. Sambo, pers. comm. to A.O. Debrot). In 2005, the first record of nesting by a Leatherback was documented for Curaçao (Debrot *et al.*, 2005). Williams *et al.* (1994) provide data on fibropapilloma incidence in Green Turtles, while Nagelkerken *et al.* (2003) provide insights into swimming behaviour and dispersal patterns in headstarted Loggerheads, but all in all, little directed research has been done on marine turtles in Curaçao.

Habitat conservation

The Curaçao Underwater Park was established in 1983 along the eastern tip of the island and includes some of Curaçao's finest reefs. The seaward boundary is the 60-m depth contour and the high-water mark and the total surface area of the park is 600 ha of reef and 436 ha of inner bays (Sybesma and van't Hof, 1989). The marine turtle nesting sites in the north of the island are protected in the Shete Boka ("Seven Inlets" in Papiamentu) National Park. Large tracts of natural coastline, including in this park, are legally designated as conservation habitat by means of the EOP (see Debrot *et al.*, 2005). The primary threat to these nesting beaches, reported to be "some of the most important remaining sea turtle nesting habitat of the island" (Sybesma, 1992), is sand-mining (illegal at all times), which has reduced some beaches to rubble. Debrot and Pors (1995) suggest that more aggressive, habitat-related law enforcement is needed, along with regular beach clean-ups, protection against "excessive recreational use" and the placement of physical barriers to hinder vehicle traffic. All of these recommendations have been in full implementation in the Shete Boka National Park since 1993, where tar and litter contamination are high (Debrot *et al.*, 1995 and 1999) and require constant attention. Debrot *et al.* (2005) have recently identified several additional beaches that require protection.

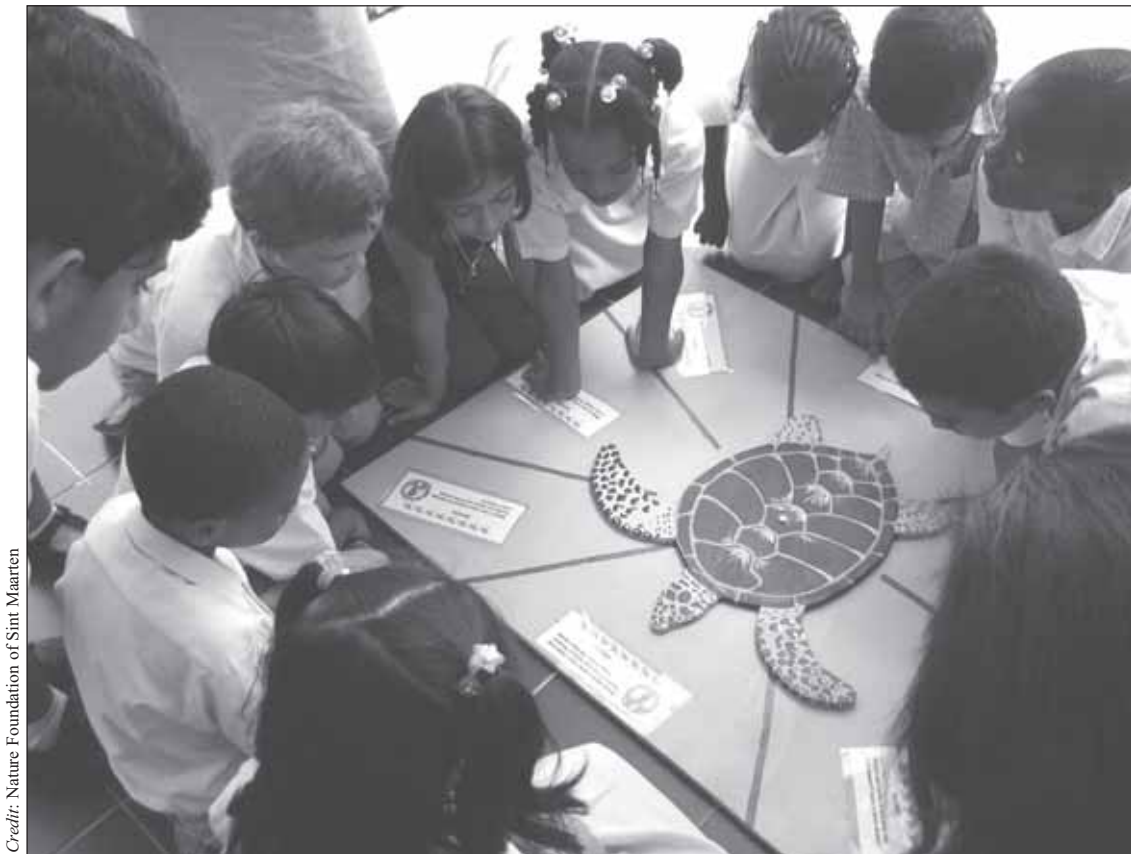
All proposed developments or activities in designated conservation areas in Curaçao are formally reviewed by CARMABI at the permitting stage.

Education and public awareness

The RCC Sea Turtle Monitoring Project, initiated in 1993, has included a range of awareness activities, including: public seminars, lectures and workshops; interviews with fishers, nesting-beach clean-ups; production and distribution of a marine turtle flyer; policy and legislation; radio broadcasts and publications, such as a colouring book and an information flyer on Klein Curaçao (van Veghel-Hellmund, 1994). The Nature and Environmental Education Section (NME) of the CARMABI Foundation succeeded several years ago in integrating nature education into primary and secondary schools in Curaçao, involving more than 15 000 school children annually. It has been asked—and has received funding from DCNA—to help set up similar educational programmes on the other islands of the Netherlands Antilles in 2006. At present, 60 sixth-grade classes (ca. 1800 children) visit the Shete Boka Park annually for marine turtle sighting excursions. The NME of the CARMABI Foundation also has a fair selection of audio visual materials on marine turtles that school children and other interested parties can borrow for (class) presentations.

Constraints to marine turtle conservation and management

The major constraint to marine turtle management and conservation in Curaçao is inadequate law enforcement. While the Underwater Park has boats at sea daily, enforcement patrols occur only once a week owing to budgetary constraints. The Coast Guard patrols 24 hours every day and makes regular arrests but is necessarily limited because of its other obligations. Enforcement of land-use zoning legislation by the Department of Urban Planning (known as DROV) is "fair to good", despite the shortage of enforcement officers (B. Leysner, Curaçao Underwater Park Manager, *in litt.*, 7 September 2005). Continued work on public awareness among fishers will help to prevent the consumption of incidentally caught marine turtles. Increased funding and better legislation regarding the Underwater Park will, it is hoped, result in a greater effort towards patrolling it.



Credit: Nature Foundation of Sint Maarten

School children in the Netherlands Antilles learn about marine turtles through play.

Summary and recommendations

1. First and foremost, island-level legislation should be adopted including better regulations with regard to the marine park and its management, enabling the management organization to levy user fees in order to ensure a better financial basis for the management.
2. More research on the marine turtles around Curaçao should be undertaken. At present, data are lacking on numbers of turtles foraging around the island, numbers of turtles using the protected beaches, the location of important foraging grounds, and on eventual nesting destinations of the juvenile turtles foraging around the island (discernable, for example, by investigation of genetic origins).
3. Sufficient resources should be secured to enable regular marine turtle population monitoring on a sustained basis, such as by STINAPA park rangers, so as to be able to monitor trends over the long term.
4. Public awareness campaigns about marine turtles and the need to protect them should be continued and expanded and the participation of community volunteers encouraged. Given the very low numbers of marine turtles believed present in Curaçao and the paucity of information on their population abundance, trend or status, even low levels of illegal exploitation, including through incidental mortality in fishing operations, might constitute a threat to population recovery, such that every effort should be made to engage the public further in conservation efforts.

5. Use should be made of regional resources available to assist in capacity-building, including those accessible through WIDECAS (e.g. tags and basic field equipment, database management software, educational materials, off-site training and mentoring programmes, assistance with project development and fund-raising).

Additional references

- Boeke, J. (1907a). Iets over de visscherij op Bonaire. *Neerlandia* 11(12):206–207.
- Boeke, J. (1907b). *Rapport betreffende een voorloopig onderzoek naar den toestand van de visscherij en de industrie van zeeproducten in de kolonie Curaçao*. F.J. Belinfante, s'Gravenhage, The Netherlands.
- van Buurt, G. (1984). National Report for the Netherlands Antilles. Pp. 329–336. In: P. Bacon *et al.* (Eds). *Proceedings of the First Western Atlantic Turtle Symposium, San José, Costa Rica, July 1983*, III, Appendix 7. University of Miami Press.
- Debrot, A.O, J.E. Bradshaw and A.B. Tiel. (1995). Tar contamination on beaches in Curaçao, Netherlands Antilles. *Marine Pollution Bulletin* 30(11):689–693
- Debrot, A.O. and I. Nagelkerken. (2000). User perceptions on coastal resource state and management options in Curaçao. *Revista de Biología Tropical* 48 Supplement 1:95–106.
- Debrot, A.O. and L.P.J.J. Pors. (1995). Sea turtle nesting activity on northeast coast beaches of Curacao, 1993. *Caribbean Journal of Science* 31(3–4):333–338.
- Debrot, A.O, A.B. Tiel and J.E. Bradshaw. (1999). Beach debris in Curaçao, Netherlands Antilles. *Marine Pollution Bulletin* 38(9):795–801.
- Eeuwens, P.A. (1907). Schildpadden. *Neerlandia* 11(12):207–210.
- Nagelkerken, I., L.P.J.J. Pors and P. Hoetjes. (2003). Swimming behaviour and dispersal patterns of headstarted Loggerhead turtles *Caretta caretta*. *Aquatic Ecology* 37(2):183–190.
- Sybesma, J. and P.C. Hoetjes. (1992). First record of the Olive Ridley and of nesting by the Loggerhead turtle in Curaçao. *Caribbean Journal of Science* 28(1–2):103–104.
- Sybesma, J. and T. van't Hof. (1989). *Guide to the Curaçao Underwater Park*. Netherlands Antilles National Parks Foundation (STINAPA), Curaçao. IV + 67 pp.
- van Veghel-Hellmund, I. (1994). Foundation Reef Care Curaçao Master Plan. June 1994. Reef Care Curaçao. 47 pp. Unpublished.
- Williams, E.H., L. Bunckley-Williams, E.C. Peters, B. Pinto-Rodriguez, R. Matos-Morales, A.A. Mignucci-Giannoni, K.V. Hall, J.V. Rueda-Almonacid, J. Sybesma, I.B. de Calventi and R.H. Boulon. (1994). An epizootic of cutaneous fibropapillomas in Green Turtles *Chelonia mydas* of the Caribbean: part of a panzootic? *Journal of Aquatic Animal Health* 6(1):70-78.

Netherlands Antilles: Saba

Introduction

One of the northernmost of the Windward Islands and totalling 13 km² in land area, the island of Saba is the smallest of the five islands of the Netherlands Antilles. Saba is a steep, dormant volcano surrounded by well-developed fringing reefs. It has no permanent beaches. Both Saba and nearby Sint Eustatius are close to the Saba Bank, a shallow underwater bank (ca. 2200 km²) that incorporates some well-developed coral reefs and algae fields. Both these habitats serve as important feeding grounds for Green Turtles and Hawksbill Turtles (Sybesma, 1992).

The waters surrounding the entire island of Saba to the 60-m depth contour have been protected since 1987, when the Saba Marine Park—now the Saba National Marine Park (SNMP)—was established.

Summary of the status of marine turtles in Saba

There is very little information available on the current status of marine turtles in Saba. Hawksbill and Green Turtles are the most common species and forage in habitats surrounding the island. Sybesma (1987) reported that Hawksbill Turtles were most regularly seen and that an average of one turtle sighting per three dives had been reported by the marine park manager and the two dive operators. No more updated information could be located in the course of this review.

Occurrence of marine turtles in Saba

English common name	Scientific name	Occurrence
Loggerhead	<i>Caretta caretta</i>	I
Green Turtle	<i>Chelonia mydas</i>	N?, F
Leatherback	<i>Dermochelys coriacea</i>	N?
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	N, F
Kemp's Ridley	<i>Lepidochelys kempii</i>	A
Olive Ridley	<i>Lepidochelys olivacea</i>	A

Key: N=nesting; F= foraging; I=infrequent; A=absent

Despite the absence of permanent beaches on the island, residents of Saba insisted to Meylan (1983) that Hawksbill and Green Turtles nested on rare occasions at Cave of Rum Bay, Wells Bay and Fort Bay. Van Buurt (1984) reported nesting at Concordia Bay during July and August. One octogenarian (cited in Sybesma, 1992) recalled the nesting of a Leatherback at Fort Bay “many years ago”. The Saba Conservation Foundation (SCF)/SNMP (D. Kooistra, Director, *in litt.*, 25 October 2004) reports recent marine turtle sightings, including nesting activity: in 2003, ca. 80 recently hatched Hawksbill Turtles found trapped between rubble in Cove Bay were rescued by locals and released to the sea, while in October 2004, one or more Hawksbill Turtles came ashore several times at Cove Bay in an attempt to lay eggs; seven pits were dug, but owing to the rocky substrate, it is not clear whether eggs were laid. Also in October 2004, two male Loggerheads and one female were spotted just off the harbour at Fort Bay, probably mating.

The transboundary movements of marine turtles occurring in Saba are not known.

Overview of the legal framework for marine turtle management

Laws and regulations relating to marine turtles

Until April 2001, when the National Nature Conservation Ordinance was fully implemented and, *inter alia*, protected marine turtles, exploitation of marine turtles was regulated under Article 5 of the *Eilandsverordening Marien Milieu Saba Ab. 1987 No. 10* (Saba’s Marine Environmental Ordinance (MEO)) of 25 June 1987, which:

- prohibits the capture of marine turtles by foreigners (defined as non-residents of Saba (D. Kooistra, *in litt.*, 25 October 2004));
- restricts the catch of turtles to two animals per person, per year;
- prohibits the capture of female turtles from April to November;
- prohibits the disturbance of nests and the removal of eggs; and
- requires that all turtles caught be reported to the Saba Marine Park Authorities.

These provisions of the MEO have never been repealed (DOAF, 2002) but are considered to have been superseded by protections afforded by the National Nature Conservation Ordinance.

The MEO provides for violations of the Ordinance to be subject to penalties of a monetary fine not to exceed a maximum of 5000 Netherlands Antillian guilders (ANG5000) and/or one month in gaol and confiscation of the equipment (spear gun, car, boat, etc.) used in committing the offence (Articles 17 and 20). In addition, the MEO (Article 19) provides that, in addition to law enforcement officers as designated in the Civil Code, the persons in charge of managing the marine park and other persons nominated as such by the Island Resolution Containing General Provisions (IRCGP) may be charged with law enforcement.

Responsible authorities

The SCF oversees operation of the SNMP. Although the MEO provides for the SNMP Manager to be conferred with special police enforcement powers, this authority must be granted by the Lt. Governor (head of the island police) and he has declined to take this step, despite several requests from the marine park manager during the past decade (D. Kooistra, *in litt.*, 25 October 2004).

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective

Meylan (1983) noted that, historically, turtles played a more prominent role in the culture of Saba. At the beginning of the century, fishers from Saba were left for a period on Aves Island (Isla de Aves, Venezuela) to turn over turtles as they emerged to nest and often returned with as many as 50 turtles. By the 1980s, according to Sybesma (1987), marine turtle fishing had become “nearly non-existent”, with fewer than a dozen full-time fishers catching turtles opportunistically for their own consumption. However, spear-fishing of turtles had become popular with the local SCUBA club; Meylan (1983) estimated that over 20 turtles were taken per year in this manner.

Recent (since 1992) exploitation

There have been no reports of marine turtle landings in the past decade made to authorities of the marine park. The last turtle known to have been caught (accidentally)—more than 10 years ago—was bought from the fisher and released (D. Kooistra, *in litt.*, 25 October 2004).

International trade

Historical perspective

Other than Meylan's (1983) report about the capture of marine turtles by Saba fishermen at Aves Island, there is no evidence of former international trade in marine turtles involving Saba. Sybesma (1992) indicated that a small tortoiseshell souvenir trade reported by Meylan (1983) had disappeared.

Recent (since 1992) international trade

There is no information to indicate that there is any international trade in marine turtles involving Saba.

Enforcement issues

The extent of illegal take of marine turtles in Saba is unknown. There have been no reports of illegal activities in relation to marine turtles (D. Kooistra, *in litt.*, 25 October 2004).

Marine turtle management

Management of exploitation

There has been no stock assessment in the usual sense for any species of marine turtle in Saba. There is no history of active management of marine turtles and no data to indicate the extent to which historical levels of exploitation have resulted in population declines. The restrictions on the take of marine turtles set out in the MEO of 1987 protected nesting females and nests and limited the number of turtles that could be taken and the reporting system that it required was thought to work "reasonably well" (Sybesma, 1992), such that few marine turtles are believed to have been landed since the Ordinance was enacted. Although hard data are lacking, this information would appear to indicate that the ordinance was effective in reducing marine turtle exploitation, including those animals that Meylan (1983) reported were being taken by spear-fishers. Marine turtles are now completely protected and there appears to be no evidence that they are exploited illegally, thus suggesting that any management issues currently relate to indirect impacts, in particular those that are habitat-related.

Species research and conservation

Recent efforts to improve knowledge of marine turtles in Saba were initiated in 2003, when voluntary sighting forms were introduced for use by divers, who could complete them and return them to the SCF/SNMP. Because of a lack of staff, no other monitoring has been done. However, the advent of an environmental education officer, provided through the newly founded DCNA to provide assistance to the nature conservation authorities of the three Windward Islands of the Netherlands Antilles (Sint Maarten, Saba and Sint Eustatius), was expected to enable more collection of marine turtle data, in addition to public awareness and outreach (D. Kooistra, *in litt.*, 25 October 2004).

Habitat conservation

With only isolated accounts of nesting, the protection of critical foraging habitat is of most concern in Saba. The Saba Marine Park, established in 1986 and fully operational since 1987, encompasses the island and incorporates the high-water mark to the 60-m (200-foot) depth contour, including the seabed and overlying waters. There are no habitat conservation initiatives designed specifically for marine turtles, but the species are presumed to benefit from a zoning system that provides for conservation and sustainable use. To this end, for example, a system of mooring buoys facilitates diving and prevents damage to corals. The Saba Marine Park (now the SNMP) was the first self-financed marine park in the world. Since early 1993, its operation has been dependent on donations, grants, souvenir sales and visitor fees (Kooistra, 1998). In 1999, the Park received the status of National Park.

Education and public awareness

Public awareness activities in relation to marine turtles and broader environmental issues are primarily conducted through the staff of the SCF/SNMP and include interpretation, weekly educational programmes and outreach to community stakeholders (Kooistra, 1998). Weekly snorkel trips conducted for the local youth of Saba since 1998 have proved very successful in reducing anxiety about the ocean and encouraging conservation, awareness and respect for the SNMP. In 2004, the SCF's marine and terrestrial educational activities were afforded more structure through the Scouts of Saba (D. Kooistra, *in litt.*, 25 October 2004).

Because of a lack of qualified staff for education and outreach activities on all three of the Windward Islands, it was decided to hire an environmental education officer jointly for all three marine parks as part of a year-long information campaign for the protection of marine turtles and their habitats in Sint Maarten, Saba, Sint Eustatius and Bonaire, launched in November 2004 as an initiative of DCNA (D. Kooistra, *in litt.*, 25 October 2004).

Constraints to marine turtle conservation and management

Marine turtle conservation and management in Saba face a range of constraints. First and foremost, these activities are largely dependent on the SCF, an NGO that operates wholly on the basis of funds that it raises from fees, marketing and external fundraising and whose primary responsibilities include the challenges of managing both the biodiversity and the impacts, anthropogenic and other, on the SNMP. That marine park personnel have not yet been granted authority to enforce the laws supporting the management and protection of the park, including marine turtles, is an additional constraint, compounded by the lack of back-up by the other authorities in cases of violations. Finally, although the "turtles may be totally safe around Saba today" through enforcement and other efforts, their long-term status and that of the surrounding reefs "is uncertain and depends too much on the local political environment" (D. Kooistra, *in litt.*, 25 October 2004).

Summary and recommendations

Although Saba is reported to have a long history of marine turtle exploitation, this exploitation appears to have ceased at least a decade ago, possibly as a result of the 1987 protections afforded through the establishment of the Saba Marine Park and restrictions on marine turtle exploitation enacted through the National Nature Conservation Ordinance. The current view of residents on Saba recognizes the importance of marine turtles for visiting divers (D. Kooistra, *in litt.*, 2004), rather than, it would appear, for local consumption or use. That said,

and in anticipation of further decentralization of natural resource and environmental management in the Netherlands Antilles, the marine turtle provisions of the MEO should be revised to confer the full legal protection afforded under the National Nature Conservation Ordinance.

That so little information exists on the status of marine turtles both nesting and foraging in Saba must be considered an impediment to their management over the long-term. However, efforts to increase that knowledge, in particular as regards foraging turtles, are time-consuming and demanding in the form of human, financial and technical resources, which are currently lacking. Full advantage should be taken of regional resources, expertise and training available through WIDECAS and other entities in designing and implementing a sampling/sightings programme to census the status of foraging marine turtle populations in a manner sufficient to inform policy over the long term.

There is a clear need for far greater political support for environmental protection efforts (D. Kooistra, *in litt.*, 2004) from within the government. Despite the absence of apparent threats, confusions regarding the natural resource use restrictions deriving from three layers of government in Saba—as with the other islands of the Netherlands Antilles—and regarding enforcement authorities for these is impeding the effectiveness of environmental statutes. In addition, inadequate effort on the part of government to explain and justify the rationale for certain environmental statutes (e.g. restrictions on fishing) (briefings are primarily conducted by the NGO SCF) and to enforce them undermines support for and compliance with these statutes by the public.

Finally, failure to confer enforcement authority on the manager of the marine park, as provided for in the MEO, results in less effective law enforcement for marine turtles and other environmental protection measures, as in many instances, the police are unfamiliar with and uninterested in the provisions of the MEO (D. Kooistra, *in litt.*, 25 October 2004).

Additional references

Kooistra, D. (1998). Eco-tourism in Saba. *Islander Magazine* 5, January 1998. www.islandstudies.org/islander/issue5

Netherlands Antilles: Sint Eustatius

Introduction

Lying approximately 58 km south-west of Sint Maarten and 27 km south-east of Saba and totalling only 21 km² in land area, Sint Eustatius (referred to locally as “Statia”) is the second-smallest of the five islands constituting the Netherlands Antilles. Along with Saba, Sint Eustatius lies close to the Saba Bank, a shallow underwater bank that has well-developed coral reefs and algae fields, habitats that serve as important feeding grounds for Green Turtles and Hawksbill Turtles. The island has some sandy beaches and the south-west coast has well-developed coral reef ridges, interspersed with sandy channels; some shallow coral patches occur at Jenkins Bay and Kay Bay. On the Atlantic side, there is some coral development on nearshore steep slopes; in deeper water, coral patches and ridges occur in a mixed coral, sponge and algae community (Sybesma, 1992).

At the time of publication of the STRAP for the Netherlands Antilles (Sybesma, 1992) by WIDECAS and the United Nations Caribbean Environment Programme, there were no regulations in place in Sint Eustatius restricting the take of marine turtles and little, if any, management activity on their behalf. However, the STRAP indicated that consumption of turtle meat was at low levels, that there was no local tortoiseshell industry and that the trade in marine turtles was “not likely” to be “a problem” on the island.

There have been significant advances in marine turtle conservation and management in Sint Eustatius since 1992. Marine turtles, their nests and nesting areas are now considered fully protected under the Netherlands Antilles National Nature Conservation Ordinance. The Sint Eustatius Marine Park (known as Statia Marine Park), which incorporates the waters surrounding Sint Eustatius from the high-water mark to the 30-m depth contour, was established in 1996 and came under active management by the non-governmental Sint Eustatius National Parks Foundation (STENAPA) in 1998. The island’s most important nesting ground, Zeelandia Beach, was declared protected in October 2001. Finally, thanks to the efforts of STENAPA, and with support and assistance from WIDECAS, a range of marine turtle monitoring and conservation activities have been initiated in recent years.

Despite a great deal of progress over the past decade in enhancing marine turtle conservation and management in Sint Eustatius, the recovery of populations faces constant challenges, including occasional illegal take of turtles and turtle eggs and degradation of nesting habitat by sand-mining, driving on the beach, the accumulation of beach debris, and other factors. The greatest challenge, however, appears to be the tenuous financial circumstances faced by STENAPA (Anon., 2003), which, as an NGO, depends on external funding to support its work. As the only entity in Sint Eustatius that is implementing any efforts on behalf of marine turtle conservation and management, STENAPA must remain viable if these activities are to continue.

Summary of the status of marine turtles in Sint Eustatius

Four marine turtle species have been documented in the waters of Sint Eustatius: the Loggerhead, Green Turtle, Leatherback and Hawksbill Turtle (see table below). Of these, the Green Turtle, Leatherback and Hawksbill Turtle are known to nest on the island. The main foraging areas for these species are not yet known. Zeelandia Beach on the eastern shore is the highest-density nesting beach; in 2003, a minimum of 7–18 turtles representing three different species nested there (Le Scao and Esteban, 2004).

Occurrence of marine turtles in Sint Eustatius

English common name	Scientific name	Occurrence
Loggerhead	<i>Caretta caretta</i>	F
Green Turtle	<i>Chelonia mydas</i>	N, F
Leatherback	<i>Dermochelys coriacea</i>	N
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	N, F
Kemp's Ridley	<i>Lepidochelys kempii</i>	A
Olive Ridley	<i>Lepidochelys olivacea</i>	A

Key: N=nesting; F= foraging; I=infrequent; A=absent

From interviews conducted with local fishers who had been active decades ago, Le Scao and Esteban (2004) concluded that the numbers of nesting turtles and turtles found at sea had decreased over the past century.

Overview of the legal framework for marine turtle management

Laws and regulations relating to marine turtles

The *Marien Milieu Verordening Sint Eustatius* (Marine Environment Ordinance of Sint Eustatius) AB 1996/03 of 25 March 1996 set, in Article 6, limits on the take of marine turtles in the island's territorial waters, namely: a limit of two turtles per person, per year; a seven-and-a-half-month closed season (1 April–10 November) for female turtles; a requirement to report turtle catches to the manager of the Statia Marine Park prior to being allowed to kill them; and protection of turtle nests and eggs at all times. Penalties for violating the Ordinance are a maximum fine of 5000 Netherlands Antillian guilders (ANG5000) or a maximum of one month in gaol.

The provisions of Article 6 have been superseded by the National Nature Conservation Ordinance of the Netherlands Antilles, enacted in 2001, which confers complete protection on marine turtles and their nesting areas (STENAPA, 2002).

Responsible authorities

In 1996, the Sint Eustatius government delegated to STENAPA, the only environmental NGO in Sint Eustatius, responsibility for managing the national and marine parks of the island, including, it would appear, the provisions that apply to marine turtles. Additional legislation provides for the designation of STENAPA as a “non-governmental lawperson” to enforce the marine environment regulation. STENAPA expects to obtain this “special police status” in the near future (R. Le Scao, Co-ordinator, STENAPA Sea Turtle Conservation Programme, *in litt.*, 16 March 2004).

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective

Meylan (1983) reported that in Sint Eustatius turtles were killed on the nesting beach whenever they were encountered. Sybesma (1992) indicated no knowledge of the extent to which this practice continued. However, he noted that the consumption of marine turtle meat was very low and strictly local, that restaurants were very seldom offered turtle meat by fishers (one “gourmet” restaurant owner informed that he had only been approached to buy turtle twice in the previous five years—Sybesma, 1987), that there was no local tortoiseshell industry and, finally, that trade in marine turtles was “not likely” to be “a problem” on the island.

Recent (since 1992) exploitation

Since implementation of the National Nature Conservation Ordinance, in 2001, the take of marine turtles has been considered illegal in Sint Eustatius. According to STENAPA (2002), there are no statistics available on the extent

of illegal exploitation. Information on illegal fishing is only “hearsay”, as it is widely known that such fishing is illegal and, as such, is not reported. Restaurants know that it is illegal to offer marine turtle meat and so there is no commercial market (STENAPA, 2002).

STENAPA (2002) reports that there is documented evidence that local Statians continue to poach marine turtle eggs, believed to have aphrodisiacal properties, from nests. These are generally shared between family and friends—few are sold. Only one poaching incident was recorded by STENAPA in 2003 (Le Scao and Esteban, 2004), that of a nest poached in May at the northern end of Zeelandia Beach.

International trade

Historical perspective

Neither Meylan (1983) nor Sybesma (1992) presented information on international trade in marine turtle products involving Sint Eustatius. Le Scao and Esteban (2004) learned from interviews with Statian fishers that, in the 1920s and 1930s, a Frenchman from Saint Barthélemy hunted turtles in the waters of the island and sold them both in Sint Eustatius and abroad.

Recent (since 1992) international trade

There is no evidence of (illegal) international trade in marine turtles involving Sint Eustatius and no information to suggest that it is occurring. If international trade in marine turtles were occurring, STENAPA (2002) suggested that it would be more likely to involve Sint Maarten than Sint Eustatius and also questioned whether there might be take of marine turtles by fishers from neighbouring Saint Kitts, but noted there is no direct evidence of this.

Enforcement issues

Sybesma (1992) reported a lack of enforcement of environmental regulations in the Netherlands Antilles and this was still considered a problem in Sint Eustatius in 2002 (STENAPA, 2002). However, significant progress in environmental enforcement appears to have been made in the past few years as, according to Le Scao (*in litt.*, 16 March 2004), the police are engaged, responsive to reports of violations and providing increasing assistance to STENAPA. In addition, STENAPA is collaborating with the police to obtain “special police status”; once sufficient funding is secured, STENAPA’s manager and assistant manager will undergo training to discharge this new authority (R. Le Scao, *in litt.*, 16 March 2004).

STENAPA (2002) reported that poaching of turtle nests continued but considered illegal sand-mining to be a greater threat to marine turtles. Le Scao (*in litt.*, 16 March 2004) reports that sand-mining is now rare and actively controlled by the police. One Leatherback nest was destroyed directly by sand-mining on Zeelandia Beach in 2003 and was reported to the police (Le Scao and Esteban, 2004). STENAPA report “reason to believe” that their presence on the beach at night has had a positive effect in limiting poaching of marine turtles and eggs and preventing ‘joyriding’ and sand-mining (Le Scao and Esteban, 2004). This suggests a need to ensure that this presence continues.

Marine turtle management

Management of exploitation

As is the case throughout the Netherlands Antilles, there has been no stock assessment in the usual sense for any species of marine turtle in Sint Eustatius. Prior to population monitoring initiated by STENAPA in 2001 there was no active management of marine turtles and there are no data to indicate the extent to which historical levels of exploitation have resulted in population declines. The restrictions established in 1996 on the take of marine turtles in Sint Eustatius can be considered only rudimentary at best and inadequate in guaranteeing any reduced impact on marine turtle populations. Further, the absence of any statistics on the take of marine turtles from the legal fishery that operated prior to 1998 indicates that there was no monitoring of the fishery so that it could inform management. Hence, the complete protection of marine turtles through the National Nature Conservation Ordinance of the Netherlands Antilles, in the absence or any revisions to the existing exploitation regime, should be seen as a positive step for conservation and management.

Species research and conservation

Research and conservation efforts for marine turtles have only recently been initiated in Sint Eustatius. Through the efforts of STENAPA, and based on best practices and standard guidelines articulated by WIDECAST, the Sint Eustatius Sea Turtle Conservation Programme began in 2001. The objectives of this programme include: increasing the marine turtle nesting population; increasing hatchling survival rates, collecting data on nesting, hatching and other activities; fully protecting nesting habitats; monitoring foraging habitats; education of local residents and tourists; and encouraging research to improve conservation (Le Scao and Esteban, 2004). STENAPA is assisted in these efforts by volunteers from the local snorkel club and Junior Ranger Club and from two international volunteer programmes—the STENAPA Internship Programme, begun in 2001, and the UK-based Working Abroad Programme, which commenced in 2003 (Le Scao and Esteban, 2004). Some research results have recently been published (Debrot *et al.*, 2005).

Population monitoring studies are under way at Zeelandia Beach, one of the major nesting sites for Leatherbacks and Hawksbill Turtles. With tags and training from the WIDECAST Marine Turtle Tagging Centre in Barbados, flipper tagging began for the first time in 2002 (STENAPA, 2002). In addition, in December 2003, STENAPA initiated underwater



Credit: C.L. Campbell

Relocating Hawksbill Turtle eggs, in Nicaragua, in an attempt to assure their safety.

monitoring of foraging turtles, with the assistance of the three dive shops in Sint Eustatius. A form is completed for each marine turtle sighting by staff or customers and the data are collected and entered into a database (Le Scao and Esteban, 2004).

Finally, in addition to the monitoring of nesting activity through day and night patrols during the nesting season and through measuring and tagging turtles, the STENAPA programme involves the relocation of nests and assistance to hatchlings (Le Scao and Esteban, 2004). Annual reports are produced and recommendations made regarding future management needs.

Habitat conservation

The Statia Marine Park, defined as the waters surrounding Sint Eustatius from the high-water mark to the 30-m depth contour, was designated in 1996 through the *Marien Milieu Verordening Sint Eustatius*, with the objective of preserving and managing the island's marine resources for the benefit and enjoyment of the people and future generations. During 1997, infrastructure (moorings and visitor centre) and a management plan were put in place. Active management of the park commenced in January 1998. The Marine Park consists of two reserves, or no-take zones, Jenkins Bay in the north and van Gallows Bay in the south, and has over 30 moored and protected dive sites.

In an effort to address the effects of sand-mining on marine turtle nests and nesting habitat, and citing huge losses of sand, the disruption of native vegetation, and a diminished beach profile, the Island Council, under the authority of the local marine environment regulation and the National Nature Conservation Ordinance (which protects marine turtle nesting areas), permitted STENAPA, in 2001, to place a "No Sand Mining" sign at Zeelandia Beach, which is the most important marine turtle nesting beach of the island, particularly for the Leatherback and the Green Turtle (Debrot *et al.*, 2005). This ended the use of heavy machinery, which was destroying turtle nests. In 2003, joy-riding on the beach became a problem and, at the request of STENAPA, the island government agreed in mid-2003 to prohibit driving on the beach (STENAPA, 2002).

The Sea Turtle Conservation Programme also involves beach-mapping to monitor beach erosion and sand movement and identify nest locations and beach clean-ups, with assistance from local residents and a US-based educational programme, Broadreach (Le Scao and Esteban, 2004).

Education and public awareness

STENAPA has been involved in a range of activities aimed at educating local residents and tourists about marine turtle conservation and involving them in their conservation efforts. A leaflet entitled "Guidelines for Visitors to the Saint Eustatius Sea Turtle Monitoring Programme at Zeelandia Beach", explains that STENAPA started its monitoring programme in 2001, that "all sea turtles and their habitats are protected" in the Netherlands Antilles and that "the Marine Park is part of the Wider Caribbean Sea Turtle Conservation Network and follows WIDECAST protocols to carry out monitoring of sea turtles nesting on Statia". All visitors and guests to the programme receive the leaflet, must be accompanied by a trained guide on the beach and are asked to follow specific guidelines such as those regarding lighting (N. Esteban, Manager, STENAPA, *in litt.*, 13 April 2005).

STENAPA gives monthly presentations that include marine turtle conservation and biology at local schools (Le Scao and Esteban, 2004). In August 2003, they extended their outreach to the largest local company employing

local residents—they organized a series of four presentations on marine turtle monitoring. The Snorkel Club and Junior Ranger Club programmes run by STENAPA provide after-school activities for children aged eight and over (R. Le Scao, *in litt.*, 16 March 2004).

Constraints to marine turtle conservation and management

Taking into account the constraints articulated in the **Introduction** *Netherlands Antilles*, all of which are important for Sint Eustatius, it is noteworthy as well that there would be no marine turtle conservation or management in Sint Eustatius, were it not for STENAPA. However, as an NGO with a range of environmental mandates, STENAPA's marine turtle activities depend on external financial support for essential equipment, such as for night patrols, additional staff training and increased manpower to enhance supervision of crews undertaking night patrols (Le Scao and Esteban, 2004). With a full-time programme co-ordinator and more and better-equipped, better-trained and better-supervised volunteers, STENAPA will be able to increase its monitoring and data-collection activities.

Summary and recommendations

Since marine turtles were conferred complete legal protection in 2001, there has been steady progress for marine turtle conservation in Sint Eustatius, through the efforts of STENAPA, assisted by the island government, local residents, international volunteers and Caribbean regional expertise and assistance. These efforts are increasing the knowledge of marine turtles, enhancing their protection and engaging an increased number of constituents in support for marine turtle conservation in the island.

In an effort to secure and expand these achievements, the following recommendations are offered:

1. In anticipation of further decentralization of natural resource and environmental management responsibilities to island governments, the *Marien Milieu Verordening Sint Eustatius* should be revised to bring the marine turtle provisions in line with the full protections afforded through the National Nature Conservation Ordinance.
2. The essential role of STENAPA in marine turtle management, outreach and conservation efforts in Sint Eustatius should be recognized through increased funding and logistical support, such as might be possible through a co-management arrangement with local government and more support from national and international funding sources.
3. Mechanisms to quantify levels of incidental catch of marine turtles should be developed. Measures to reduce or eliminate incidental catch of marine turtles, such as through time–area closures and/or alternative types of gear, should be implemented, as necessary.
4. There is a need for greater enforcement capacity and effort, including training, logistical support and a mobile enforcement unit. This capacity should involve outreach and other activities that will engage greater efforts on the part of police for fisheries and broader environmental enforcement, in particular in relation to sand-mining and other impacts on marine turtle habitats. A mutually agreed set of protocols and procedures for these agencies to follow in such circumstances may be an option to consider.

5. Finally, increased efforts should be made to engage local communities, including fishers, in marine turtle conservation and management. Fisheries extension efforts should be implemented that involve regular exchanges with fishers of information on marine turtles and their conservation and management needs and the participation of fishers in efforts to manage marine turtles so as to enhance compliance with regulations and support for marine turtle conservation. Support directed towards sustainable fishery practices and/or alternative livelihoods should be provided, as relevant and necessary, to assist fishers meaningfully in their efforts to comply with the closure of the marine turtle fishery.

Additional references

- Anon. (2003). Stacia Government keeps STENAPA open till end of year. *MINA Bulletin* 8(4), November 2003. Environmental Department, Ministry of Public Health and Social Development, Netherlands Antilles. www.mina.vomil.an
- STENAPA. (2002). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of Marine Turtles in the Lesser Antilles, Central America, Colombia and Venezuela. Completed by Kay Lynn Plummer, Manager, STENAPA, Sint Eustatius. Dated 19 July 2002.
- Le Scao, R. and N. Esteban. (2004). Sint Eustatius Sea Turtle Monitoring Programme Annual Report, 2003. Sint Eustatius National Parks Foundation (STENAPA). Unpublished.

Netherlands Antilles: Sint Maarten

Introduction

The island of Saint Martin/Sint Maarten lies just south of Anguilla, the northernmost island in the Lesser Antilles. Sint Maarten is the southern, Dutch part of the island and covers 34 km² of land area. The northern half of the island, Saint Martin, is French and, along with the neighbouring island of Saint Barthélemy, forms part of the overseas French department of Guadeloupe. The island has developed into a popular tourist destination. According to DOAF (2002), most of the marine turtle nesting beaches in Sint Maarten are now occupied by hotels and tourist facilities.

According to the Nature Foundation of Sint Maarten (NFSM) (2002; A. Caballero, pers. comm., 2005), few of the recommendations put forward in the STRAP for the Netherlands Antilles (Sybesma, 1992) have been implemented by the Government of Sint Maarten. Those efforts that are being made are largely through NGOs like NFSM, which lack legal authority and an adequate local legal framework to which to refer in pursuing them.

Summary of the status of marine turtles in Sint Maarten

Three marine turtle species are regularly recorded in Sint Maarten: the Green Turtle and Hawksbill Turtle both forage and nest, while the Leatherback occurs only seasonally to nest (Debrot *et al.*, 2005). In an interesting historical notation, Hermans (1961) recounts that, on 17 April 1947 a gravid Leatherback was detained on a Sint Maarten beach by means of ropes; she subsequently escaped, became entangled at sea, and drowned. The species was considered inedible.

Occurrence of marine turtles in Sint Maarten

English common name	Scientific name	Occurrence
Loggerhead	<i>Caretta caretta</i>	I
Green Turtle	<i>Chelonia mydas</i>	N, F
Leatherback	<i>Dermochelys coriacea</i>	N
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	N, F
Kemp's Ridley	<i>Lepidochelys kempii</i>	A
Olive Ridley	<i>Lepidochelys olivacea</i>	A

Key: N=nesting; F= foraging; I=infrequent; A=absent

Sybesma (1987) reported the Green Turtle to be the species most frequently encountered, but currently it is primarily Hawksbill Turtles and Leatherbacks that are observed (A. Caballero, *in litt.*, 23 March 2005). The Loggerhead is infrequently recorded. Sybesma (1987) indicated that dive operators reported seeing marine turtles “frequently (once a week) mostly from the boat on the way to the dive spot”; although current sighting rates are unknown, they are thought to be seen more than once a week (A. Caballero, *in litt.*, 23 March 2005). Preliminary results indicate an increasing trend in Leatherback nesting on Sint Maarten, consistent with the long-term recovery trend of this species on nearby Saint Croix (Debrot *et al.*, 2005). The highest densities of foraging Green and Hawksbill Turtles are found in the Simpson Bay area and Dawn Beach/Oyster Bay area (NFSM, 2002).

Although there has as yet been no systematic monitoring of marine turtles in Sint Maarten, investigations undertaken thus far by volunteers have documented nesting of Leatherbacks and Green and Hawksbill Turtles in Mullet Bay, Simpson Bay, and Guana Bay and of Green and Hawksbill Turtles on Dawn Beach and along Gibbs Bay (Debrot *et al.*, 2005). Occasional Leatherback nesting has been recorded in Cupecoy (NFSM, 2002). A total of seven beaches have been identified as being used for nesting by marine turtles (A. Caballero, pers. comm., 29 March 2005; Debrot *et al.*, 2005).

Overview of the legal framework for marine turtle management

Laws and regulations relating to marine turtles

There are no specific island-level regulations governing the exploitation of marine turtles in Sint Maarten. The *Eilandsverordering Natuurbeheer en-Bescherming, nr. 25* (Island Nature Ordinance), adopted in September 2003, is framework legislation that invokes the commitments of the Netherlands Antilles in relation to the SPAW Protocol, CITES and other international obligations and, thus, protects marine turtles and other species covered in those agreements, but makes no specific provisions. Until this legislation was passed, the Netherlands Antilles National Nature Conservation Ordinance, which entered into force in April 2001, was understood to apply and, thus, to provide full legal protection for marine turtles in Sint Maarten (NFSM, 2002; L. Brown, Environmental Department of Sint Maarten-VROM, *in litt.*, 12 August 2002)

Although the general protections conferred through the National Nature Conservation Ordinance and Island Nature Ordinance are important, according to NFSM (2002; A. Caballero, pers. comm., 29 March 2005),

dependence on CITES, the SPAW Protocol and other international mandates is not an adequate basis for local marine turtle management, whether it be controlling exploitation or protecting important sites.

A marine park ordinance, which would formally designate the Sint Maarten Marine Park, its zoning plan, and other management parameters, is still in draft form and, thus, has not yet been adopted (A. Caballero, *in litt.*, 23 March 2005).

Responsible authorities

Nature conservation and environmental management on Sint Maarten are the responsibility of the Department of Public Housing, Physical Planning and Environment (VROM) in Philipsburg. In addition, the Coast Guard of the Netherlands Antilles and Aruba, Public Prosecutor's office and Customs have enforcement authority. NFSM serves as the island's Scientific Authority for CITES and, although not yet formally mandated, manages the Sint Maarten Marine Park.

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective

Meylan (1983) reported a significant demand from the tourist trade for marine turtle meat in restaurants and turtle product souvenirs in Sint Maarten and noted that the depleted nature of local stocks necessitated travel by divers (who captured turtles using spear guns) to neighbouring islands, such as Anguilla and Sint Eustatius. In contrast, Sybesma (1992) reported a decade later that the exploitation of turtles in Sint Maarten "is very low". There continued to be spear-fishing of turtles for local use, but he found no evidence that nets were still set to ensnare turtles. He interpreted the low level of effort as a reflection of low demand: he noted, for example, that the one fisher who occasionally brought in turtles caught near Sint Eustatius for local consumption sold the turtle meat for less than snapper or lobster; he reported putting in more labour to catch it and, as a result, that it was not economical for him. This suggests the possibility that turtles were, or had become, depleted and/or difficult to find. Sybesma (1992) found no indication of turtle meat being sold in markets or offered in restaurants and concluded consumption to be strictly by locals, rather than by tourists; further, he found no indication of turtle shells or shell ornaments being sold and concluded that demand from tourists was "probably" very low.

Recent (since 1992) exploitation

The take of marine turtles has been illegal under the National Nature Conservation Ordinance since April 2001. There is no directed illegal take of marine turtles, but turtles are caught occasionally as by-catch by local fishers, who, "if not controlled," tend to keep the turtles for their own personal consumption (NFSM, 2002). The only other illegal exploitation of marine turtles appears to be sales by "occasional souvenir stores that retail sea turtle items," which are "not regulated" through the Customs/Prosecutor's office (NFSM, 2002), despite the obvious implication that many, if not most, of these items will leave the country (in the possession of foreign tourists) in contravention of the National Nature Conservation Ordinance.

International trade

Historical perspective

There are no official statistics on international trade in marine turtles involving Sint Maarten. Meylan (1983) reported an active demand from the local tourist trade and indicated that a tortoiseshell dealer on the island was, in 1980, buying shell from several islands in the Leeward Islands and exporting it to the Netherlands. Sybesma (1992) subsequently reported that the shells for sale in souvenir shops were imported from elsewhere, rumoured to be the Dominican Republic and/or Haiti. Both authors also reported information on transboundary movement to and from neighbouring islands of fishers taking turtles.

Recent (since 1992) international trade

NFSM (2002) reports no knowledge of any international trade in marine turtle or turtle products involving Sint Maarten, since this became illegal in 2001 under the National Nature Conservation Ordinance. There is still some inter-island sale of turtle meat from Anguilla to Sint Maarten (i.e. international trade) if there is turtle by-catch during fishing activities (A. Caballero, *in litt.*, 23 March 2005). In 2004, there were three to four confiscations of ca. 10 turtle shells, for which a fine of 5000 Netherlands Antillian guilders (ANG5000) may be levied per shell. Caballero (pers. comm., 29 March 2005) reports that these were imports from boats from Saint Kitts and Nevis, as well as Guyana, and that Customs/Coast Guards seize boats until the fine is paid. NFSM (2002) reports that imports are not sufficiently controlled and/or enforced.

Enforcement issues

There is little evidence of illegal exploitation or trade of marine turtles in Sint Maarten and it is not viewed as a problem for marine turtle conservation and management (NFSM, 2002). However, the absence of specific legal provisions relating to marine turtles and insufficient monitoring and controls, as well as the continued availability of marine turtle products in souvenir shops and continued confiscations of illegal imports by Customs and the Coast Guard, suggest the possibility at least that it may be more prevalent than is currently believed.

No stockpiles of marine turtle products are known to exist in Sint Maarten. All marine turtle products held in private hands (along with all other CITES Appendix-I specimens) have now been registered by NFSM in its capacity as the CITES Scientific Authority, as required under the National Nature Conservation Ordinance. The registration process, now closed, was available for a period of time to encourage local residents in possession of personal items to claim them legally; the registration process was not intended for commercial businesses (A. Caballero, *in litt.*, 12 April 2005). Any marine turtle product that has not been registered is prohibited from sale and subject to confiscation (NFSM, 2002).

Marine turtle management

There has been no stock assessment in the usual sense for any species of marine turtle in Sint Maarten. There is very little active management of marine turtles and no data to indicate the extent to which historical levels of exploitation have resulted in population declines. There does not appear to have been any formal record-keeping of marine turtle landings when those landings were legal and there are no official statistics on any illegal

exploitation, as no specific record (only informal reporting) is made of marine turtle confiscations. Although adoption of the Island Nature Ordinance and the agreement on zoning of the Marine Park are significant steps forward, there are still major legal and institutional gaps with respect to marine turtle conservation and management. Adoption of the marine park ordinance will be an essential step forward in this regard. In the meantime, NFSM, established in 1997, is the lead actor on behalf of marine turtles in Sint Maarten but, as an NGO, it faces numerous constraints in taking this work forward.

Management of exploitation

There is no indication that exploitation of marine turtles was managed in any way prior to implementation of the National Nature Conservation Ordinance in April 2001 and, other than the registration of all marine turtle products in private hands, there has been little organized effort to document and assess the implications of any continued illegal take. In particular, no such work is being undertaken in the sphere of marine turtle product marketing, such as by local souvenir shops and their suppliers, including questioning what the origin of such products might be (NFSM, 2002).

Species research and conservation

Until recently, no effort appears to have been directed towards research and conservation of marine turtles in Sint Maarten. Turtle monitoring programmes, based on best practices and standard guidelines articulated by WIDECAS, are conducted during the nesting season by volunteers in the Sea Turtle Club organized by NFSM. However, these have not been regular, owing to the voluntary nature of the effort and the lack of a volunteer coordinator.

Major advances are expected over the coming year, however, with the implementation of a Marine Turtle Research Project, currently under development, which is expected to begin in mid-2005 with funding and technical support through DCNA, a recently established foundation that represents the interests of the nature conservation and management organizations of the Netherlands Antilles and Aruba. One of several elements of this project will be satellite-tracking, along the lines of the work that has been undertaken in Bonaire, in order to encourage public interest in marine turtle issues and define range States for the marine turtles using the territorial waters of Sint Maarten.

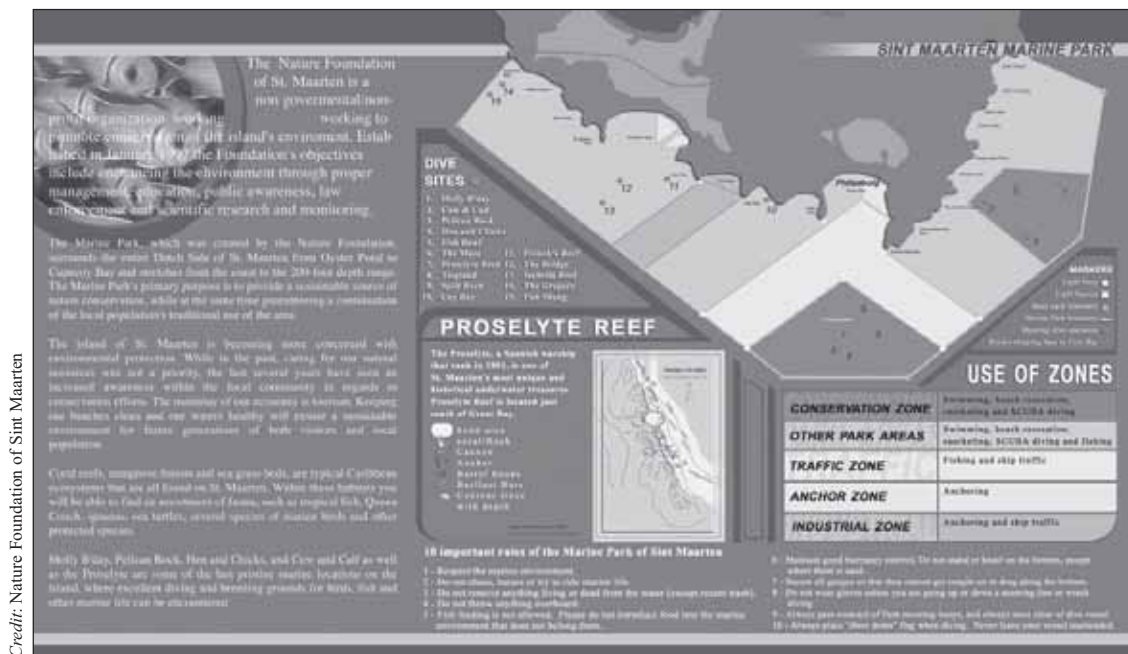
There is currently no tagging programme in place to document the existence and delineation of marine turtle stocks and enable a degree of population monitoring, and no population-monitoring studies are under way to determine long-term population trends. At least some of these activities are expected to be initiated with NFSM's planned Marine Turtle Research Project.

Habitat conservation

The Sint Maarten Marine Park has been under development for several years under the leadership of NFSM, and zoning for this was approved in 1999. The Marine Park encompasses the entire coast of Sint Maarten from Oyster Pond to Cupecoy Bay, stretching from the coastal waters and the beaches to the 200-foot depth range. NFSM manages the Marine Park. Its primary purpose is to balance nature conservation with continued traditional use of the area; hence, it is zoned for different uses. The zoning is as follows:

- **conservation zone:** designated to preserve natural values by excluding all potentially damaging activities; defined based on significant natural values, such as the presence of unspoiled coral reefs, and function, such as nursery areas for marine species (fish sanctuaries, lobster/conch and fishing areas all fall under the conservation zone)
- **industrial zone:** designated for such industrial activities as oil trans-shipment and cargo transport and located in the general direction of Cole Bay and Great Bay Harbour
- **anchor zone:** designated as areas where anchoring has been determined to cause the least environmental damage or where moorings have been placed
- **traffic zone/shipping lanes:** a traffic zone is defined particularly for the large cruise ships that enter Great Bay, while the shipping lanes to Cole Bay are for freighters and tankers
- **other park areas:** designated as zones where general management regulations apply

Although the legal basis for the Marine Park's operation, the marine park ordinance, has not yet been approved by the Island Executive Council, there has been a degree of implementation of management measures. In its current iteration, the marine park ordinance will provide protection for all seven known marine turtle nesting beaches by requiring a permit for various activities, including beach construction, sand-mining, and the use of vehicles on the beach. A Beach Policy Plan exists but has not yet been transformed into law (A. Caballero, pers. comm., 29 March 2005).



A plan of the Sint Maarten Marine Park

Education and public awareness

Since its founding in 1997, NFSM has undertaken a range of activities to enhance awareness of marine turtles. As the focal point for WIDECAS in Sint Maarten, the Foundation has benefited from regional expertise in

designing and erecting signs with conservation purposes; distributing outreach materials (e.g. species identification leaflets); development of a campaign poster and bumper stickers (“Nature is our Future”); creating curriculum tools and a slide-show presentation for schools; maintaining a marine turtle technical library; and nominating local biologists for marine turtle training courses and workshops (A. Caballero, pers. comm., 2005).

These efforts have now expanded through implementation of a year-long information, education and outreach campaign for the protection of marine turtles and their habitats in Sint Maarten, Saba, Sint Eustatius and Bonaire, launched in November 2004 as an initiative of DCNA. The campaign is running simultaneously in all four islands on but is tailored to each individual island’s situation. In Sint Maarten, it has included school visits, presentations in the media, the development of a reggae marine turtle song, new brochures and stickers and a puppet show.



Credit: Nature Foundation of Sint Maarten

School children on Sint Maarten learn about marine turtles by watching a puppet show

Constraints to marine turtle conservation and management

There are several constraints to marine turtle conservation and management in Sint Maarten. First and foremost, there is an inadequate legal framework in the form of specific prohibitions and other provisions relating to the exploitation of marine turtles and the commercial possession and sale of marine turtle products, as well as protection of marine turtle habitats. Other constraints include limited financial resources and institutional

capacity (e.g. technical knowledge, personnel) in both government departments (Customs, Public Prosecutor's Office, Environment Department, Coast Guard) and NFSM.

NFSM notes that great strides are being made within the current legal framework to advance marine turtle conservation; however, "significant progress may only be possible through structural change" (NFSM, 2002). A final concern is that most of the effort currently under way is being pursued through the non-governmental NFSM, whose operation is largely dependent on funding from external sources.

Summary and recommendations

Marine turtles have been protected in Sint Maarten since 1991, when National Nature Conservation Ordinance of the Netherlands Antilles was adopted, and these protections have been further strengthened through the 2003 Island Nature Ordinance. However, there are still no specific legal protections relating to marine turtles, in particular with respect to habitat protection. Although there is no evidence to suggest extensive illegal exploitation or trade, confiscations of attempted imports have occurred and, thus, provide evidence of a certain level of illegal activity. That said, the major issues for marine turtles in Sint Maarten appear to be habitat-related. It is in this context that the following recommendations are presented.

1. Island-level legislation should be adopted that provides for specific protections for marine turtles and other vulnerable or threatened species, with a major emphasis on habitat protections, including environmental impact assessment and beach-front lighting restrictions to curb disorientation of nesting females and their young. This legislation should specify the agencies that have management and enforcement authority and provide for regulations that enable those responsibilities to be discharged effectively.
2. The management authorities of NFSM should be formalized as necessary in recognition of and in order to enhance the Foundation's essential role as an independent scientific advisor and a major actor with respect to nature, and marine turtle research, outreach and conservation.
3. The Sint Maarten Government should move expeditiously to adopt the marine park ordinance and enable full implementation of its provisions, in particular as they relate to protection of specific habitats.
4. Given the paucity of information on the exploitation of marine turtles in Sint Maarten, a focused effort should be made to investigate the extent of illegal marine turtle exploitation, including capture and commercial use of marine turtle products in the jurisdiction, including the source of the specimens in trade.
5. An inventory of all souvenir shops should be undertaken as a follow-up to formal registration of all CITES Appendix-I specimens and any illegalities should be vigorously acted upon. Similarly, clarity is needed on the issue of jurisdiction, control and prosecution of souvenir sales.
6. Increased efforts should be directed towards the control of imports and exports from Sint Maarten so as to intercept potentially illegal shipments of marine turtle products and enable follow-up investigations into documented illegal trade.

7. Sufficient resources should be provided to enable regular marine turtle population monitoring on a sustained basis so as to be able to monitor trends over the long term. Full advantage should be taken of regional expertise, such as that of WIDECASST and other entities, in research design and the incorporation of best practices.
8. Adequate and sustained funding, and greater international support, should be provided to NFSM to support its nature management and marine turtle conservation efforts.

Additional references

NFSM [Nature Foundation of Sint Maarten]. (2002). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of the Marine Turtles of the Lesser Antilles, Central America, Colombia and Venezuela. Completed by Paul Ellinger, Assistant Marine Park Manager. Dated 11 July 2002.

Federation of Saint Kitts and Nevis

Introduction

The Federation of Saint Kitts and Nevis comprises two volcanic islands with a total land area of 261 km² (Saint Kitts, 168 km², and Nevis, 93 km²) and 135 km of coastline, separated by a three-kilometre channel, the Narrows. The islands were first settled by the British in 1623 and became an associated State with full internal autonomy in 1967. The country achieved full independence in September 1983, but maintained its link with the UK by joining the Commonwealth in the same year (Anon., 2006). The two islands operate as a federated State, each with its own ministries and government agencies in charge of fisheries and other sectors. While certain issues are governed at the island level, others are governed at federal level, through legislation drafted by bilateral, inter-island committees and adopted by the Federal Assembly, comprising representatives from both islands, eight from Saint Kitts and three from Nevis (R.A. Anslyn, Director of Fisheries-Nevis, pers. comm., 2004).

Meylan (1983) reported that marine turtle populations in Saint Kitts were considered by most residents to be declining. Wilkins and Barrett (1987) reported that turtles were “relatively low in abundance” as compared to 1983 when the first surveys were undertaken. Based on extensive interviews with fishers and other residents, literature reviews and other analyses, Eckert and Honebrink (1992) concluded that all three nesting species of marine turtle in Saint Kitts and Nevis had declined considerably from historic levels and that there were fewer than at any other time during the 20th century. They cited a consensus that the number of nesting females had declined because of the virtually uncontrolled take of both eggs and adult turtles.

A Sea Turtle Recovery Action Plan (STRAP) for Saint Kitts and Nevis, developed and published under the auspices of the Wider Caribbean Sea Turtle Conservation Network (WIDECAST) and the United Nations Caribbean Environment Programme (Eckert and Honebrink, 1992), reviewed in detail the status of and threats to marine turtles in the country and provided a series of recommendations for improving the management and recovery of populations. The STRAP identified exploitation as the most significant stress on local turtle populations and attributed this to an inadequate and outdated regulatory framework featuring minimum size limits, a closed season that did not correspond with peak breeding periods and inadequate penalties. Additional pressures, including the loss of nesting beaches to sand-mining and harbour development and degradation of foraging grounds as a result of indiscriminate anchorings, were documented, and the loss of further nesting sites to hotel and other construction was projected in the coming years.

Among the many recommendations the STRAP made to promote the recovery of depleted stocks in Saint Kitts and Nevis were: a) the establishment of a moratorium on the take of marine turtles (“until such time as credible scientific studies show that a regulated take will not adversely affect sea turtle populations”); b) protection of important nesting beaches and foraging areas; c) improvement of the legal and regulatory framework for marine turtle conservation, including establishment of protected areas and other habitat conservation measures; d) increased law enforcement capacity and effort; and e) increased public awareness of pertinent issues. A number of research-oriented recommendations were made, including implementation of field surveys to identify important foraging grounds and population monitoring studies to document long-term trends in numbers. These and other recommendations were incorporated into a proposed five-year Sea Turtle Conservation Programme.

More than a decade after the STRAP was published, efforts are under way on both islands to maintain Index beach monitoring, and advances have been made in public awareness, but comparatively little attention has been given to the recommendations pertaining to exploitation, law enforcement and the designation of protected areas. The legal fishery continues and, although restrictions are in effect, these are not sufficient to prevent further population depletion, particularly in the context of a rudimentary management regime and chronically insufficient enforcement resources. Further, despite individual efforts, there is no comprehensive, systematic monitoring programme in place on either island aimed at assessing marine turtle population status and trends and the impact of exploitation on these. Notable, however, in this context are recent efforts by the Nevis Turtle Group to organize regular patrols of five nesting beaches (Seahaven, White Bay, Stockpen, Black Bay, Indian Castle) on Nevis and efforts by Ross University, in collaboration with the Department of Fisheries and the Saint Christopher Heritage Society (SCHS), to monitor Leatherback nesting on Saint Kitts (DOF, 2002; K. Stewart, SCHS, *in litt.*, 16 September 2004).

Although various elements of this management regime are under review (DOF, 2002; FMU, 2002) and may be revised, the effectiveness of any revised regulatory measures will depend on the adequacy of human, financial and logistical resources to support their full implementation, and the effectiveness of any revised overall management regime will depend greatly on the adequacy of the monitoring programmes that should be put in place to monitor marine turtle populations and/or trends in turtle landings and infer what these mean for marine turtle conservation and management needs.

Summary of the status of marine turtles in Saint Kitts and Nevis

Four species of marine turtle are known from Saint Kitts and Nevis. Three species, the Green Turtle, Hawksbill Turtle and Leatherback, are known to nest. Although the Leatherback occurs only seasonally to nest, the two other species also forage in local waters. The Loggerhead occurs infrequently and is not considered to nest in the islands (Meylan, 1983; Eckert and Honebrink, 1992).

Occurrence of marine turtles in Saint Kitts and Nevis

English common name	Scientific name	Occurrence
Loggerhead	<i>Caretta caretta</i>	I, F?
Green Turtle	<i>Chelonia mydas</i>	N, F
Leatherback	<i>Dermochelys coriacea</i>	N
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	N, F
Kemp's Ridley	<i>Lepidochelys kempii</i>	A
Olive Ridley	<i>Lepidochelys olivacea</i>	A

Key: N=nesting; F= foraging; I=infrequent; A=absent

In Nevis, Hawksbill Turtles are the major nesting species. There is also nesting by Green Turtles, and nesting by Leatherbacks was recently confirmed, in 2004, when at least 14 nests were recorded (E. Pemberton, *in litt.*, 23 June 2004). Preliminary studies have identified the main turtle nesting beaches, numbering 11 and found

primarily on the north-west leeward (Caribbean) coast (DOF, 2004), and the major known foraging grounds are the coral reefs and seagrass beds of the north-west, east and south coasts (Eckert and Honebrink, 1992; DOF, 2002).

In Saint Kitts, turtles are observed around the entire island. The Department of Fisheries (formerly the Fisheries Management Unit) (FMU, 2002) reports that Belle Tete (Sandy Point), Keys, and Conaree/Canada Beach are the major known nesting areas, while Orchard (2002) reports these to be South East Peninsula for Hawksbill and Green Turtles (and particularly Major's Bay for Hawksbill Turtles) and, for Leatherbacks, northern South East Peninsula and Frigate Bay, northward along the Atlantic coast, including Conaree and Keys, to the Cayon River. Green Turtle nesting is comparatively rare and is typically confined to the broad tip of South East Peninsula.

Neither the Saint Kitts Department of Fisheries (FMU, 2002) nor the Nevis Department of Fisheries (DOF, 2002) reports knowledge of what range States share turtle stocks with Saint Kitts and Nevis. However, tagging and satellite-tracking studies have provided some insights. Meylan (1999) reported that an adult female Hawksbill Turtle flipper-tagged during nesting at Jumby Bay, Antigua, in 1987 was later recaptured at Pelican Point, Saint Kitts (110 km away). More recently, a satellite-tracking project found that a female Hawksbill fitted with a transmitter during nesting at Jumby Bay in September 1998 left Antigua after the egg-laying season and travelled to Saint Kitts. She spent 15 months foraging there before the batteries expired on the transmitter and she returned to Jumby Bay to nest again in 2001 (K. Andrews, University of Georgia, *in litt.*, 18 October 2002). A post-nesting Green Turtle fitted with a satellite transmitter in Montserrat on 16 September 2004 later moved into the waters of Saint Kitts and Nevis (see www.seaturtle.org/tracking).

With no baseline data on marine turtle populations, no long-term population monitoring programmes in place and no systematic monitoring of the legal fishery, neither the government nor NGO sources could provide updated information on marine turtle population status. Given the lack of change in the management regime since Eckert and Honebrink (1992), there is no reason to assume that marine turtle stocks in Saint Kitts and Nevis are anything but depleted, a state which has characterized them in the literature for more than two decades. Whether stocks are depleted and stable, depleted and continuing to decline, or depleted but improving cannot be known without a census and sustained study.

Overview of the legal framework for marine turtle management

Membership in international and regional treaties

Saint Kitts and Nevis participates in relatively few international environmental agreements: although party to the Convention on Biological Diversity (CBD), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the United Nations Convention on the Law of the Sea (UNCLOS), the country has not acceded to the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC), nor the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, or Cartagena Convention, nor any of its three protocols. Hence, the country's specific international obligations with respect to marine turtles are restricted to the provisions of CITES, to which the government acceded on 14 February 1994.

Membership of Saint Kitts and Nevis in multilateral agreements relating to marine turtles

Convention	Saint Kitts and Nevis
Cartagena Convention	No
Protocol Concerning Specially Protected Areas and Wildlife (SPAW)	No
Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region	No
Protocol Concerning Pollution from Land-based Sources and Activities	No
Convention on Biological Diversity (CBD)	07.01.1993 (R)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	15.05.1994 (E)
Convention on Migratory Species (CMS)	No
Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	No
MARPOL 73/78 (Annex I/II)	24.03.1998 (A)
MARPOL 73/78 (Annex III)	24.03.1998 (A)
MARPOL 73/78 (Annex IV)	24.03.1998 (A)
MARPOL 73/78 (Annex V)	24.03.1998 (A)
Convention on Wetlands of International Importance (Ramsar)	No
UN Convention on Law of the Sea (UNCLOS)	07.01.1993 (R)
Western Hemisphere Convention	No
World Heritage Convention	10.07.1986 (A)

Key: Date of: Ratification (R); Accession (A); Entry into force (E)

Laws and regulations relating to marine turtles

Exploitation of marine turtles in Saint Kitts and Nevis is legal and has been regulated for most of the last 50 years. A *Turtle Ordinance* component of the national fisheries legislation in force between 1948 and 1992 protected small marine turtles (under 20 lb (nine kilogrammes)) and established an annual closed season from 1 June to 30 September. The *Turtle Ordinance* was repealed by 1992 amendments to the *Fisheries Act* of 1984, but no specific provisions for marine turtles were incorporated into the new Act, thus removing all restrictions on the exploitation of marine turtles until adoption of the *Fisheries Regulations* of 1995.

Article 19 of the *Fisheries Regulations* of 1995 (No. 11 of the Statutory Rules and Orders), issued under Section 40 of the *Fisheries Act* (No. 4) of 1984, is the statute currently in force to regulate exploitation of marine turtles. It establishes the following restrictions (with marine turtles defined as the whole or any part of any turtle):

1. minimum size limits, with “undersized turtles” defined as:
 - Leatherbacks weighing less than 158.18 kg (350 lb)
 - Green Turtles weighing less than 81.66 kg (180 lb)
 - Hawksbill Turtles weighing less than 38.6 kg (85 lb)
 - Loggerheads weighing less than 72.59 kg (160 lb)
2. an annual seven-month closed season from 28 February to 1 October, during which time it is prohibited to: fish for, remove from the fishery waters (defined as including the beach), or at any time have in one’s

possession, expose for sale, sell or purchase any turtle. This closed season operates every year or as otherwise ministerially stated by public notice.

3. prohibitions to:

- disturb, remove from fishery waters (defined as including the beach), expose for sale, purchase or at any time have in his possession any turtle eggs;
- remove from the fishery waters (defined as including the beach), expose for sale, sell, purchase, or at any time have in one's possession any undersized turtle;
- interfere with any turtle nest, or any turtle that is nesting; and
- set within 300 yards of the shores of both islands any net or seine or any other device for the purpose of or with the intention of fishing for, catching or taking any turtle

Article 39 of the *Fisheries Regulations* of 1995 stipulates that any person contravening any of the provisions of the Regulations is guilty of an offence and shall be liable on conviction to a fine not exceeding 5000 East Caribbean dollars (XCD5000).

According to Eckert and Honebrink (1992), the *National Conservation and Environment Protection Act* (NCEPA) of 1987 provides for the establishment and administration of national parks, historic and archaeological sites and other areas of natural or cultural interest. In addition, the Act allows for the establishment of a Conservation Commission to advise the relevant minister on the selection of protected areas, among other things, and declares that the "Conservation Commission shall promote conservation as part of long-term national economic development". A variety of activities are regulated under this legislation, including sand-mining and the removal of beach vegetation. Anchoring, polluting, collecting or harassing wildlife, and fishing may be restricted in protected areas. Animals (including wild birds and their eggs) listed in the Third Schedule of the Act are nationally protected. Eckert and Honebrink (1992) encouraged full implementation of this Act and recommended that all marine turtle species be protected through listing on the Third Schedule. The Act also provides for implementation of a coastal zone management plan to regulate development activities and such a plan is currently being put in place (MALHC, 2002). Efforts in Nevis to develop environmental projects on the basis of the NCEPA have proved unsuccessful because it became evident that the minister mentioned in the Act was the relevant minister in Saint Kitts, not Nevis; efforts are now under way to repeal and replace the NCEPA with the *National Conservation and Environmental Management Act*, which will be a federal Act (applying to both Saint Kitts and Nevis) conferring on Nevis more autonomy and more powers on the Nevis Minister to administer the Act for Nevis (R.A. Anslyn, Director of Fisheries-Nevis, *in litt.*, 28 October 2004).

The CITES National Legislation Project assessed CITES-implementing legislation in Saint Kitts and Nevis as "believed generally not to meet all requirements for the implementation of CITES" (Anon., 2002) and assigned a deadline of 31 December 2003 for adequate implementing legislation to be enacted. This deadline was subsequently extended and, by the time of the 13th meeting of the Conference of the Parties to CITES, Saint Kitts and Nevis had completed draft implementing legislation and submitted it to the CITES Secretariat; progress will be reviewed at the 54th meeting of the CITES Standing Committee in October 2006 (Anon., 2004; Anon., 2005). Once finalized by the joint Nevis-Saint Kitts inter-agency committee, this legislation will be presented for adoption by the Federal Assembly (R.A. Anslyn, pers. comm., 2004).

In Nevis, legislation to manage development better in the coastal zone is being drafted (MALHC, 2002).

Responsible authorities

Although the management of fisheries falls within federal jurisdiction and is, thus, governed by federal legislation, each island assumes management authority over its local resources. In Nevis, the Department of Fisheries (Ministry of Agriculture), Coast Guard and police each have authority for different aspects of marine turtle management and enforcement; fisheries include turtles both at sea and while nesting on the beach (E. Pemberton, Department of Fisheries, pers. comm., February 2004). In Saint Kitts, the Department of Fisheries (Ministry of Agriculture) has primary management and enforcement authority for marine turtles (FMU, 2002). The Saint Kitts Department of Environment (Ministry of Environment) also has a mandate relating to marine turtles, which includes protecting nesting beach habitat through coastal zone management and planning, enforcement of sand-mining prohibitions and regulating pollution and other pressures (Orchard, 2002; E. Pemberton, pers. comm., February 2004).

The Director of Agriculture, Ministry of Agriculture (Saint Kitts) serves as the CITES Management Authority for Saint Kitts and the Director of Fisheries (Nevis) serves as the CITES Management Authority for Nevis. The CITES Scientific Authority is a committee composed of the Director of Agriculture, Saint Kitts; Director of Agriculture, Nevis; Senior Fisheries Officer, Saint Kitts; Director of Fisheries, Nevis; and the Manager of the Central Marketing Corporation, Saint Kitts.

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective

According to Eckert and Honebrink (1992), literature accounts of the capture and use of marine turtles in Saint Kitts and Nevis date back to 1603 and there is archeological evidence of the use of marine turtles at sites in Nevis dating to 200 BC to 1500 AD. Eckert and Honebrink (1992), along with summaries compiled by government representatives to the Western Atlantic Turtle Symposia (Wilkins and Meylan, 1984; Wilkins and Barrett, 1987) and numerous accounts since then, provided evidence of the importance that marine turtles have played in the diet and trade of the islands over several centuries.

In addition to what historical records they could find, Eckert and Honebrink (1992) presented details on marine turtle exploitation at the time of their writing. Turtles were netted at sea and killed on the nesting beach. Turtle hunters and observers familiar with the fishery disagreed on the exact number of turtles harvested per year, but it appeared likely that in excess of 50 to 100 turtles, mostly Green and Hawksbill Turtles, were landed annually on each of the two islands. Although they reported that the number of nets set and hunters awaiting gravid females on nesting beaches was “considerably lower than at any time in the past” (with the number of part-time turtle fishers estimated to be fewer than 10 on each island), the number of spear-fishers landing marine turtles, mostly small juveniles, was growing. In addition, collection of eggs, although unquantified, still approached 100% in some areas.



A Hawksbill Turtle in coastal foraging habitat.

Eckert and Honebrink (1992) compiled data on the marine turtle fishery from a number of sources, including the Nevis Department of Fisheries, for several years up to the time of their writing; data compiled for the open season in Nevis (1 October to 31 May) were as follows: 1984: 5000 lb meat; 1986–87: ca. 110 turtles, mostly Hawksbill Turtles, and ca. 20 turtle fishers; 1987–88: 47 turtles, mostly female Hawksbill Turtles and eight turtle fishers; 1990–91: 75 turtles. For 1988 and 1989, data were compiled on an annual basis and record 100–120 turtles and 60–70 turtles, respectively.

Even fewer historical data appear to be available on landings in the marine turtle fishery in Saint Kitts. A total of 50 turtles were reported in Eckert and Honebrink (1992) as having been caught in Saint Kitts during the 1986–87 open season. Although these authors reported that fisheries personnel estimated that fewer than 50 turtles were landed per year, they provided evidence to suggest that the true number may have exceeded 100.

Eckert and Honebrink (1992), citing Wilkins and Meylan (1984) and Wilkins and Barrett (1987) and their own interviews with individuals on the islands, reported that marine turtles were used extensively: Green and Hawksbill Turtles for meat (consumed locally and sold to hotels and restaurants) and carapaces (used as decoration); Hawksbill Turtles for shell used in jewellery; and Leatherbacks for oil. The eggs of all species were considered a delicacy and also regarded as having aphrodisiac properties; on Nevis, at least, they were consumed locally and also sold to some of the hotels.

Eckert and Honebrink (1992) cited at least one author's report that the closed season was "generally ineffective" in restricting the take of marine turtles and that Green Turtle meat could be found on sale in Saint Kitts during the closed season. They cited additional reports, including information from fisheries personnel on both Nevis and Saint Kitts, that illegal exploitation of eggs during the closed season was a particular problem on both islands.

Recent (since 1992) exploitation

In Nevis, according to the Department of Fisheries (2002), the legal turtle fishery targets Green and Hawksbill Turtles. Turtles are caught at sea generally between October and February (the open season) using large mesh tangle nets; turtles are also taken (illegally) on beaches while nesting, accidentally captured in fishing gear, and caught by fishers diving for lobsters, reef fish and conches (MALHC, 2002). Meat is the primary product consumed: it is commercially sold (XCD4.00/lb) to restaurants and consumed by rural residents. There is no market for turtle carapaces on the island. The sale of turtle products is not regulated other than through the restrictions mandated by the *Fisheries Regulations* of 1995. For no fisher is turtle fishing a major source of income or livelihood.

The Nevis Department of Fisheries did not systematically maintain records of turtle landings from 1984 to 2002 (DOF, 2002). The taking of marine turtles had been on the decline, but a noticeable increase in gear and capture prompted the Department to conduct a survey to determine the current status of the fishery (MALHC, 2002). Fishers were provided with record-books, and completed forms were collected on a weekly basis in January and February 2002. The data below derive from the landing forms submitted in Nevis from January 2002 until the season's closing on 28 February 2002. It should be noted that the volume reported represents a minimum catch, as landings during the first three months of the open season—October to December 2001—are not included, undersized turtles would not have been reported, and the records pertain to Nevis only:

Number of turtles harvested:	93 turtles
Total live weight of turtles:	20 655 lb
Number of fishers in turtle fishery:	19
Number of nets set for turtles:	21
Number of turtles caught by divers:	14
Number of turtles caught by net:	79
Price of turtle meat:	XCD4.00/lb

Efforts to continue recording landings in the legal marine turtle fishery in subsequent years have not met with the same level of co-operation from fishers (E. Pemberton, pers. comm., February 2004); because the system is currently voluntary and not mandated in the *Fisheries Regulations*, there is no legal recourse for lack of compliance. That circumstance and the fact that information about the potential health risks to consumers of fibropapilloma tumours that are now being found on marine turtles had discouraged turtle consumption resulted in few turtles having been recorded as landed in subsequent years. Only 10 were reported landed in Nevis in 2003; however, this drop may prove to have been short-lived as there is evidence that turtle consumption in Nevis is increasing for reasons which are not clear (R.A. Anslyn, pers. comm., 2004).

In addition to the legal take, there is illegal exploitation of marine turtles on Nevis, according to anecdotal evidence and as testified to by seizures of marine turtle products (DOF, 2002). Although not taken openly, marine

turtles continue to be taken illegally both on the beach and by spear-fishers, who, more often than not, will take a turtle rather than release it (E. Pemberton, pers. comm., 2004). There is no estimate of the number of turtles taken illegally per year in Nevis, but the Director of Fisheries (R.A. Anslyn, pers. comm., 2002) reports “about three” seizures of out-of-season meat or undersized turtles (which are released if alive) each year; there have, as yet, been no arrests or prosecutions associated with these seizures or other infractions.

In Saint Kitts, according to the Department of Fisheries (FMU, 2002), fewer than 20 fishers take turtles of all three species. Turtle meat is the product most in demand and it is both sold locally and shared amongst family; most of the turtles taken are Hawksbill and Green Turtles, but one part-time fisher is known to continue to take Leatherbacks for oil (R. Wilkins, Department of Fisheries, Saint Kitts, pers. comm., 2004). There are no monitoring programmes in place to record the number of turtles landed; any information is derived from interviews. In addition, there is no systematic monitoring to ensure compliance with restrictions. The sale of marine turtle products is neither regulated nor monitored and no statistics are available. Although illegal take of turtles in Saint Kitts is not considered by the Department of Fisheries to be a problem (FMU, 2002), it is not uncommon (E. Pemberton, pers. comm., 2004) and there have been a few recent arrests for violations of the closed-season restriction (R. Wilkins, pers. comm., 2004).

A decade ago, officers from the Departments of Fisheries in Saint Kitts and Nevis reported to Eckert and Honebrink (1992) that “eggs are harvested year-around and probably in large numbers”. Today, officers from the Departments of Fisheries in both islands indicate that egg poaching is not nearly the problem it once was and attribute this progress to enhanced public awareness. Heyliger (Department of Fisheries, Saint Kitts, pers. comm., 2002), for example, cites the success of educational programmes directed at school children, who share their concerns about endangered turtles with their parents. That said, poaching of eggs and nesting turtles continues at unquantified and potentially high levels (E. Pemberton, pers. comm., 2004). Officers from the Departments of Fisheries in both islands lament the serious problem of hatchling predation by mongooses and feral dogs; Anslyn (pers. comm., 2002) cited a recent report of mongoose “gobbling up Hawksbill hatchlings as fast as they were emerging at Sea Haven Beach” in Nevis.

International trade

Historical perspective

Groombridge and Luxmoore (1989) reported that, based on official statistics, there appeared to be very little international trade involving turtles or turtle products from Saint Kitts and Nevis; however, they cited evidence from Meylan (1983) that this trade was occurring. Eckert and Honebrink (1992), also citing Meylan (1983) and other authors, and based on interviews with Department of Fisheries staff and others, reported a “modest level” of export of turtle products from Saint Kitts and Nevis to neighbouring islands. Buyers from Saint Lucia, Puerto Rico, Dominica and Guadeloupe were reported by Meylan to purchase Hawksbill shell from fishers in Nevis, and subsequent authors reported the sale of meat to buyers in “Saint Barthelemew” (Saint Barthélemy, French department of Guadeloupe). Meylan (1983) also reported that the ban on importation of turtle products into the USA had apparently caused this trade to be sharply curtailed.

According to Eckert and Honebrink (1992), “in October 1991, several sources reported to the NHCS [Nevis Historical and Conservation Society] that 1400 lb (636 kg) of turtle meat had been exported to a buyer in Saint

Barthelemew. It was common knowledge amongst Nevis divers, fishermen and fisheries personnel interviewed for this report that turtle meat is routinely sold to neighbouring islands, especially Saint Barthelemew, but also Saint Martin and perhaps others. Meat sells in Nevis for XCD3–5/lb, but a fisherman reportedly earned ca. five US dollars (USD5)/lb by selling it through a middleman in Saint Barthelemew. Turtle meat sometimes leaves the country by air (labelled simply ‘meat’) and other times by boat.”

Japanese Customs statistics on imports of Hawksbill shell from 1970 to 1992 included, in 1990, a record of 136 kg from Saint Kitts and Nevis (estimated, based on the values in Milliken and Tokunaga (1987), as having derived from a minimum of 100 Hawksbill Turtles). Eckert and Honebrink (1992) indicated that Fisheries Division personnel had no knowledge of these exports and did not believe that they came from Saint Kitts and Nevis; further, they considered it unlikely that so many Hawksbill Turtles could have been caught in the waters of the country and surmised that the true origin of the shipment had been misrepresented. CITES trade statistics derived from the UNEP-WCMC CITES Trade Database for 1975 to 1992, inclusive, record no imports of marine turtles or their products originating from Saint Kitts and Nevis.

Recent (since 1992) international trade

Saint Kitts and Nevis acceded to CITES in 1994. CITES trade statistics for the period 1993-2004, inclusive, document the import into the USA of two kilogrammes of meat (no species specified) in 1993 and the seizure on point of entry to the USA of two kilogrammes of Hawksbill meat in 2004, as well as the export to the USA, in 2001, of four Green Turtle and six Hawksbill carapaces for scientific purposes (reported by the Government of Saint Kitts and Nevis but not recorded by the USA) and to Barbados, in 2004, of 100 Hawksbill specimens for scientific purposes. No imports of Hawksbill shell into Japan from Saint Kitts and Nevis were recorded in Japanese Customs statistics after 1990 (H. Kiyono, TRAFFIC East Asia-Japan Office, *in litt.* to TRAFFIC International, 29 July 2002).

The Nevis and the Saint Kitts Departments of Fisheries (DOF, 2002 and FMU, 2002, respectively) reported that there were no legal imports or exports of marine turtles and no known illegal imports or exports. Orchard (2002) concurred that there was no information to suggest any illegal export.

Enforcement issues

No specific data have been made available in the course of this study on the number or nature of seizures of marine turtle products in either Nevis or Saint Kitts and no data appear to exist on the extent of illegal take and domestic trade in marine turtles in the country. However, as noted above, seizures of marine turtle products have occurred and arrests have recently been made in Saint Kitts. The Nevis Department of Fisheries (DOF, 2002) considers illegal exploitation to be a problem for management and poaching of nesting females and eggs a constraint to their turtle monitoring programme (DOF, 2004). They also recognize inadequate enforcement as a problem (R.A. Anslyn, pers. comm., 2004).

Under the terms of the *Fisheries Act* (No. 4, of 1984), every Fisheries Officer in Saint Kitts and Nevis is an enforcement officer. However, the powers of enforcement are limited: a Fisheries Officer may, for example, confiscate illegal items but, lacking powers of arrest, he must depend on the availability of the police to assist and intervene. This makes it very difficult for the officer to pursue a violation: if, for example, a Fisheries Officer

confiscates a turtle, he essentially removes evidence that the police would need to pursue a violation with the specific individual; if a Fisheries Officer leaves the scene to call in the police, he loses either the evidence or both evidence and the alleged offender; or, because the police usually have other priorities, Fisheries Officers are unable to secure the assistance of the police in making an arrest (R.A. Anslyn, pers. comm., 2004). This problem highlights the need to clarify much more explicitly the legal authorities invested in fisheries department personnel and the limits of those authorities and, possibly, to provide specific training on these and develop specific procedures for these and other enforcement staff to follow in such circumstances. Finally, there appears to be a need for outreach to the police to engage greater support for this type of enforcement effort.

Another enforcement problem, common in small communities, is a sociological one. As indicated by Anslyn (*in litt.*, 22 August 2004), staff from the Fisheries Department do not want to offend anyone while executing their duties, in the interest of maintaining conservation practices. For example, in the absence of specific regulations requiring fishers to record and report on their fishing effort, including marine turtle landings, they are put in a position of encouraging voluntary provision of these data, which can only be done through a constructive, collaborative relationship and not an adversarial one. The authority of the Fisheries Officers has, as a result, been eroded and “this has sent the wrong message to the offenders”. There is a need for an arrangement that redresses this problem so that the “officer’s presence and mission [are] recognized in an authoritative way” (R.A. Anslyn, *in litt.*, 22 August 2004).

“Greater enforcement has always been an option waiting to be implemented” (R.A. Anslyn, *in litt.*, 22 August 2004). How best to accomplish this is a point of discussion. Assigning dedicated enforcement personnel with the full range of enforcement powers is one option: in Saint Kitts, the Department of Fisheries employs an enforcement officer, but there is no dedicated fisheries enforcement capacity in Nevis, where there may be a need for one to two trained fisheries enforcement personnel (E. Pemberton, pers. comm., 2004). Another mechanism currently being discussed in the context of revised fisheries regulations is the requirement for licences for fishing; as currently proposed, these would be inexpensive to secure, but because they would be conditionally renewable on an annual basis, this would theoretically serve as an incentive to comply with the regulations (R.A. Anslyn, pers. comm., 2004).

Both the Nevis (DOF, 2002) and Saint Kitts (FMU, 2002) Departments of Fisheries report that there are no stockpiles of marine turtle products on the islands.

Marine turtle management

Management of exploitation

Eckert and Honebrink (1992) expressed concerns about the *Turtle Ordinance* of 1948 in effect in Saint Kitts and Nevis at the time of their writing. These regulations set a minimum size limit of nine kilogrammes (20 lb) at all times and a closed season for all turtles and eggs from 1 June to 30 September. Although some of the problems that they identified have been addressed by the substantially improved 1995 turtle regulations, the following problems remain:

- the closed season of 28 February–1 October does not encompass the full breeding season (the peak is April–December); hence, despite the prohibition on “interference” with nests and nesting females, potentially

- gravid females may still be taken (although not legally from the nesting beach);
- minimum size limits directly contradict best practices in the management of marine turtles, which are characterized by naturally high juvenile mortality, slow maturation and long life;
- enforcing the 300-yard limit is problematic, as it is unlikely that an enforcement officer would know where a successful netting had taken place;
- there is no provision for the confiscation of equipment used in an offence; and
- the fishery is “open entry” with no licensing of turtle fishers and no quota for the number of turtles a fisher can land each year.

Eckert and Honebrink (1992) reported that the draft Fisheries Regulations included a moratorium on exploitation of all marine turtles and eggs at all times and recommended that if a “period of harvest is inevitable prior to the Regulations coming into effect”, interim regulations should declare a *maximum* size limit and a closed season of 1 April to 30 November. Not only has the moratorium not been adopted, but neither of these provisions has been incorporated in the current regulations. Some improvements have been made, such as expansion of the closed season and an increase in the maximum fine but, by *increasing* the minimum sizes for all species in the 1995 regulations, fishers are now required to focus their harvest on large juveniles and breeding-age adults, the age classes that the populations are least able to replace. Establishing minimum size limits defies the reality that the reproductive value in marine turtles increases dramatically with size/age and contradicts more than a decade of recommendations on best management practices, which began with Frazer (1989) describing to the Second Western Atlantic Turtle Symposium the life-history rationale behind setting “maximum size limits to ensure that large turtles are not taken”.

In addition to shortcomings in the regulations, there is no regular monitoring of the fishery in Saint Kitts. A voluntary reporting initiative has only been running for a few years in Nevis and the data-collectors are having difficulties securing the co-operation of the fishers, who apparently are fearful that better reporting will lead to the closure of the marine turtle fishery (E. Pemberton, pers. comm., 2004). In neither island is monitoring in place at the level of specificity required to enable the identification of trends in catches and what they might mean for populations of the species concerned and the government concedes that management and monitoring of the legal fishery are not sufficient to ensure that the fishery does not result in a reduction in marine turtle numbers (DOF, 2002).

Discussions have been under way for several years regarding revisions to the national regulatory framework for managing marine turtles. Management recommendations that have been put forward and are under consideration (MALHC, 2002; FMU, 2002) include those to:

- tag and release half the marine turtle catch;
- reduce the open season to two months (1 January to 28 February);
- impose an annual quota;
- limit the fishing gear (nets) per fisher and install ownership identification tags; and
- require licences for all fishers, including for the take of turtles, which would be renewed on an annual basis (R.A. Anslyn, pers. comm., 2004).

However, these additional restrictions are but one component of a management programme that, at the very least, should include four other components, namely:

- systematic, sustained recording of the fishery in terms of numbers and species and sizes of turtle taken and the localities where they were taken, as well as the number of fishers, gear types, etc., and domestic marketing of derived products;
- efforts—outreach, extension work and education—to inform and increase compliance with the legal restrictions and related management efforts;
- strict enforcement, through patrols on beaches and at sea, and prosecution of violators, bearing in mind as well that community-based programmes and initiatives are considered to be most effective; and
- systematic monitoring of marine turtle populations so as to identify and address management gaps, document critical sites for conservation and detect real and meaningful trends in marine turtle numbers.

Species research and conservation

Although in the past, the Nevis Historical and Conservation Society has spearheaded numerous efforts on behalf of marine turtles in Nevis, most marine turtle research and conservation in Nevis is currently being undertaken through the Department of Fisheries, who have established and supervise a Nevis Turtle Group that includes Department staff and others.

According to the Department of Fisheries (MALHC, 2002; DOF, 2002), nesting population monitoring studies have only recently been initiated in Nevis with the aim of determining long-term population trends. Sea Haven Beach (the most productive Hawksbill nesting site on the island) and Cades Bay have been designated as Index beaches. Patrols are undertaken during the nesting season at least twice a week, and sometimes more frequently, depending on nesting activity, on these two Index beaches, and some monitoring is undertaken on the other nesting beaches. These patrols are undertaken by the Department of Fisheries with assistance of personnel from other government departments and the private sector, including local groups and organizations that are encouraged to participate in the programme (DOF, 2004). Tagging of turtles has also been initiated: as of February 2004, 11 turtles (10 Hawksbill Turtles, and one Green Turtle) had been tagged, eight of them on Sea Haven Beach (E. Pemberton, pers. comm., February 2004). Regional resources available to assist in capacity-building have been used, including those available through WIDECAS (e.g. tags and basic field equipment, database management software, educational materials, off-site training and mentoring programmes, assistance with project development and fund-raising).

As of 2002, no studies were under way in Saint Kitts aimed at identifying trends in marine turtle populations (FMU, 2002). In March 2003, SCHS and Ross University, with permits from the Department of Fisheries and tags and training from WIDECAS, initiated monitoring on the two main Leatherback nesting beaches. Surveys are undertaken two to three times per week from March into September and, although the data on hatchling emergences are poor, 90–95% of the adult Leatherback emergences on these beaches are thought to have been recorded during the past two seasons (K. Stewart, SCHS, *in litt.*, 16 September 2004).

Habitat conservation

There are no marine protected areas in Saint Kitts and Nevis and no reserves, marine or terrestrial, have been set aside. None of the nesting beaches have yet been protected on either island. Proposals for marine as well as terrestrial protected areas have been in process for many years, but no definitive action has been taken (FMU, 2002). Both the Department of Fisheries and the Department of Environment in Saint Kitts have the authority to

designate protected areas and reserves of various kinds, although marine protected areas must be designated at the federal level and are, thus, dependent on decisions by the Federal Assembly (R.A. Anslyn, pers. comm., 2004).

There is a range of habitat issues affecting marine turtles in Saint Kitts and Nevis. In Nevis, at least, habitat degradation and destruction are a key area of concern, and unregulated or poorly planned coastal development (DOF, 2004) is a driving factor. Physical development deters nesting females, while hatchlings and adults are disoriented by artificial beach-front hotel lighting (and in some instances have had to be rescued from streets or have been found on the airport runway—DOF, 2004); and vehicles driving on the beaches create disturbance and compact nesting sites (MALHC, 2002). In addition to the persistent problem of sand-mining, a particular concern arising recently is the potential impact of the proposed expansion of the Nevis airport on Sea Haven Beach, one of the major marine turtle nesting beaches on the island (E. Pemberton, pers. comm., 2004).

In connection with the South East Peninsula Development Project in Saint Kitts, Eckert (1989) summarized the distribution and abundance of nesting on the peninsula (which includes the most important nesting and foraging habitat in the country) and provided habitat management recommendations for beaches (e.g. regarding waste disposal, sand-mining, recreation and traffic, beach-front lighting) and nearshore waters, concluding that “all South East Peninsula beaches should be declared Conservation Districts (as advocated by the Handbook of Development Guidelines and Considerations for the South East Peninsula and the Proposed Land Use Management Plan) and the offshore zone between Nag’s Head and White House Bay (as far as the ferry/marina site, should Little Salt Pond be so designated) should be established as a Marine Reserve”. These measures have not been implemented.

Education and public awareness

SCHS has long been involved in education and awareness activities relating to marine turtles, including brochures, posters, videos, presentations to local schools and media interviews. Orchard (2002) notes that the Society has developed a project proposal for a Sea Turtle Conservation Officer but lacks the time and manpower to secure the funding and identify a suitable person for the job. In Nevis, the Department of Fisheries has introduced educational programmes on radio and articles in newspapers and newsletters (MAHLC, 2002) and facilitates student visits to nesting beaches. In addition, the Department has recently launched a stamp competition, whereby children under 16 years of age can submit marine turtle drawings that may be chosen for publication as postage stamps (E. Pemberton, pers. comm., February 2004). WIDECAST outreach materials are widely distributed in the country. In addition, at least one hotel in Nevis, the Four Seasons Resort, is participating in education and awareness programmes, as well as assisting with conservation efforts (R.A. Anslyn, *in litt.*, 22 August 2004).

Constraints to marine turtle conservation and management

The Nevis Department of Fisheries (DOF, 2002), in acknowledging the need for improved management of marine turtles, reports that it faces a number of constraints in addressing issues with both the legal and illegal fishery. These include lack of public support, limited manpower (e.g. for monitoring), lack of trained personnel, insufficient funding, insufficient training and the lack of equipment. More recently, the Department (DOF, 2004) has identified a particular need for transport, including for at-sea monitoring and tagging, for enforcement, and

for technical assistance in advising hotels and private homes regarding the proper installation of beach-front lighting. Also in Nevis, inadequacies in coastal zone legislation and enforcement are an impediment to improved marine turtle management. Some development projects, such as those funded by bilateral or multilateral development assistance agencies, are required to be based on an environmental impact assessment; however, these assessments are not always done well, and their findings are not always implemented (E. Pemberton, pers. comm., February 2004). Finally, there is a need for greater political support at the federal level for environmental initiatives (R.A. Anslyn, pers. comm. 2004).

According to Orchard (2002), there are similar constraints to improved marine turtle management in Saint Kitts: limited manpower, lack of trained staff, and insufficient funding. In her judgment, the most important ingredient for effective marine turtle management is one or more officers “dedicated solely” to monitoring, enforcement and education.

Summary and recommendations

Marine turtle populations have long been considered by informed observers to be depleted from historical levels of abundance. However, because there has been no systematic population monitoring of marine turtle populations in Saint Kitts and Nevis until very recently and no organized monitoring of legal and illegal exploitation, there is no basis to determine the contemporary status or trend of marine turtle populations in the country. That the legal fishery, as stipulated in the fisheries regulations for turtles, has targeted the large juvenile and adult turtles that are the most important age classes to protect in order to maintain population numbers and promote population recovery, and that illegal take of turtles and eggs persists at unknown levels, suggest that their status is likely to have declined rather than improved over the years.

The current regime fails to achieve management and is inconsistent with the principles and practice of sustainable use. That these shortcomings have been recognized by the government is a positive first step in what should be a comprehensive effort to modernize the management framework relevant to marine turtle stocks in the country. The lack of a scientifically based stock assessment and limits on the numbers of turtles that may be taken or of fishers licensed to take turtles suggests a need for additional measures that would assist in preventing further population declines and, possibly, promoting population recovery. Fundamental to any exploitation regime aimed at sustainable use is the development and implementation of a monitoring programme for the fishery to record relevant data on landings so as to assess compliance, monitor trends, and infer what those trends may mean for marine turtle populations and for the effectiveness of management measures.

In accordance with the FAO Code of Conduct for Responsible Fisheries (FAO, 1995), an explicitly precautionary code, which states that “the right to fish carries with it the obligation to do so in a responsible manner so as to ensure effective conservation and management of the living aquatic resources”, the management of marine turtle resources in Saint Kitts and Nevis should seek to maintain the availability of the resource “in sufficient quantities for present and future generations in the context of food security, poverty alleviation and sustainable development”. Management measures should, *inter alia*, prevent over-fishing, rehabilitate depleted populations, incorporate the best scientific evidence (taking into account traditional knowledge, as well as relevant environmental, economic and social factors), assign priority to research and data collection (including at international scales), and promote environmentally safe fishing gear and practices in order to protect both the target resource and the ecosystems upon which it depends.

Among the fundamental components of any regime aimed at management of wild populations are: restrictions on exploitation that are consistent with the species' biological requirements; a monitoring programme—systematic, sustained, and rigorous collection and review of data—either on the specifics of exploitation or of wild populations so as to discern trends that can inform management; mechanisms to identify, monitor and address other threats to the species being exploited, so that these threats can be factored with exploitation to assess what level of overall mortality the species might sustain; and a high level of compliance (sometimes achievable only through vigorous enforcement) with the restrictions put in place to ensure that management goals are achieved. It does not appear that any of these activities are being undertaken—at least not on the systematic basis that is required—in either Saint Kitts or Nevis.

1. In the light of the recognized depleted status of marine turtles in Saint Kitts and Nevis and the potential for continuing declines resulting from the legally mandated exploitation of large juvenile and adult turtles, and in the absence of population monitoring, there is no discernible basis for the maintenance of a legal fishery for marine turtles in Saint Kitts and Nevis. The government should move expeditiously on a comprehensive revision of both the regulatory framework and the broader institutional mandates and priorities that provide for the types of activities that form part of a scientifically based management programme. The government should consider, in this context, whether a moratorium may be advisable as an interim or longer-term measure.
2. In support of a comprehensive review and revision of the legal framework for marine turtle management, a comprehensive frame survey should be undertaken to quantify and characterize exploitation and use of marine turtles at the national level, including:
 - the landing of turtles at sea and hunting on nesting beaches;
 - exchange and marketing of turtles and turtle products;
 - numbers and types of fishers (and gears) involved, including the extent to which marine turtle landings result from incidental or opportunistic take in other fishing operations or from a targeted fishery;
 - processing and marketing patterns; and
 - the importance to livelihoods of the products and income derived from marine turtle exploitation.

This investigation should also aim to establish the nature and extent of illegal exploitation and trade of marine turtles and eggs and marine turtle products, and the extent to which they may negatively impact marine turtle populations and compromise management.

3. If legal exploitation of marine turtles is to continue in Saint Kitts and Nevis, the restrictions on this exploitation should reflect the biological parameters of marine turtles, take into account their depleted status and aim, at a minimum, at preventing any further population declines. Any exploitation regimen promoting population recovery and maintenance should be established and conducted according to sound management principles and practice, which should include the following:
 - A. Bringing exploitation in line with biological principles, including:
 - complete protection of nesting females, their eggs and young at all times;
 - complete protection of all species during the primary nesting season, 1 March to 30 November;
 - complete protection of the Leatherback, which occurs in the country only as an adult, and typically an egg-bearing female;

- maximum size limits, based on length (which is easier to undertake in the field) rather than weight, so as to safeguard large juveniles and adults;
- a conservative limit on the numbers of animals that may be exploited, based on a scientific stock assessment; and
- a requirement that capture quotas be based, if not on stock assessment, on data derived from national processes and research activities, and that, as far as practicable, these data be collected in such a way as to be compatible with the goal of assessing stocks throughout their full geographic ranges.

B. Managing the legal fishery through an enforceable, high-compliance monitoring programme aimed at establishing trends and monitoring these over time. A national programme to monitor marine turtle exploitation should document comprehensively and systematically, and in a manner allowing such records to be analysed and compared over time, the following:

- the number of fishers taking marine turtles and by what means;
- the number, size and species distribution of the marine turtles landed;
- the localities where turtles were taken;
- catch-per-unit effort; and
- the disposition of the marine turtles landed, including value of the animal and/or products if sold or traded.

In further support of reliable monitoring of the fishery, the following should be considered as requirements for participation:

- that ownership identification tags be installed on approved gear (e.g. nets)
- that turtles be landed alive or intact; prohibiting, for example, the use of spear guns and extended net sets that can result in drowning, and providing for reliable recording and verification of turtle landings; and
- that the licensing process include as a criterion full participation in the monitoring programme.

C. Establishing a systematic marine turtle monitoring programme that will:

- document distribution and abundance of local populations;
- identify major nesting grounds and foraging areas;
- designate Index nesting beaches and Index foraging grounds, and document the numbers of marine turtles occurring in these over time;
- manage data records such that statistically significant trends in abundance can be identified and inform management; and
- identify and monitor threats and other factors influencing marine turtle survival.

4. Mechanisms to quantify levels of incidental catch of marine turtles should be developed. Measures to reduce or eliminate incidental catch of marine turtles, such as through time–area closures and/or alternative (especially to gill nets) types of gear, should be implemented.

5. Critical habitats, both terrestrial and marine, should be identified and protected, and incorporated into broader biodiversity management programmes, in recognition of the importance of habitat pressures on marine turtles and the importance of these animals and intact marine turtle habitats for the country’s “tourism product”. The government should consider:

- expanding the number of protected nesting beaches;
 - enhancing habitat protection measures, including restriction/regulation of tourism and other activities near nesting beaches during the egg-laying season and vigorous enforcement of such measures, such as against vehicles driving on nesting beaches and sand-mining;
 - adopting regulations to prevent or otherwise manage leaving of nets and other debris on the beach;
 - improving coastal zone management (and monitoring) capacity, including through environmental impact assessment, particularly in relation to sand-mining and beach-front construction;
 - expanding the system of protected areas; and
 - strengthening the management framework for protected areas to ensure that these areas fulfill their stated objectives.
6. There is need for greater enforcement capacity and effort. This capacity should involve clearer and possibly enhanced authorities for personnel from the Departments of Fisheries and other enforcement personnel and, possibly, dedicated enforcement staff. In addition, it should include training and logistical support, including a mobile enforcement unit, for both on-land and at-sea monitoring efforts. Finally, this capacity should involve outreach and other activities that will engage greater efforts on the part of police for fisheries and broader environmental enforcement. A mutually agreed set of protocols and procedures for these agencies to follow in such circumstances may be an option to consider.
 7. Increased efforts should be made to engage local communities, including fishers, in marine turtle conservation and management. Fisheries extension efforts should be implemented that involve regular exchanges with fishers of information on marine turtles and their conservation and management needs and the participation of fishers in efforts to manage marine turtles so as to enhance compliance with regulations and support for marine turtle conservation. Support directed towards sustainable fishery practices and/or alternative livelihoods should be provided, as relevant and necessary, to assist fishers meaningfully in their efforts to comply with revised marine turtle regulations. Similar outreach efforts should be made with the tourism sector as regards the importance of best practice in relation to construction, beach-front lighting, recreational use of nesting beaches, and other marine turtle management issues, as well as the important role that marine turtles and their natural habitats play in attracting visitors.
 8. There should be effective co-ordination between the Departments of Fisheries in Saint Kitts and Nevis, so as to ensure that the management measures being implemented for the marine turtles that are undoubtedly moving around the two islands are well-integrated and mutually reinforcing, and to enhance these agencies' ability to assess trends in the fishery and in the country's turtle populations. Monitoring, including the sharing of data on marine turtle distribution and exploitation, enforcement, and public outreach are two areas that would particularly benefit from effective co-ordination.
 9. Financial, logistical, and political support and encouragement should be extended to relevant government agencies to develop and implement a modern, scientifically based conservation and management regime for nationally depleted marine turtle stocks, including for the revision of the legal framework, scientific studies, monitoring programmes, enforcement capacity and institutional strengthening of government agencies whose mandate includes marine turtles and their habitats. Both private and public foreign investment in the fisheries and tourism sectors in Saint Kitts and Nevis should take account of the increased responsibilities—and costs—for the Departments of Fisheries and other agencies in managing the resources concerned sustainably and the broader biodiversity impacts that may ensue.

10. Financial, logistical and political support and encouragement should also be extended to active non-governmental and network-co-ordinated research and monitoring efforts, such as those undertaken by the Nevis Turtle Group and, in Saint Kitts, by SCHS and Ross University. Building on the success of current programmes is encouraged.

References

- Anon. (2002). CITES Document CoP12 Doc. 28. Working document of the 12th meeting of the Conference of the Parties, Santiago (Chile), 3–15 November 2002. Accessible at www.cites.org. Viewed 12 December 2005.
- Anon. (2004). CITES Document CoP13 Doc. 22 (Rev. 2). Working document of the 13th meeting of the Conference of the Parties, Bangkok (Thailand), 2–14 October 2004. Accessible at www.cites.org. Viewed 12 December 2005.
- Anon. (2005). SC53 Summary Record. Official report of the 53rd meeting of the CITES Standing Committee. Accessible at www.cites.org. Viewed 12 December 2005.
- Anon. (2006). Commonwealth Secretariat. St Kitts and Nevis. History. Website of the Commonwealth. <http://www.thecommonwealth.org/Templates/YearbookInternal.asp?NodeID=145177>
- DOF (Department of Fisheries, Nevis). (2002). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of Marine Turtles in the Lesser Antilles, Central America, Colombia and Venezuela. Completed by Emile Lemuel Pemberton, Fisheries Development Officer. Dated 29 July 2002.
- DOF (Department of Fisheries, Nevis). (2004). Sea Turtle Monitoring Programme, Nevis, West Indies. Report prepared for the 2004 Annual General Meeting of the Wider Caribbean Sea Turtle Conservation Network (WIDECAST), 21–22 February 2004, San José, Costa Rica. 2 pp. Unpublished.
- Eckert, K.L. (1989). *Marine Turtle Resource Management Plan for the Southeast Peninsula of Saint Kitts, West Indies*. US Agency for International Development/DESFIL Project No. DHR-5438-C-00-6054-00. Washington, D.C. 34 pp.
- Eckert, K.L. and T.D. Honebrink. (1992). *WIDECAST Sea Turtle Recovery Action Plan for St. Kitts and Nevis*. CEP Technical Report No. 17. UNEP Caribbean Environment Programme, Kingston, Jamaica. xii + 16 pp.
- FAO. (1995). Code of Conduct for Responsible Fisheries. Adopted by the 28th Session of the FAO Conference. Food and Agriculture Organization of the United Nations, Rome. 34 pp. + annexes. www.fao.org/fi/agreem/codecond/codecon.asp
- FMU (Fisheries Management Unit, Saint Kitts). (2002). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of Marine Turtles in the Lesser Antilles, Central America, Colombia and Venezuela. Completed by Samuel J. Heyliger, Assistant Fisheries Officer. Dated 25 July 2002. (Follow-up telephone conversation 10 October 2002).
- Frazer, N.B. (1989). Management Options: A Philosophical Approach to Population Models. Pp. 198–207. In: L. Ogren (Ed.-in-Chief). *Proceedings of the Second Western Atlantic Turtle Symposium*. Panama City, Florida. NOAA Technical Memorandum NMFS-SEFC-226. US Department of Commerce.
- Groombridge, B. and R. Luxmoore. (1989). *The Green Turtle and Hawksbill (Reptilia: Cheloniidae): World Status, Exploitation and Trade*. Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Lausanne, Switzerland. 601 pp.
- MALHC (Ministry of Agriculture, Lands, Housing and Co-operatives, Nevis). (2002). National Report: Nevis. Prepared for the Second CITES Wider Caribbean Hawksbill Turtle Dialogue Meeting, Grand Cayman, Cayman Islands, 12–23 May 2002. 8 pp. Unpublished.

- Meylan, A.B. (1983). Marine turtles of the Leeward Islands, Lesser Antilles. *Atoll Research Bulletin* 278:1–24 + figs.
- Meylan, A.B. (1999). International movements of immature and adult hawksbill turtles (*Eretmochelys imbricata*) in the Caribbean Region. *Chelonian Conservation and Biology* 3(2):189–194.
- Milliken, T. and H. Tokunaga. (1987). *The Japanese Sea Turtle Trade 1970–1986*. A special report prepared by TRAFFIC (Japan). Center for Environmental Education, Washington, DC. 171 pp.
- Orchard, K., WIDECAST Country Co-ordinator, Saint Christopher Heritage Society, Saint Kitts. Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of Marine Turtles in the Lesser Antilles, Central America, Colombia and Venezuela. Dated 16 August 2002.
- Wilkins, R. and A.B. Meylan. (1984). Western Atlantic Turtle Symposium National Report for Saint Kitts–Nevis. Pp. 364–369. In: P. Bacon *et al.* (Eds). *Proceedings of the Western Atlantic Turtle Symposium, 17–22 July 1983, San José, Costa Rica*, III, Appendix 7. University of Miami Press, Florida.
- Wilkins, R. and A. Barrett. (1987). National Report for Saint Kitts and Nevis. Prepared for the Second Western Atlantic Turtle Symposium, 11–16 October 1987, Mayagüez, Puerto Rico. 25 pp. Unpublished.

Saint Lucia

Introduction

The island of Saint Lucia is 616 km² in size and features a lush mountainous landscape with a wide range of terrestrial and marine habitats, including a superior natural harbour at Port Castries. Part of the Windward Islands of the Caribbean Sea, Saint Lucia rests on an ancient volcanic ridge connecting Martinique to the north with Saint Vincent to the south. Saint Lucia harbours a rich avian fauna, of which four species are endemic (including the national bird, the Saint Lucia Parrot *Amazona versicolor*) and, typical of Caribbean island States, a more modest diversity of native mammals and reptiles, including four species of marine turtle (CCA, 1991).

Habitat transformation, pollution and over-harvesting are common factors contributing to the decline of biodiversity around the world, and Saint Lucia is no exception (Government of Saint Lucia, 2000). Marine turtle populations in Saint Lucia have been subjected to a variety of pressures historically and this situation continues. Based on archaeological evidence (e.g. from Grande Anse, Marie Galante and Folle Anse), marine turtles were important to the prehistoric fishing economy of Saint Lucia (Wing and Reitz, 1982). There are few relevant literature references prior to World War II, but it is likely that turtles were an important component of local culture and economy through most of the 20th century (summarized by d'Auvergne and Eckert, 1993).

Based on existing literature, as well as unpublished data and local interviews, a national Sea Turtle Recovery Action Plan (STRAP) for Saint Lucia was published by the Wider Caribbean Sea Turtle Conservation Network (WIDECAST) and the United Nations Caribbean Environment Programme in 1993 (d'Auvergne and Eckert, 1993). The STRAP reviewed in detail the status of marine turtles in the country and the threats that they faced and made recommendations concerning research and management gaps and priorities, the regulatory framework, and community-level involvement in the design, implementation and evaluation of priority actions. In addition to direct exploitation, through a legal fishery operating on the basis of minimum size limits during a five-month open season and incidental capture in fisheries targeting other species, the STRAP identified the loss of nesting beaches to coastal tourism development and the mining of beach sand for construction purposes as major threats. Degradation of foraging habitat from increased commercial and recreational use and other impacts, such as dynamiting, anchoring, siltation and over-fishing, was also documented.

In the face of declining marine turtle populations, a lack of data relevant to determining potentially sustainable harvest levels and insufficient resources to enforce a more tightly controlled regime, a moratorium on marine turtle exploitation was established in Saint Lucia in 1996 and was twice extended (to 30 September 2004) so as to enable an assessment of marine turtle populations and improvements in the overall management framework for these species. Following the expiration of the moratorium in 2004, and awaiting a directive from the Cabinet of Ministers regarding whether or not the moratorium will be reinstated, the *Fisheries Regulations No. 9* of 1994, which governed the marine turtle fishery prior to the moratorium, are in place (D. Pierre-Nathaniel, Department of Fisheries, *in litt.*, 20 April 2005).

There was no comprehensive mechanism in place to record systematically landings associated with the legal marine turtle fishery that operated in Saint Lucia until 1996 and stock assessment initiatives intended for implementation during the moratorium lagged for lack of funding. Although quantitative data on trends in marine turtle populations are still not available, the most recent published reviews (e.g. Murray, 1984; Groombridge and

Luxmoore, 1989; d’Auvergne and Eckert, 1993) describe populations as depleted and declining. Murray (1984) reported that “fishermen have indicated that the numbers of sea turtles seen and/or captured in 1982 show a significant decrease relative to 1980 and a major decrease relative to 1972”. More recently, however, marine resource-users (fishers and coastal boaters) have provided anecdotal reports of increased marine turtle sightings, most likely Hawksbill and Green Turtles, in the country’s waters. There are no comprehensive data with which to confirm this trend nor to determine whether there is a corresponding trend in nesting activity, since an island-wide monitoring programme has not yet been put in place, primarily as a result of resource (mainly funding) constraints.

The recently revised Plan for Managing the Fisheries of Saint Lucia 2001–2005 (DOF, 2001b) includes a Management Plan for Marine Turtles intended to “restore turtle populations, promote sustainable use of the resource, and ensure equitable sharing of benefits”. The Management Plan places priority on determining the status of local stocks by gathering more detailed information on distribution and abundance, and assessing the impact of the moratorium and other management tools on current trends. In addition, it includes proposals for addressing “over-exploitation”, including through increased law enforcement, the development of alternative livelihoods for fishers, and revised management measures; protection of critical areas of habitat; sustained research and monitoring; and public education (including increased information exchange, and sector-specific awareness programmes).

The Government of Saint Lucia has emphasized that curbing illegal collection of turtle eggs and nesting females is a “key requirement for continued improvement in the ambient abundance of these species” (DOF, 2001a) and, towards this end, the Management Plan for Marine Turtles builds on the recommendations of d’Auvergne and Eckert (1993) in prioritizing the management and protection of all life stages and the habitats upon which they depend, active participation in international agreements, and continued support for a national marine turtle conservation programme.

With regard to general habitat issues, progress has been made in reducing indiscriminate anchoring, but sand-mining, for example, “continues to be of concern [and is] inadequately regulated” and even today the “development of tourism infrastructure along many traditional Hawksbill nesting beaches [is a deterrent to nesting] due to disturbance from noise and waterfront lighting and the recent popularity of motorised vehicles for beach cleaning” (DOF, 2001a). Saint Lucia is well known for a functioning network of marine reserves and other forms of marine management areas; in addition, two important nesting beaches (Grande Anse and Fond d’Or) enjoy protected status.

Summary of the status of marine turtles in Saint Lucia

Four species of marine turtle occur in the waters of Saint Lucia. The Green and Hawksbill Turtles are the most common and are represented by individuals of varying sizes throughout the year; the Leatherback is less common and is observed only during seasonal nesting (March to August, with the peak in May and June); there are “unconfirmed reports of Loggerheads sighted in Saint Lucia’s waters and even more rare reports of Loggerheads nesting on the island’s beaches” (DOF, 2002). Major foraging areas for marine turtles around the island have not been scientifically verified, but Green and Hawksbill Turtles of various sizes are present year-round and significant foraging areas (generally coincident with healthy seagrass and coral reef systems) are likely to be familiar to fishers, divers, and other habitual marine-resource users. All available information in this regard was previously summarized by d’Auvergne and Eckert (1993).

Occurrence of marine turtles in Saint Lucia

English common name	Scientific name	Occurrence
Loggerhead	<i>Caretta caretta</i>	I
Green Turtle	<i>Chelonia mydas</i>	N, F
Leatherback	<i>Dermochelys coriacea</i>	N
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	N, F
Kemp's Ridley	<i>Lepidochelys kempii</i>	A
Olive Ridley	<i>Lepidochelys olivacea</i>	A

Key: N=nesting; F= foraging; I=infrequent; A=absent

Most documented nesting on the island is by Leatherbacks, primarily on the high-energy beaches of the east coast; in contrast, Hawksbill and Green Turtles are more commonly observed on the leeward coast (summarized by d'Auvergne and Eckert, 1993; reaffirmed by DOF, 2002). One of the best-known nesting beaches is Grande Anse on the north-east coast of the island, where the Leatherback is the dominant nesting species, but Green Turtles and Hawksbill Turtles are also encountered. All three species are known to visit other beaches, but “no regular monitoring occurs to validate the frequency [of nesting]” at sites other than Grand Anse (DOF, 2002).

Studies designed to investigate the genetic origins of juveniles foraging in Saint Lucia's waters and/or to document international movements by juveniles and adults would lend impetus to targeted multilateral management initiatives by identifying range States that share marine turtle stocks with Saint Lucia. No studies of long-distance movement have been undertaken as yet, but some information is available. For example, Carr *et al.* (1982) reported the capture near Vieux-Fort, Saint Lucia of a Green Turtle previously tagged while nesting at Aves Island (Isla de Aves, Venezuela). Boulon (1989) reported a Hawksbill Turtle tagged in Saint Thomas (US Virgin Islands) in April 1982 and recaptured 16 months later in Saint Lucia. In 2003, an adult Hawksbill Turtle tagged in Barbados was caught (and apparently released) in Saint Lucia and a Leatherback tagged during nesting in Saint Lucia later nested in Barbados (J. Horrocks, Barbados Sea Turtle Project, pers. comm., 2004).

Overview of the legal framework for marine turtle management

Membership in international and regional treaties

Saint Lucia ratified the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1982 and entered no reservations with respect to marine turtles. Saint Lucia has subsequently ratified the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, or Cartagena Convention, and its Protocols Concerning Specially Protected Areas and Wildlife (SPAW Protocol), and Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region.

Membership of Saint Lucia in multilateral agreements relating to marine turtles

Convention	Saint Lucia
Cartagena Convention	20.11.1984 (R)
Protocol Concerning Specially Protected Areas and Wildlife (SPAW)	25.04.2000 (R)
Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region	20.11.1984 (R)
Protocol Concerning Pollution from Land-based Sources and Activities	No
Convention on Biological Diversity (CBD)	28.07.1993 (A)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	15.03.1983 (E)
Convention on Migratory Species (CMS)	No
Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	No
MARPOL 73/78 (Annex I/II)	12.10.2000 (A)
MARPOL 73/78 (Annex III)	12.10.2000 (A)
MARPOL 73/78 (Annex IV)	12.10.2000 (A)
MARPOL 73/78 (Annex V)	12.10.2000 (A)
Convention on Wetlands of International Importance (Ramsar)	19.06.2002 (E)
UN Convention on Law of the Sea (UNCLOS)	27.03.1985 (R)
Western Hemisphere Convention	No
World Heritage Convention	14.10.1991 (R)

Key: Date of: Ratification (R); Accession (A); Entry into force (E)

Laws and regulations relating to marine turtles

Regulation of the legal fishery for marine turtles in Saint Lucia dates back at least as far as the *Turtle, Lobster and Fish Protection Act (No. 13)* of 1971. This law set out the following restrictions on exploitation of marine turtles:

- a four-month closed season from 1 May to 31 August, during which time it was prohibited to: fish for, kill, collect, sell, purchase, or possess turtles and their eggs, or meat;
- a prohibition on the setting of nets and other gear with the intent to catch turtles within 100 metres of the shore;
- a prohibition on the take of turtles or their eggs on land; and
- a prohibition on the take, sale, purchase, and possession of turtles under a minimum size limit of 15 lb (6.8 kg).

Under this Act, the *Fisheries (Turtle, Lobster and Fish Protection) Regulations No. 67* of 1987 were enacted. Later, the *Fisheries Act (No. 10)* of 1984 repealed the 1971 Act, and the *Fisheries Regulations (No. 9)* of 1994 repealed the 1987 Regulations. Section 39 of the current Regulations includes measures for the protection of turtles and sets forth the following restrictions:

“33. (1) No person shall:

- (a) disturb, remove from the fishery waters, expose for sale, sell, purchase, or at any time have in his possession any turtle eggs;

- (b) interfere with any turtle nest, or turtle that is nesting;
- (c) remove from the fishery waters, expose for sale, sell, purchase, or at any time have in his possession any undersized turtle;
- (d) set within 100 metres of the shores of Saint Lucia any net or seine or any other artifice for the purpose of or with the intention of fishing for, catching or taking any turtle; and
- (e) fish for, remove from the fishery waters, or at any time have in his possession, expose for sale, sell, or purchase any turtle between the 28th day of February to the 1st day of October in every year or as otherwise stated by the Minister by notice published in the Gazette and in a newspaper which is printed or circulated in the State.

(2) In this Regulation:

- (a) “turtle” includes the whole or any part of any turtle;
- (b) “undersized” means a weight less than: 27.22 kg (59.88 lb) for Hawksbill Turtles; 34.02 kg (74.84 lb) for Green Turtles and Loggerheads; and 298.4 kg (65.65 lb) for Leatherbacks.”

Section 49 of the *Fisheries Regulations* provides for a penalty, on summary conviction, of a fine not exceeding 5000 East Caribbean dollars (XCD5000) for violation of, or failure to comply with, the Regulations. The *Fisheries Act* also allows for vessels and gear to be impounded.

A moratorium on the capture of marine turtles entered into effect on 1 March 1996 after having been published in the *Saint Lucia Gazette* 165(59) on 2 December 1995. The moratorium notice is reproduced below:

“The public is hereby notified that effective March 01, 1996, there shall be in place a moratorium on the harvesting of turtles in Saint Lucia. During the period of this moratorium, it shall be against the law to interfere with the nesting activities of turtles, catch, trade, keep turtles as pets or for eggs, or for use in any other form. All turtles accidentally caught are to be released in the marine environment or handed over to the Department of Fisheries for its release. Any contravention will result in a fine of \$5000 as stipulated under the *Fisheries Act No. 10* of 1984, and the *Fisheries Regulations No. 9* of 1994. All areas declared as protected for nesting turtles should not be interfered with except with the permission of the Minister for Agriculture, Lands, Fisheries and Forestry [now the Minister of Agriculture, Forestry and Fisheries].”

The moratorium was relaxed for a one-month restricted fishery period in December 1999.

Cabinet Conclusion No. 480 of 2000 continued the moratorium until June 2003, with the stipulation that “a re-assessment [was] to be conducted during the later half of the year 2002”. *Cabinet Conclusion No. 748* of 2003 further continued the moratorium until 30 September 2004, at which time it expired and was not renewed.

A review of the *Fisheries Act (No. 10)* of 1984 and the *Fisheries Regulations (No. 9)* of 1994 was initiated in 2001 (DOF, 2002). Although this review is not yet complete, the revised regulations are described as having “flexibility (as opposed to stated provisions) that allows for the determination of the season, target species, size limits, etc.” and increased fines (D. Pierre-Nathaniel, *in litt.*, 20 April 2005).

Saint Lucia's CITES-implementing legislation was assessed by the CITES National Legislation Project as "believed generally not to meet all requirements for implementation of CITES". Saint Lucia has submitted a Legislation Plan and draft legislation to the CITES Secretariat and, according to the Department of Fisheries (DOF, 2002), a CITES Legislative Working Group, under the guidance of the Chief Legislative Drafter from the office of the Attorney General and the CITES Secretariat, has been overseeing, from the latter part of 2001, the development of CITES-enabling legislation for the country. The Working Group includes representatives from the Department of Fisheries (Chair), Department of Forestry, Veterinary Division, Crop Protection Unit, Biodiversity Project, Ministry of Commerce and the Customs and Excise Department. National CITES legislation will include, among other provisions: designation of CITES Management and Scientific Authorities; prohibition of trade in specimens in violation of the Convention; penalties for prohibited trade; and provision for the confiscation of unlawfully traded or possessed specimens. Legislative progress will be reviewed at the 54th meeting of the CITES Standing Committee in October 2006 (Anon., 2005), but enactment is believed to be imminent (S. Nash, Chief, Capacity Building Unit, CITES Secretariat, *in litt.* to J. Gray, TRAFFIC International, 21 September 2005).

In addition to the fisheries legislation mentioned above, there are a number of legislative instruments that relate to wildlife trade controls and, thus, to the conservation and management of marine turtles in Saint Lucia, namely the:

- *Forest, Soil and Water Conservation: An Ordinance to make Provision for the Conservation of the Forest, Soil and Water Resources of the Colony, 1946*
- *Animals (Diseases and Importation): An Ordinance to Control the Importation of Animals, Birds, Reptiles and Insects, and to Regulate the Treatment and Disposal of Animals which are Suffering or are Suspected to be Suffering from any Disease and for any other Matters Related Thereto or Connected Therewith, 1956*
- *External Trade Act, No. 5 of 1968*
- *Wildlife Protection Act, No. 9 of 1980*
- *Plant Protection Act, Saint Lucia, No. 21 of 1988*
- *Customs (Control and Management) Act, No. 23 of 1990*
- *Animals (Diseases and Importation) Ordinance (Amendment) Act, No. 15 of 1994*
- *External Trade (Restricted Imports) Order, Statutory Instrument, 1996, No. 31*
- *National Conservation Authority Act, No. 16 of 1999*

Responsible authorities

The Department of Fisheries of the Ministry of Agriculture, Forestry and Fisheries is responsible for the development and management of the fisheries sector in Saint Lucia, which includes marine turtles. Part I, Section 2 of the *Fisheries Act (No. 10)* of 1984 defines an "authorised officer" as "any fisheries officer, customs officer, or police officer and any other person or category of persons designated as an authorised officer by the Minister under Section 26". Similarly, the draft national CITES legislation defines "officer" as "any police officer, forest officer, fisheries officer, customs officer, veterinary officer, plant protection officer, local fisheries management authority officer, national conservation authority officer, public officer or any officer of any relevant statutory body or board authorized by the Minister to enforce this Act". These officers have authority under the relevant legislative instruments listed above (DOF, 2002).

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective

What is known of the history of marine turtle exploitation in Saint Lucia was reviewed by d’Auvergne and Eckert (1993). They cited evidence that marine turtles played an important role in the prehistoric fishing economy of the island and suggested that turtles continued to be an important element in the island’s culture and economy through the 20th century. A legal fishery operated until the moratorium was established in 1996 and, although regulated since 1971, was not greatly restricted. Green and Hawksbill Turtles were the focus of the fishery and the meat was shared among family and friends, as well as sold on the local market, including to restaurants. Leatherbacks were not fished for nor usually killed for their meat; however, they were killed for their unlaidd eggs (d’Auvergne and Eckert, 1993), and flippers and certain internal organs were sometimes sought “for their alleged aphrodisiac qualities” (DOF, 2002).

One fisher gave an “order of magnitude” estimate of ca. 500 turtles as the number taken per year in the 1970s (d’Auvergne and Eckert, 1993). The same informant “felt that dynamite fishing was responsible for the destruction of significant numbers of turtles in Saint Lucia”. Based on local interviews and data from the Department of Fisheries, d’Auvergne and Eckert (1993) estimated that 200 or more turtles had been legally landed per year [during the five-month open season] since 1990, “in addition to an unquantified number caught during the closed season and a most likely large number of females removed illegally from nesting beaches”.

Data from the Department of Fisheries for the annual five-month open season in 1991 and 1992 document the landing of 3055 lb and 1468 lb (whole weight) of Hawksbill and Green Turtles (mostly juveniles) combined, in 1991 and 1992, respectively, at 11 landing sites. An estimated 10–15 fishers were targeting turtles using nets, and an estimated 15–20 nets were deployed during the open season. Only one individual was reported to rely heavily on the income derived from the take of turtles at that time. In most cases, d’Auvergne and Eckert (1993) concluded, full-time fishers augmented their annual income by taking turtles in the open season. By contrast, they reported that “dozens of rural, part-time fishermen” and non-fishers living adjacent to nesting beaches visited nesting beaches during the breeding season to kill egg-bearing females on an opportunistic basis. Finally, in addition to the directed take, they reported that Green and Hawksbill Turtles were sometimes caught incidentally by other fishing activities. Saint Lucia has a multi-species fishery, including shallow shelf and reef fish, deep slope fish, large pelagics, coastal pelagics, flying fish and a variety of shellfish and other invertebrates caught by a diversity of gear (DOF, 2002).

Evidence for illegal exploitation of marine turtles during the closed season and in violation of the prohibitions on the taking of eggs and nesting females was provided by d’Auvergne and Eckert (1993). The killing of egg-bearing Leatherbacks on Grande Anse was perhaps the most visible violation, owing to a beach-monitoring programme that began in 1983. The number of Leatherback carcasses documented varied from year to year, but reportedly averaged five to six during the 1980s. In 1989, poaching was significantly reduced owing to the presence of two wardens employed by the Department of Fisheries to patrol Grande Anse Beach and Mangroves Marine Reserve. The wardens were employed only part-time and, “despite their best efforts, the number of Leatherback carcasses rose again in 1991. Funding to support the Wardens expired in 1992 [and] it is almost

Credit: Scott A. Eckert/WIDECAST



Illegal take of marine turtle eggs is widespread throughout the Eastern Caribbean.

certain that at least 10 turtles were killed in 1993, not only at Grande Anse but also on the neighbouring beach at Petit Anse, and that this number represented a majority of the nesting population that year” based on nest counts (d’Auvergne and Eckert, 1993).

Egg poaching had also reached critical levels prior to the enactment of the moratorium in 1996. The proportion of eggs removed from nesting beaches cannot be known, but informed observers unanimously agreed that few nests escaped discovery. For example, of 33 Green and Hawksbill nests recorded by volunteers working with the Saint Lucia Naturalists’ Society (SLNS) on Grande Anse in

1993, 30 had been dug and the other three were unharmed only because they had been camouflaged by volunteers from the Society (P. James, SLNS, pers. comm., cited in d’Auvergne and Eckert, 1993).

Recent (since 1992) exploitation

A moratorium on the exploitation of marine turtles entered into effect in March 1996 and exploitation declined as a result, but the “continued illegal harvest of eggs, nesting females and foraging adults is of concern, as monitoring and control is made difficult by the decentralized nature of the resource and isolated location of many nesting beaches” (DOF, 2001a). Incidental and opportunistic take of marine turtles in fisheries operations is a continual challenge, as is the case throughout the region; there are no estimates available of the number of turtles involved.

According to the Department of Fisheries (DOF, 2002), “no dedicated records were maintained on the marine turtle fishery, but data collectors would take note of instances when sea turtles were landed and these were submitted to the Department of Fisheries” as part of normal fisheries data collection procedure; these data “would [not be] likely..to be conclusive or even significantly indicative of trends, since the data are sporadic at best”. Accurate landing records were kept during a one-month relaxation of the moratorium in December 1999, during which time 17 “traditional” turtle fishers were issued permits to take marine turtles “in accordance with the stipulated conditions” and landed a total of 76 Green and Hawksbill Turtles.

Similarly, no statistics are available on the sale of marine turtle meat or products in Saint Lucia prior to the moratorium (DOF, 2002). As in years past, meat that was not shared among family and friends was sold by fishers to the general public, including to restaurants. The most recent price of marine turtle meat was XCD5.00/lb. In addition to Green and Hawksbill Turtle meat, turtle eggs of all species were valued commodities. Indeed, the “illegal collection and consumption of turtle eggs and illegal killing of nesting females still occurred in certain locations”, including Grande Anse, despite the moratorium, and the incidental capture of turtles as by-catch remains an unquantified threat for which “no comprehensive records are available” (DOF, 2001a). The consumption of turtle meat is a “deep-rooted tradition” in Saint Lucia and is unlikely to be eradicated in the

course of a few years. Notwithstanding, reports and observations suggest that the illegal take of marine turtles and their eggs was more common in the past than in recent times and became even less apparent as the moratorium progressed (DOF, 2002). The Department of Fisheries maintains records of all reported incidents and sightings (including the disorientation of hatchlings as a result of beach-front lighting or nest loss as a result of erosion).

According to the Department of Fisheries (DOF, 2002), individuals involved in the illegal killing of marine turtles on nesting beaches, in particular, are not *bona fide* licensed fishers but other community members living adjacent to nesting grounds. In the case of Leatherbacks killed at Grande Anse, there may be some demand for specialized parts of the carcass (flippers, selected internal organs), but most of the turtle is wasted, something that a *bona fide* fisher would be unlikely to tolerate. In contrast, *bona fide* fishers are more likely to be involved in the illegal take of turtles at sea. Illegal take at sea is “less likely to be reported, as the likelihood of observation by onlookers is smaller compared to the slaughtering on a beach. Even on beaches, reports may not necessarily be indicative of the level of illegal activity, as persons do not openly exhibit their doings; and illegal activity often occurs on remote nesting beaches” (DOF, 2002).

At the time of writing, statistics on resumed exploitation (e.g. regarding numbers of fishers involved, numbers of turtles landed, species composition and marketing) are unavailable.

International trade

Historical perspective

According to Murray (1984), an internationally oriented turtle industry in Saint Lucia began around 1937 with the export of live Green Turtles to England and the USA, but after 1941 this concerned predominantly dried Green Turtle products. The trade from 1949 onwards then depended on imports from Aves Island. As many as 300 turtles were imported annually under special licence during the closed season in Saint Lucia, with a proportion of the meat sold locally until 1975. Until 1979, most of the turtles imported from Aves Island were shipped to the Federal Republic of Germany. Rebel (1974) quoted landing estimates for 1969 of 17 046 kg of Green Turtle and 10 909 kg of Hawksbill Turtle. Carr *et al.* (1982) reported that the establishment of a permanent garrison on Aves Island finally brought this unauthorized exploitation under control.

Imports into Japan of Hawksbill shell from Saint Lucia, as reported in Japanese Customs statistics, have been reviewed by several authors. Milliken and Tokunaga (1987) compiled and analysed Japanese Customs statistics on marine turtle imports for the period 1970–1986, which documented the import of a total of 2997 kg of Hawksbill shell from Saint Lucia (see table overleaf). Based on an estimated 1.34 kg of shell scutes per animal [the average yield for Caribbean Hawksbill Turtles—see Milliken and Tokunaga, 1987], d’Auvergne and Eckert (1993) concluded that some 2240 Hawksbill Turtles were removed from the wild to supply that volume of shell. In addition, Japanese Customs statistics for the same period documented the import of 434 kg of Green Turtle shell from Saint Lucia in 1979 and 1980 (Milliken and Tokunaga, 1987). No imports of turtle shell were recorded in Japanese statistics from 1984 to 1992, the last year that such imports into Japan were legal. Strict implementation of CITES by Saint Lucia, after its accession entered into effect in 1983, is generally viewed as the reason for the cessation of this trade.

Japanese imports (kg) of Hawksbill Turtle shell 1970-1992, from Saint Lucia, as recorded in Japanese Customs statistics

Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
	0	0	0	345	288	332	0	489	349	152	143	267
Year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Total
	270	362	0	0	0	0	0	0	0	0	0	2997

Sources: Milliken and Tokunaga 1987; H. Kiyono, TRAFFIC East Asia - Japan Office, *in litt.* to TRAFFIC International, 29 July 2002.

CITES trade statistics derived from the UNEP-WCMC CITES Trade Database document very little trade in marine turtles involving Saint Lucia from 1975 to 1992, inclusive. Other than five carapaces seized in the destination country (mostly the USA) and one body, presumably pre-Convention, only one other transaction is recorded; this, however, is the most notable: 234 kg of Hawksbill “scales” [carapace scutes] imported by France in 1988 from Saint Lucia, with the country of origin declared as Saint Vincent and the Grenadines. It is possible that these scutes were pre-Convention for Saint Lucia; however, it is unlikely that they were so for France.

Recent (since 1992) international trade

Official statistics provide little evidence of continued international trade in marine turtle products to or from Saint Lucia. CITES-recorded trade for the period 1993–2004, inclusive, consists of no more than three items: two carapaces seized on entry to the UK and USA, respectively, and one body, a personal item, possibly pre-Convention, reported exported by Saint Lucia. The Department of Fisheries reports no knowledge or documentation of any marine turtles or marine turtle products exported from or imported by Saint Lucia and concludes that such trade does not present a management problem (DOF, 2002).

Hawksbill shell jewellery and other items were once commonly sold to tourists visiting Saint Lucia, according to d’Auvergne and Eckert (1993), but accession to CITES and related educational campaigns appeared to have been successful in removing these items from local boutiques. In addition to finding little evidence of a market for Hawksbill shell articles and finished carapaces at the time of their writing, they reported an awareness amongst some merchants of the threatened status of marine turtles and a lack of interest in being involved in such a trade.

Enforcement issues

Based on the findings of d’Auvergne and Eckert (1993) and reports from the Government of Saint Lucia (DOF, 2001a and b; 2002), illegal take of marine turtles and eggs occurred long before the institution of the moratorium in 1996 and persists at unknown levels. Because the consumption of turtles is a long-standing tradition, poaching activity is likely to continue unless major advancements can be made to change behaviour. This is a daunting task, made all the more complicated by the fact that poaching tends to occur at sea or on isolated beaches and often at night and illegally acquired turtles and turtle meat, eggs and products can be easily sold without being displayed in an open market. The challenge in Saint Lucia is to minimize such activity through continued engagement of communities and stakeholders, improving surveillance capacity, and emphasizing information-

sharing so that science-based best practices (e.g. emphasizing the risks associated with killing reproductively active adults in late-maturing, long-lived species such as marine turtles) are more generally appreciated and adhered to.

The Government of Saint Lucia, through its own capacity and in concert with others, has made efforts to enhance the level and effectiveness of law enforcement. Joint training and surveillance exercises were undertaken in 2000–2001, between the Department of Fisheries, Coast Guard, and district police officers and beach rangers of the National Conservation Authority (DOF, 2001a). There have been arrests and offences compounded [settled out of court], for violations of laws pertaining to marine turtles both prior to and during the moratorium. Penalties have included monetary fines, gaol time, equipment confiscation and, whenever possible, the release of the turtle (D. Pierre-Nathoniél, Department of Fisheries, pers. comm., 2004).

The general public assist with surveillance. Staff at the Department of Fisheries (DOF, 2002) report that hotel personnel and other persons contact them when they encounter disoriented hatchlings, nesting turtles, exposed eggs and killed turtles, which demonstrates some level of public support and co-operation. However, even with increased public support, funding for broader public awareness and sensitivity and for increased manpower and resources to channel into a turtle management programme is likely to remain a problem.

In accordance with the language of the moratorium, which required that “all turtles accidentally caught [be] released in the marine environment or handed over to the Department of Fisheries for their release”, extension officers in various communities, as well as officers of the Soufrière Marine Management Area (SMMA), caused marine turtles caught by fishers, where observed (e.g. incidentally captured in nets), to be released. The public has also made reports, for which there has been follow-up by the Department of Fisheries or marine police, leading to release. Only hatchling-stage turtles have been brought into the Department of Fisheries for later release by fisheries staff (D. Pierre-Nathoniél, DOF, pers. comm., 2004). Ideally, the reporting framework, and the willingness of the public to participate, will continue to benefit management by informing the government of illegal activity in the post-moratorium era.

Increased enforcement capacity and effort are needed to address:

1. **Opportunistic, out-of-season take of turtles at sea.** This take is most likely to be by licensed fishers and other boaters targeting other species, such as Queen Conch, Spiny Lobster or reef fishes. Fishers in Saint Lucia generally do not depend on any one fishery for their livelihood but rather a combination of fisheries. d’Auvergne and Eckert (1993) noted that there was a Marine Unit in the police force, but that this Unit lacked the manpower and resources (especially boats) to patrol the coastline fully. The Department of Fisheries (DOF, 2002) confirms that this problem persists and that contemporary constraints include “limited manpower and equipment (including marine police boats and personnel in relation to surveillance); lower priority being given for marine police surveillance of marine resource offences compared to criminal offences; remoteness of beaches; insufficient funding; and lack of public support in relation to traditional consumption of sea turtle meat”.
2. **Collection of eggs and killing of nesting females on beaches.** The Department of Fisheries (DOF, 2002) notes in this regard that it is often not fishers who are involved in these activities but rather local residents living in the vicinity of these beaches. An increase in patrols on these beaches could be effective. d’Auvergne

and Eckert (1993) noted, for example, that two part-time wardens employed in 1989 by the Department of Fisheries to patrol Grande Anse Beach and Mangroves Marine Reserve were effective in reducing the killing of turtles and take of eggs. However, more effective surveillance on remote beaches is not likely to become a reality, except for areas where a community group is involved in monitoring and data collection, as in the case of the Desbarras Sea Turtle Watch Group (DSTWG), in relation to Grande Anse.

3. **Prosecutions.** While arrests do occur, there is consensus that additional personnel and supporting resources (including training) are needed before a sufficient capacity to detect, process and effectively prosecute offences can be achieved. As is generally the case throughout the Caribbean region, lower priority is afforded to marine police surveillance of marine resource offences as compared, for example, to drug-related and other criminal offences.

The Department of Fisheries (DOF, 2002) reports no knowledge of stockpiles of marine turtle products in Saint Lucia.

Marine turtle management in Saint Lucia

The Government of Saint Lucia has implemented a number of the recommendations set out in the Saint Lucia STRAP, published in 1993, including, most notably, an eight-and-a-half-year moratorium on the take of marine turtles, with the intention of maintaining the moratorium until such time, to quote the recommendation of d’Auvergne and Eckert (1993): “as there is sufficient information to show that a regulated harvest will not compromise the sustainable recovery of depleted stocks”. It is regrettable, from a management standpoint, that the moratorium expired prior to the government’s conducting a stock assessment designed to define a level of sustainable take. Notwithstanding, as reported to CITES in 2001 (DOF, 2001a) and set out in the national Management Plan for Marine Turtles (DOF, 2001b), efforts are under way to review management and conservation needs, enhance legal and other frameworks, fill important information gaps, and secure the necessary support, both political and financial, to implement the measures required to promote the recovery of marine turtle populations. Many of the current and proposed activities involve a range of stakeholder groups, including other government agencies, NGOs and representatives of civil society.

Management of exploitation

There has been no stock assessment in the usual sense for any species of marine turtle in Saint Lucia. Both management and monitoring of the legal fishery were insufficient in ensuring it did not result in a reduction of marine turtle numbers and the Department of Fisheries is currently reviewing other management measures. These include overall improvements (e.g. the implementation of gear authorization and limited entry systems for nearshore fisheries to better regulate gear restrictions and assist in resource recovery efforts for reef and bank resources and fisheries), as well as improvements specifically designed to modernize the country’s approach to the marine turtle fishery (e.g. maximum as opposed to minimum size limits) (DOF, 2001b and 2002).

In response to population declines and to facilitate relevant data collection and assessment, a moratorium on the take, sale and possession of marine turtles and turtle products entered into effect in March 1996. Although a number of proposals were put forward for funding research on marine turtle populations during the moratorium, no funding was secured, with the result that the only regular marine turtle monitoring during the moratorium was at Grande Anse Beach, primarily in relation to nesting Leatherbacks but also including Hawksbill and Green Turtles.

Sea-going persons and persons on properties adjacent to beaches indicate that numbers of marine turtles seem to be on the rise, even on beaches where sightings had become less frequent, providing a glimpse of progress made (D. Pierre-Nathaniel, DOF, pers. comm., 2004). Quantifying and characterizing such progress, both at sea and at major nesting sites, is one of the most important challenges of the post-moratorium era, as is the design and implementation of modern era management regimes sufficient to restore marine turtles to desirable levels of abundance.

As Cabinet debates the regulations that will define the post-moratorium era, the several inadequacies, identified by d’Auvergne and Eckert (1993), of the 1994 *Fisheries Regulations* that governed the turtle fishery at the time that the moratorium was enacted should be recalled. Most important among them were that: a) minimum size limits do not protect the older animals—large juveniles and adults—that are most important to the maintenance and recovery of marine turtle populations; and b) the closed season did not encompass the entire breeding season. They recommended at the time of their writing that any legal take should be limited to Green Turtles and Loggerheads *smaller* than 60 cm in shell length; that the closed season should be altered to cover the eight-month peak breeding season from 1 April to 30 November; and that Hawksbill Turtles (characterized as “seriously depleted in the Western Atlantic”) and Leatherbacks be protected at all times, in the case of the latter because only egg-bearing females are encountered in Saint Lucia.

However, these restrictions would be but one component of a management programme that, at its very least, should include at least four other components:

1. systematic, sustained recording of the fishery (during open season, if reinstated) in terms of numbers and species and sizes taken and the localities where they were taken, as well as the number of fishers, gear types, etc., and domestic marketing of derived products;
2. efforts—outreach, extension work, and education—to inform and increase compliance with the legal restrictions and related management efforts;
3. strict enforcement, through patrols on beaches and at sea, and prosecution of violations, bearing in mind as well that community-based programmes and initiatives are considered to be most effective; and
4. much more systematic monitoring of marine turtle populations so as to identify and address management gaps, document critical sites for conservation, and detect real and meaningful trends in marine turtle numbers.

Although integral to a management programme, these activities are costly in human, material, and financial resources. The Department of Fisheries (DOF, 2002) considers limited manpower and insufficient funding to constrain more effective monitoring and management. Hence, their efforts to secure funding to expand their work to allow for an island-wide assessment of both historical trends and current levels of turtle take should be supported. Regional resources available to assist in capacity-building, including those available through WIDECAST (e.g. tags and basic field equipment, database management software, education and outreach materials, training and mentoring programmes, assistance with project development and fund-raising), should be fully used to this end.

Species research and conservation

There are major gaps in knowledge of the abundance and distribution of marine turtles in Saint Lucia. Primary foraging grounds around the island have not been scientifically verified and, with one exception, there is no

systematic monitoring of nesting. The only beach where regular monitoring and systematic tagging of turtles (primarily Leatherbacks) are conducted is Grande Anse Beach on the north-east coast. Until funding is available to expand monitoring and data-collection efforts (including at-sea monitoring), the Department of Fisheries has relied on an informal system of reports from hotel personnel and other individuals about turtle nesting or other incidents, such as disoriented hatchlings, exposed eggs or slaughtered turtles. While useful and encouraged, these efforts cannot stand in for a more formal and systematic monitoring programme.

The Department of Fisheries, SLNS, and various local students and volunteers, began monitoring Grande Anse for nesting activity in 1983 and the site was designated a marine reserve in 1986. Monitoring has been conducted by the community-based DSTWG since 2001. In addition to yielding useful data on the nesting pattern of the Leatherbacks primarily found there, this project exemplifies the potential that this work has for broader community involvement in similar efforts elsewhere on the island. The once-a-week monitoring of nesting activity and flipper-tagging of turtles has now expanded to several days a week, with trained data-collectors and field guides operating under the supervision of the adjacent community of Desbarras. Participating community members have also received training from WIDECAS, the Department of Fisheries, and the Saint Lucia Heritage Tourism Programme for aspects such as data collection and management, field technique (e.g. tagging), and record-keeping, as well as management skills related to fees and accounting, guide recruitment and training, and programme evaluation.

DSTWG was conceived to enable community members to earn a living by sharing the turtle-nesting experience with tourists, while actively participating in the conservation of marine turtles. Turtle-watching at Grande Anse involves community tour guides and local and visiting guests. Guides are trained in the proper technique of turtle-watching and brief guests on these. Group shifts walk the one-mile beach from the evening of one day to the following morning and check for nesting turtles, turtle tracks or hatchlings. When a turtle is encountered, the group is allowed to observe its activity, according to specific guidelines. Various data are collected, including size and species of turtle, number of eggs laid, etc., and turtles are tagged before they return to the sea (DOF, 2002). In addition to collecting important data, the project aims to minimize the level of illegal egg harvest and capture of nesting females as well as to provide a sustainable livelihood for residents of the nearby community. Officially launched in April 2001, this project was recognized as an official Heritage Tourism Initiative and awarded a grant under the Saint Lucia Heritage Tourism Programme (DOF, 2001a).

With respect to other beaches in the country, the Department of Fisheries receives sporadic reports from the public, generally from March to November, on marine turtle activity (e.g. nestings; species, where known; beach name and location, where applicable; illegal activity; exposed eggs; disoriented hatchlings and/or adults). A compilation of this information for 2001 to 2004 is expected to be completed by the end of 2005. In addition, a revised and improved form for the recording of this information is available and staff members have been further encouraged to record all known activities. A general marine turtle form was developed in 2003 for use by security guards (stationed on the beach) and other personnel of beach-front restaurants, as well as by hotels, environmental groups, divers, fishers, etc. This form is being distributed in an incremental manner and it is hoped that, over time, this will become a useful source of information (D. Pierre-Nathaniel, DOF, *in litt.*, 20 August 2004).

To fill some of the gaps identified in the Management Plan for Marine Turtles, the Department of Fisheries is collecting historical information on social and geographical issues, catch and effort, marketing and demand, economics and trade, general resource use, public awareness, and population trends (D. Pierre-Nathaniel, DOF, pers. comm., 2004).

Habitat conservation

Saint Lucia is well known for its pioneering efforts to establish marine reserves, or no-take zones and other forms of marine management areas. The SMMA and Canaries and Anse-La-Raye Marine Management Area (CAMMA) were established to: (i) conserve coastal and marine resources within their respective geographical limits; (ii) promote the sustainable use of these marine resources while enhancing their economic, social and cultural benefits; and (iii) manage conflicts that may occur among users of these resources (Government of Saint Lucia, 2001). While none of the marine reserves established in 1986 in what would later (1995) become known as the SMMA were declared solely for the benefit of marine turtles, these animals, especially Hawksbill Turtles, have been observed in the area and are presumed to benefit from the management framework. This may well be the case with other marine reserves around the island that were established in 1986 and 1990 and re-declared in 2000, although not all are under active management (DOF, 2002). The Government of Saint Lucia (DOF, 2001a) indicates an intention to develop marine management areas elsewhere around the island, to resolve resource degradation and various user conflicts.

Marine turtle nesting beaches have also been protected. Grande Anse beach was designated a marine reserve in 1986 and reconfirmed in 2000, as was Fond d'Or (Saint Lucia *Gazette* of 15 October 1986 and Saint Lucia *Gazette* of 29 April 2000).

In recognition of the threat that tourism infrastructure development poses to marine turtle nesting habitat, in particular along the leeward coast, the Government of Saint Lucia (DOF, 2001a) reports that the Department of Fisheries is currently drafting relevant amendments to the fisheries legislation (*Fisheries Act* of 1984 and *Fisheries Regulations* of 1994) to enable a greater measure of control on activities in these areas. For example, there is a proposed regulation on artificial beach-front lighting with reference to adult nesting and hatchling survival. The Ministry of Physical Development, Environment and Housing has a new *Physical Planning and Development Act (No. 29)* of 2001, which sets the basis for addressing environmental impact assessment and coastal set-backs; draft environmental impact assessment regulations under this Act are currently under way. Relevant recommendations are presented by d'Auvergne and Eckert (1993).

Education and public awareness

Effective enforcement of marine turtle protective regulations was viewed as “nearly impossible” by d'Auvergne and Eckert (1993) in the light of constraints faced by the Department of Fisheries and other government agencies. In particular, public education and sensitization about the status and conservation needs of marine turtles was and is considered a priority in the country's efforts to promote the recovery of depleted populations. The Department of Fisheries (DOF, 2002) notes that this is under way on a small, irregular scale (e.g. radio and television press releases; flyers, booklets and posters; newspaper supplements and newsletter articles; lectures at schools and hotels; fishers' meetings; documentaries and exhibitions), but that “a massive campaign, as is needed in the case of sea turtles” would require much more funding than is currently available. In the absence of more funding, plans to involve various groups (e.g. dive operators) in data collection on marine turtles and strengthen the capacity of groups, such as DSTWG, in turtle monitoring and data collection are already under way. Finally, the Department of Fisheries will soon release a comprehensive manual, “How to Behave around Sea Turtles”, including guidance regarding nesting, hatching, at-sea encounters and photography.

Constraints to marine turtle conservation and management

The Department of Fisheries (DOF 2002) recognizes the following as constraints to more effective management of marine turtles in Saint Lucia:

- shortcomings in the legal/regulatory framework;
- inadequate information on the status and population trend of marine turtles in Saint Lucia's waters and nesting beaches (and a lack of baseline information from which to evaluate successful management initiatives);
- limited manpower and equipment, including marine police boats and personnel in relation to surveillance;
- lower priority being given for marine police surveillance of marine resource offences compared to illegal drug-related activity and similar criminal offences;
- remoteness of nesting beaches, as well as the logistical difficulties associated with at-sea census;
- chronically insufficient funding; and
- lack of public support in certain sectors in relation to the traditional consumption of marine turtles.

The Department of Fisheries (DOF, 2002) views the "availability of human resources (manpower, technical, technological), which is inherently tied to all other constraints" as perhaps the most important ingredient for effective management at the national level, and notes that such resources are "severely lacking at this time".

The Government of Saint Lucia (DOF, 2001a) reported to CITES that the temporary lifting of the moratorium on the take of marine turtles in December 1999 was sanctioned by the Cabinet of Ministers subsequent to a request from the Department of Fisheries. The Department had made the request in response to appeals from traditional turtle fishers to reinstate the open season, which was operating in neighbouring eastern Caribbean islands. This situation suggests the need for a level of consistency in management at the regional level. In response to a specific question regarding the usefulness of a region-wide management plan for their national management efforts, the Department of Fisheries (DOF, 2002) indicated that while such a regional plan would be useful, a plan "with no funding or other resources for implementation is not very useful". Saint Lucia has consistently recognized the need for collaboration in the management of shared marine turtle stocks (DOF, 2001a and b) and actively participates in a number of regional treaties, networks, and working groups.

Summary and recommendations

The Government of Saint Lucia has a long history of effort in the management of marine turtles and, while some actions would appear to have fallen short of their intended objectives, these efforts stand as examples for countries in similar circumstances to consider. Among the measures that the government has taken are a moratorium on marine turtle exploitation, first implemented in 1996 and extended to September 2004; the protection of marine turtle nesting beaches and foraging areas; public awareness and community outreach; development of CITES-implementing legislation; and enactment of laws and regulations to undertake environmental impact assessments and address other potentially negative impacts on marine turtle habitats.

In addition, although not comprehensive, systematic monitoring has been under way since 1983 at one nesting beach and, since 2001, has been conducted through DSTWG, a community-based programme that involves members of the local community in both the population monitoring and tourism-related activities, which, in addition to collecting essential data, have generated cash income for the community and assisted, through a regular presence on the beach, in reducing poaching.

At the same time, the lack of a scientifically based assessment of the status and trends of marine turtles in Saint Lucia, both prior to establishment of the moratorium and over the course of its implementation, must be considered a management shortcoming. As the Cabinet of Ministers debates whether the moratorium will be re-initiated or, alternatively, the nature of the regulations that will define the post-moratorium era, and mindful of the nation's stated goals and objectives (DOF, 2001a and b), the recommendations articulated below are offered for consideration.

In accordance with the FAO Code of Conduct for Responsible Fisheries (FAO, 1995), an explicitly precautionary code, which states that “the right to fish carries with it the obligation to do so in a responsible manner so as to ensure effective conservation and management of the living aquatic resources”, the management of marine turtle resources in Saint Lucia should seek to maintain the availability of the resource “in sufficient quantities for present and future generations in the context of food security, poverty alleviation and sustainable development”. Management measures should, *inter alia*, prevent over-fishing, rehabilitate depleted populations, incorporate the best scientific evidence (taking into account traditional knowledge, as well as relevant environmental, economic and social factors), assign priority to research and data collection (including at international scales), and promote environmentally safe fishing gear and practices in order to protect both the target resource and the ecosystems upon which it depends.

Among the fundamental components of any regime aimed at management of wild populations are: restrictions on exploitation that are consistent with the species' biological requirements; a monitoring programme—systematic, sustained, and rigorous collection and review of data—either on the specifics of exploitation or of wild populations so as to discern trends that can inform management; mechanisms to identify, monitor and address other threats to the species being exploited, so that these threats can be factored with exploitation to assess what level of overall mortality the species might sustain; and a high level of compliance (sometimes achievable only through vigorous enforcement) with the restrictions put in place to ensure that management goals are achieved. It does not appear that any of these activities are being undertaken—at least not on the systematic basis that is required—in Saint Lucia.

1. If there legal exploitation of marine turtles is to continue in Saint Lucia, the restrictions on this exploitation should reflect the biological parameters of marine turtles, take into account their depleted status and aim, at a minimum, at preventing any further population declines. Any exploitation regime promoting population recovery and maintenance should be established and conducted according to sound management principles and practice, which should include the following:
 - A. Bringing exploitation in line with biological principles, including:
 - complete protection of nesting females, their eggs and young at all times;
 - complete protection of all species during the primary nesting season, 1 March to 30 November;
 - complete protection of the Leatherback, which occurs in the country only as an adult, and typically an egg-bearing female;
 - maximum size limits, based on length (which is easier to undertake in the field) rather than weight, so as to safeguard large juveniles and adults;
 - a conservative limit on the numbers of animals that may be exploited, based on a scientific stock assessment; and

- a requirement that capture quotas be based, if not on stock assessment, on data derived from national processes and research activities, and that, as far as practicable, these data be collected in such a way as to be compatible with the goal of assessing stocks throughout their full geographic ranges.
- B. Managing the legal fishery through an enforceable, high-compliance monitoring programme aimed at establishing trends and monitoring these over time. A national programme to monitor marine turtle exploitation should document comprehensively and systematically, and in a manner allowing such records to be analysed and compared over time, the following:
- the number of fishers taking marine turtles and by what means;
 - the number, size and species distribution of the marine turtles landed;
 - the localities where turtles were taken;
 - catch-per-unit effort; and
 - the disposition of the marine turtles landed, including value of the animal and/or products if sold or traded.
- In further support of reliable monitoring of the fishery, the following should be considered as requirements for participation:
- that ownership identification tags be installed on approved gear (e.g. nets)
 - that turtles be landed alive or intact; prohibiting, for example, the use of spear guns and extended net sets that can result in drowning, and providing for reliable recording and verification of turtle landings; and
 - that the licensing process include as a criterion full participation in the monitoring programme.
- C. Establishing a systematic marine turtle monitoring programme that will:
- document distribution and abundance of local populations;
 - identify major nesting grounds and foraging areas;
 - designate Index nesting beaches and Index foraging grounds and document the numbers of marine turtles occurring in these over time;
 - manage data records such that statistically significant trends in abundance can be identified and inform management; and
 - identify and monitor threats and other factors influencing marine turtle survival.
2. There is a need for greater enforcement capacity and effort, including training, logistical support, and a mobile enforcement unit. This capacity should involve outreach and other activities that will engage greater efforts on the part of police for fisheries and broader environmental enforcement. A mutually agreed set of protocols and procedures for these agencies to follow in such circumstances may be an option to consider.
3. Critical habitats, both terrestrial and marine, should be identified and protected, and incorporated into broader biodiversity management programmes. Recognizing as well the importance of marine turtles and intact marine habitat for the “tourism product”, the government should consider:
- expanding the number of protected nesting beaches;
 - enhancing habitat protection measures, including restriction/regulation of tourism and other activities near nesting beaches during the egg-laying season and vigorous enforcement of such measures, such as against vehicles driving on nesting beaches and sand-mining;

- adopting regulations to prevent or otherwise manage leaving of nets and other debris on the beach;
 - improving coastal zone management (and monitoring) capacity, including through environmental impact assessment, particularly in relation to beach-front construction and sand-mining;
 - expanding the system of protected areas; and
 - strengthening the management framework for protected areas to ensure that these areas fulfill their stated objectives.
4. Mechanisms to quantify levels of incidental catch of marine turtles should be developed. Measures to reduce or eliminate incidental catch of marine turtles, such as through time–area closures and/or alternative (especially to gill nets) types of gear, should be implemented.
 5. The Government of Saint Lucia should move forward expeditiously to adopt pending legislation that will enable full implementation and enforcement of CITES provisions, including wildlife trade controls, scientific non-detriment findings, and control and monitoring, as appropriate, of stockpiles of CITES species.
 6. The fact that illegal exploitation persisted during the pre-1996 annual open season and the moratorium suggests that further progress is necessary in both law enforcement capacity and in general public awareness of marine turtle status and management requirements. Increased efforts should be made to engage local communities in marine turtle conservation and management. Fisheries and rural development extension efforts should be implemented that involve regular exchanges with fishers and others of information on marine turtles and their conservation and management needs and the participation of these communities in efforts to manage marine turtles so as to enhance compliance with regulations and support for marine turtle conservation. Support directed towards sustainable fishery practices and/or alternative livelihoods should be provided, as relevant and necessary, to assist users of marine turtles meaningfully in their efforts to comply with revised marine turtle regulations.
 7. That the efforts of Saint Lucia to establish a moratorium, conduct a stock assessment, review and revise the management regime, and develop a more profound understanding of their marine turtle resource has suffered from lack of funding is regrettable. Donor agencies should be encouraged to support these management efforts. Financial, logistical, and political support and encouragement should be extended to relevant government agencies to develop and implement a modern, scientifically based conservation and management regime for nationally depleted marine turtle stocks, including for the revision of the legal framework, scientific studies, monitoring programmes, enforcement capacity, and institutional strengthening of government agencies whose mandate includes marine turtles and their habitats. Both private and public foreign investment in the fisheries and tourism sectors in Saint Lucia should take account of the increased responsibilities—and costs—of the Department of Fisheries and other agencies in managing for sustainability the resources concerned and the broader biodiversity impacts that may ensue.
 8. Finally, community outreach and population monitoring efforts being undertaken by NGOs in collaboration with the government should be expanded through increased financial commitments from bilateral and multilateral assistance agencies. Co-management agreements between the government and NGOs/CBOs, developed by consensus, are encouraged.

References

- Anon. (2005). SC53 Summary Record. Official report of the 53rd meeting of the CITES Standing Committee. Accessible at www.cites.org. Viewed 12 December 2005.
- Boulon, R.H. (1989). Virgin Islands turtle tag recoveries outside of the U.S. Virgin Islands. Pp. 207–209. In: S.A. Eckert, K.L. Eckert and T.H. Richardson (Compilers). *Proceedings of the Ninth Annual Workshop on Sea Turtle Conservation and Biology*. NOAA Technical Memorandum NMFS-SEFSC-232. US Department of Commerce.
- d’Auvergne, C. and K. L. Eckert. (1993). *WIDECAST Sea Turtle Recovery Action Plan for St. Lucia*. CEP Technical Report No. 26. UNEP Caribbean Environment Programme, Kingston, Jamaica. xiv + 70 pp.
- Carr, A., A. Meylan, J. Mortimer, K. Bjorndal and T. Carr. (1982). *Surveys of sea turtle populations and habitats in the Western Atlantic*. NOAA Technical Memorandum NMFS-SEFC-91. US Department of Commerce.
- CCA (Caribbean Conservation Association). (1991). *Country Environmental Profile for St. Lucia*. Prepared on behalf of the Government of St. Lucia by the Caribbean Conservation Association with the technical support of the Island Resources Foundation. St. Michael, Barbados. 332 pp.
- DOF [Department of Fisheries]. (2001a). *National Report for Saint Lucia*. Submitted to First CITES Wider Caribbean Hawksbill Turtle Dialogue Meeting. Mexico City, Mexico, 15–17 May 2001. 6 pp.
- DOF [Department of Fisheries]. (2001b). Management Plan for Turtles. Pp. 46–48. In: *Plan for Managing the Fisheries of Saint Lucia 2001–2005*. January 2001. Department of Fisheries, Ministry of Agriculture, Forestry and Fisheries. Castries, Saint Lucia.
- DOF [Department of Fisheries]. (2002). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of Marine Turtles of the Lesser Antilles, Central America, Colombia and Venezuela. Completed by Dawn Pierre-Nathoniell, Fisheries Biologist, Ministry of Agriculture, Forestry and Fisheries. Castries, Saint Lucia. Dated 9 August 2002.
- FAO. (1995). Code of Conduct for Responsible Fisheries. Adopted by the 28th Session of the FAO Conference. Food and Agriculture Organization of the United Nations, Rome. 34 pp. + annexes. www.fao.org/fi/agreem/codecond/codecon.asp
- Government of Saint Lucia. (2000). *National Biodiversity Strategy and Action Plan*. Adopted by Saint Lucia Cabinet of Ministers on 14 September 2000 by Cabinet Conclusion. URL: www.slubiodiv.org/Biodiversity_Project/Information/Printed_Materials/NBSAP/nbsap.html
- Groombridge, B. and R. Luxmoore. (1989). *The Green Turtle and Hawksbill (Reptilia: Cheloniidae): World Status, Exploitation and Trade*. Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Lausanne, Switzerland. 601 pp.
- Milliken, T. and H. Tokunaga. (1987). *The Japanese Sea Turtle Trade 1970–1986*. A special report by TRAFFIC (Japan). Center for Environmental Education, Washington, DC. 171 pp.
- Murray, P.A. (1984). National Report for Saint Lucia. Pp. 370–380. In: P.R. Bacon *et al.* (Eds). *Proceedings of the First Western Atlantic Turtle Symposium*, III, Appendix 7. University of Miami Press, Florida.
- Rebel, T.P. (1974). *Sea Turtles and the Turtle Industry of the West Indies, Florida, and the Gulf of Mexico*, revised edn. University of Miami Press, Coral Gables. 250 pp.
- Wing, E.S. and E.J. Reitz. (1982). Prehistoric fishing economies of the Caribbean. *Journal of New World Archaeology* 5(2):13-32.

Saint Vincent and the Grenadines

Introduction

Saint Vincent and the Grenadines is a small archipelagic country situated along the eastern boundary of the Caribbean Sea, north of Grenada and west of Barbados. Once of disputed ownership between France and the UK, the archipelago was ceded to the latter in 1783, granted autonomy in 1969, and achieved independence in 1979. From the main island of Saint Vincent, the 33 islands and cays of the Vincentian Grenadines extend ca. 100 km southwards where, south of Union Island, they become part of Grenada. Seven of the Vincentian Grenadine islands—Bequia, Mustique, Canouan, Mayreau, Union Island, Petit Saint Vincent and Palm Island—are relatively large and inhabited; five uninhabited islands constitute the country's only marine protected area, the Tobago Cays National Marine Park (Anon., 2004a).

The islands' history of marine turtle exploitation dates back to the pre-Columbian era, but it was not until the early colonial period that large numbers of Green and Hawksbill Turtles were caught, primarily for the export of meat and shell to Europe and to other Caribbean islands and, with increasing settlement in the islands, for local consumption. Marine turtle nests and eggs and nesting turtles were fully protected by law in Saint Vincent and the Grenadines as far back as 1901 and marine turtle nests and eggs (but no longer nesting turtles) continue to be fully protected, along with marine turtles occurring in the country's wildlife and marine reserves. A legal fishery operates outside marine reserves during seven months of the year and, although it has been regulated since at least as far back as 1944, it targets, as a result of minimum size limits, large juvenile and adult turtles, which are the age classes that are most important for population maintenance and recovery. There is no comprehensive mechanism in place to record systematically landings associated with the legal marine turtle fishery, such that there are no official estimates of the numbers of turtles that are landed nor of any trends in these landings.

The only data on current levels of exploitation of marine turtles in the country since those collected by Morris (1984) and, a decade later, Scott and Horrocks (1993) derive from interviews and site visits conducted by a graduate student from the University of the West Indies (Grazette, 2002). This work confirmed earlier findings that all four species of turtle occurring in the waters of Saint Vincent and the Grenadines were exploited and, although no fishers rely solely on marine turtles for income, marine turtle meat and eggs are an important source of income and food and continue to be marketed in the country. However, while Scott and Horrocks (1993) reported on the marketing of Green Turtle and Hawksbill shells, this more recent study found little evidence of an existing market in these products. Based on figures provided by fishers, Grazette (2002) estimated an annual take of almost 600 turtles at the national level.

Scott and Horrocks (1993) noted that data on marine turtles in the country were non-existent or almost non-existent, as no in-depth field studies had been undertaken nor population monitoring programmes established. Notwithstanding, based mostly on interviews with fishers, Morris (1984) reported, "it is generally believed by fishermen that the sea turtle populations have definitely declined dramatically over the last two decades", while Scott and Horrocks (1993) concluded that, "the consequence of hundreds of years of exploitation is a widely acknowledged decline in the abundance of sea turtles".

A Sea Turtle Recovery Action Plan (STRAP) for Saint Vincent and the Grenadines, developed and published under the auspices of the Wider Caribbean Sea Turtle Conservation Network (WIDECAST) and the United

Nations Caribbean Environment Programme (Scott and Horrocks, 1993), reviewed the status of marine turtles in the country and the threats they face and presented a series of recommendations aimed at enhancing management of exploitation; improving the paltry knowledge base on marine turtle distribution, population, nesting activity, and priority sites; and promoting population recovery. The STRAP recommended, *inter alia*, that “a moratorium be implemented on the capture and sale of sea turtles and their products until such time as there [was] sufficient information to show that a regulated harvest [would] not compromise the sustainable recovery of depleted sea turtle stocks”. This recommendation had previously been made in the Saint Vincent and the Grenadines Country Environmental Profile (CCA, 1991), which noted a range of challenges facing fisheries management in the country, including the need to regulate fishing efforts so as to maintain stock levels; implement long-term monitoring of catch and fishing effort for major fisheries; and improve enforcement of existing regulations, such as for conches and lobsters.

More than a decade after the STRAP was published, there appears to have been little implementation of its recommendations, most notably with respect to a moratorium on exploitation and design and implementation of baseline surveys and population monitoring. The legal fishery continues to be restricted solely through minimum size limits and a closed season that does not fully embrace peak nesting periods, a regime that stands in conflict with current understanding of marine turtle biology and is likely to be insufficient to prevent further population depletion. These are management shortcomings that should be addressed as priorities in a revised management regime for these globally threatened species.

Summary of the status of marine turtles in Saint Vincent and the Grenadines

Four species of marine turtle occur in Saint Vincent and the Grenadines. According to Scott and Horrocks (1993), juvenile and sub-adult Hawksbill Turtles, Green Turtles and occasional Loggerheads can be seen around the islands throughout the year. Hawksbill Turtles are the most common and apparently frequent the waters of Saint Vincent more than the Grenadines, whereas Green Turtles are generally more common in the Grenadines. The Leatherback occurs only seasonally, mainly April–July, to nest.

“Preliminary and fragmentary” data on marine turtle nesting were summarized by Scott and Horrocks (1993) and included: 24 sites on the island of Saint Vincent; Princess Margaret Beach on Bequia; five beaches on Mustique;

Occurrence of marine turtles in Saint Vincent and the Grenadines

English common name	Scientific name	Occurrence
Loggerhead	<i>Caretta caretta</i>	I
Green Turtle	<i>Chelonia mydas</i>	N, F
Leatherback	<i>Dermochelys coriacea</i>	N
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	N, F
Kemp’s Ridley	<i>Lepidochelys kempii</i>	A
Olive Ridley	<i>Lepidochelys olivacea</i>	A

Key: N=nesting; F= foraging; I=infrequent; A=absent

eight beaches on Canouan; Saltwhistle on Mayreau; Petit Tobac in the Tobago Cays; eight sites on Union Island; and one site on both Frigate and “Palm (=Prune)” Islands. These data indicated Hawksbill Turtles to be the most common nesting species, both on Saint Vincent and throughout the Grenadines; however, the total estimated number of nesting females, based on estimates from the early 1980s (e.g. Morris, 1984), is thought to be lower than 20 (Meylan, 1999). Green Turtles have also been documented to nest in the country, but occurrences are rare (Morris, 1984). Leatherback nesting has been recorded on Saint Vincent and at some sites in the Grenadines.

Scott and Horrocks (1993) noted that fishers interviewed for the development of the STRAP were “nearly unanimous” in their reports that Hawksbill Turtles had declined noticeably in the Grenadines during the previous few decades and that the number of Green Turtles had also declined. In the absence of data from field surveys and clearer conclusions from interviews with fishers (Grazette, 2002), there is no basis on which to assess whether the long-term trend has improved or worsened over the intervening time.



Credit: Scott A. Eckert/WIDECAS

Comparative dorsal view of Leatherback, Green Turtle and Hawksbill Turtle hatchlings (L to R).

Little information is available on international movements of marine turtles occurring in Saint Vincent and the Grenadines. No long-range telemetry studies or genetic analyses have been conducted in furtherance of demographic study, stock assessment, or the identification of range States. Flipper-tagging conducted elsewhere in the region provides a glimpse of international movements: for example, tags from both juvenile and adult Hawksbill Turtles tagged in Barbados have been recovered in Saint Vincent and the Grenadines (J.A. Horrocks, University of the West Indies, pers. comm., 2004). A Leatherback fitted with a satellite-transmitter in Grenada in July 2002 is believed to have been landed in Saint Vincent, as the transmitter signals indicated the device’s removal from the water and a period of retention on land before it was recovered (Hays *et al.*, 2004).

Overview of the legal framework for marine turtle management

Membership in international and regional treaties

Saint Vincent and the Grenadines acceded to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1989 with a reservation entered with respect to the Hawksbill Turtle; this measure, which is still in effect, exempts the country from CITES requirements for this species. The country is also party to the Convention on the Protection and Development of the Marine Environment of the Wider Caribbean Region, or Cartagena Convention, and its Protocols Concerning Specially Protected Areas and Wildlife (SPAW Protocol) and Co-operation in Combating Oil Spills in the Wider Caribbean Region

Membership of Saint Vincent and the Grenadines in multilateral agreements relating to marine turtles

Convention	Saint Vincent and the Grenadines
Cartagena Convention	11.07.1990 (R)
Protocol Concerning Specially Protected Areas and Wildlife (SPAW)	26.07.1991 (R)
Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region	11.07.1990 (R)
Protocol Concerning Pollution from Land-based Sources and Activities	No
Convention on Biological Diversity (CBD)	03.06.1996 (A)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	28.02.1989 (E)
Convention on Migratory Species (CMS)	No
Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	No
MARPOL 73/78 (Annex I/II)	28.01.1984 (A)
MARPOL 73/78 (Annex III)	28.01.1984 (A)
MARPOL 73/78 (Annex IV)	28.01.1984 (A)
MARPOL 73/78 (Annex V)	28.01.1984 (A)
Convention on Wetlands of International Importance (Ramsar)	No
UN Convention on Law of the Sea (UNCLOS)	01.10.1993 (R)
Western Hemisphere Convention	No
World Heritage Convention	03.02.2003 (R)

Key: Date of: Ratification (R); Accession (A); Entry into force (E)

Co-operation in Combating Oil Spills in the Wider Caribbean Region, which obliges Parties to protect the marine and coastal environment, “particularly the coastal areas of the islands of the region”, from oil spill accidents and to ensure a capacity to respond to any accidents that may occur, as well as its Protocol Concerning), which, *inter alia*, calls on contracting Parties to “ensure total protection and recovery to the species of fauna listed in Annex II” (among them, all six species of marine turtle occurring in the Caribbean).

Laws and regulations relating to marine turtles

The first legal measures on behalf of marine turtles in Saint Vincent and the Grenadines were enacted in 1901 (Scott and Horrocks, 1993), when the *Birds and Fish Protection Ordinance*, *inter alia*, prohibited the take or

destruction of any turtle on land or turtle egg and the possession of any such turtle or turtle egg. These provisions were renewed in several amendments to this legislation and in specific orders for the protection of birds and game enacted over subsequent decades. In 1944, a four-month closed season (1 May–31 August) for the taking of turtles (at sea) was established; this was extended to seven months (1 March–30 September) through the *Birds and Game Protection (Turtle Close Season) Order (S.R.O. No. 61)* of 1978 but later reduced to five months (1 March–31 July) by the *Fisheries Regulations (S.R.O. No. 1)* of 1987.

Current provisions for the protection and management of marine turtles are set out in the *Fisheries Act (No. 8)* of 1986 and its implementing regulations, the *Fisheries Regulations (S.R.O. No. 1)* of 1987 and *Fisheries (Amendment) Regulations (S.R.O. No. 36)* of 1989, and the *Wildlife Protection Act (No. 16)* of 1987.

The *Fisheries Act* of 1986 defines “fish” as “any aquatic animal, whether piscine or not, and includes any shellfish, turtle, mollusc, crustacean, coral, sponge, echinoderm, its young and its eggs” and mandates the relevant minister to “take such measures as he thinks fit under this Act to promote the management and development of fisheries, so as to ensure the optimum utilisation of the fisheries resources in the fishery waters for the benefit of Saint Vincent and the Grenadines”. Among the many measures stipulated in this Act are the preparation and recurrent review of a plan, for ministerial approval, for the management and development of fisheries in the fishery waters, which shall:

- identify each fishery and assess the present state of its exploitation;
- specify the objectives to be achieved in the management of each fishery;
- specify the management and development measures to be taken; and
- specify the licensing programmes to be followed for each fishery, the limitations, if any, to be applied to local fishing operations and the amount of fishing, if any, to be allocated to foreign fishing vessels.

Part III of the Act sets forth a suite of conservation measures, including a prohibition of the use, for fishing, of explosives, poisons and other “noxious substances”, and establishes strict penalties for violations of this provision (up to 2500 East Caribbean dollars [XCD]) and any gear restrictions (up to XCD1000) established in the Act’s implementing regulations. Finally, the Act specifies the enforcement powers of authorized officers, defined as “any fisheries officer, any customs officer or police officer and any other person or category of persons designated as an authorized officer by the Minister under Section 32”.

The *Fisheries Act*’s general provisions (Part VI) authorize the Minister to promulgate regulations for a range of purposes, including:

- providing for the licensing, regulation and management of any particular fishery;
- prescribing fisheries management and conservation measures including prescribed mesh sizes, gear standards, minimum species sizes, closed seasons, closed areas, prohibited methods of fishing or fishing gear and schemes for limiting entry into all or any specified fisheries; and
- prescribing measures for the protection of turtles, lobsters and conches.

They further stipulate that “where not otherwise provided for, any breach of a regulation made under this Act shall constitute an offense and any person guilty of such an offense shall be liable on summary conviction of a fine not exceeding 1000 dollars”.

Part VI of the *Fisheries Regulations* of 1987 provides a number of fishery conservation measures, including restrictions on the use of spear guns and a prohibition on the use of tangle nets. Section 17 provides measures relating to turtles, namely:

- prohibition of interference with any turtle nest and of the disturbance, taking, sale, purchase or possession of turtle eggs;
- prohibition of the taking, sale, purchase or possession of any under-sized turtle or shell of an under-sized turtle; and
- prohibition of the taking, sale or purchase of any turtle or turtle part during “the closed season for that species of turtle”, which, for all species, is stipulated as a five-month closed season from 1 March to 1 July.

The minimum weights for taking marine turtles are set out in Schedule 10 of the Regulations and are as follows:

- Leatherback: 350 lb (158 kg)
- Green Turtle: 180 lb (81 kg)
- Hawksbill Turtle: 85 lb (38 kg)
- Loggerhead: 160 lb (72 kg)

It should be noted that these Regulations, in superseding the *Birds and Game Protection (Turtle Close Season) Order* of 1978, not only shortened the closed season but lifted the legal protection conferred on marine turtles on land, such that these animals are currently protected only through the closed-season provisions.

Part VIII of the *Fisheries Regulations*, Section 30, stipulates that “any person contravening any of these Regulations commits an offence and is liable on summary conviction to a fine not exceeding five thousand dollars”.

The *Wildlife Protection Act, 1987* (amended in 1988 and 1991—GSVG, 2004) includes reptiles in its definition of wildlife and sets forth numerous provisions for wildlife protection and management, including a fine of XCD2000 or six months’ imprisonment for violations of prohibitions in effect during established closed seasons and seizure of all guns, boats, vehicles and other equipment suspected to have been used in committing any offence under the Act. It is not apparent that any of these provisions apply to marine turtles, which are not specifically listed in any of the Schedules of the Act.

The conservation of marine turtle habitat is provided for through several pieces of legislation. Section 22 (Part III) of the *Fisheries Act* of 1986 provides for the declaration of “any area of the fishery waters and, as appropriate, any adjacent or surrounding land, to be a marine reserve” where “special measures are necessary”, *inter alia*, to “afford special protection to the flora and fauna of such areas and to protect and preserve the natural breeding ground and habitats of aquatic life, with particular regard to flora/fauna in danger of extinction”. Except as permitted by the relevant minister, so as to enhance the management of these areas, the Act prohibits in marine reserves:

- fishing or attempting to fish;
- taking or destruction of any flora and fauna other than fish;

- dredging and extraction of sand or gravel, the discharge or deposit of waste “or any other polluting matter”, or the disturbance, alteration or destruction of the natural environment; and
- construction or erection of any buildings or structures on or over any land or waters within such a reserve.

Violations of these prohibitions are subject to a fine of up to XCD1000.

The *Wildlife Protection Act, 1987* provides for the establishment of wildlife reserves to be managed as “natural areas”, in which, among other things, hunting and the disturbance, damage or destruction of any nest, egg, fry or young are prohibited; a first-time violation of these prohibitions is subject to a fine of XCD2000 and a repeat offence is subject to a fine of XCD4000 or up to one year’s imprisonment, or both (Section 11). In addition, the Act (Part VII, Section 31) provides for the establishment of a special fund for the conservation of wildlife and its natural habitats, including wildlife reserves, and for any fees charged for entry into wildlife reserves or otherwise levied under the Act, or any voluntary contributions, to be paid into the fund. Schedule One of the Act designates 21 sites in the country as wildlife reserves. According to the legal office of FAO (Faolex), the *Marine Parks Act No. 9* of 1997 provides for the designation and management of marine parks through: prohibiting fishing and other activities in marine parks; establishing penalties for violations of prohibited activities; and establishing a Marine Parks Board to, *inter alia*, regulate the use of marine parks. Regulations implementing the Act were gazetted in 1998 (GVSG, 2004).

In 2002, a *National Parks Act* was made law (GVSG, 2004).

The CITES National Legislation Project assessed the CITES-implementing legislation of Saint Vincent and the Grenadines as “believed generally not to meet all requirements for the implementation of CITES” (Anon., 2002). By the time of the 13th meeting of the Conference of the Parties to CITES, the Government of Saint Vincent and the Grenadines had submitted to the CITES Secretariat a CITES Legislation Plan outlining the process and timeline for enacting this legislation (Anon., 2004b). Draft legislation was sent to the CITES Secretariat in late 2004 and is currently undergoing the necessary reviews (Anon., 2005 a and b).

Additional legislation of relevance to marine turtles includes the following:

- *Town and Country Planning Act* of 1992, which provides for a Central Planning Board that may request environmental impact assessments for projects likely to have significant adverse effects on biodiversity.
- *Beach Protection Act (No. 10)* of 1981, which regulates the removal of sand, corals, stones and gravels from any part of any beach or sea bed.

The Government of Saint Vincent and the Grenadines notes that conservation laws benefit a number of the country’s threatened species but that these are “still inadequate and better enforcement is needed” (GSVG, 2004).

Responsible authorities

The Fisheries Division of the Ministry of Agriculture, Forestry and Fisheries is responsible for the overall management and development of the fisheries sector (Johnson, 2002) and for the management of marine and coastal diversity (GSVG, 2004), including marine turtles. The Environmental Services Unit in the Ministry of Health and Environment co-ordinates national biodiversity activities and serves as the focal point for the

implementation of various international conventions and regional initiatives, including those related to biodiversity, such as the Convention on Biological Diversity (CBD). The Central Planning Unit in the Ministry of Finance and Planning deals with land-use management and is responsible for enforcing legislation relating to environmental impact assessment and environmental mitigation. A National Parks, Rivers and Beaches Authority was established in 2003 as part of the Ministry of Tourism and Culture to “help ensure the protection of natural resources” and ensure a “more integrated approach to the conservation of natural resources important to the tourism industry” (GSVG, 2004). CITES Management and Scientific Authority responsibilities, however, are discharged through the Ministry of Agriculture, Forestry and Fisheries.

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective

According to Scott and Horrocks (1993), 17th and 18th century accounts point to marine turtle exploitation as being one of the oldest forms of commercial fishing in the Grenadines. Carr *et al.* (1982) considered exploitation of marine turtles in 1978 to be quite heavy, particularly in the Grenadines. Scott and Horrocks (1993) cited Morris (1984) and other sources in reporting that marine turtles were caught at sea through the use of nets, spear guns or by a loop attached to a pole and line, on the beach, or opportunistically while trolling offshore for large pelagic fishes, and that Hawksbill and Green Turtles were the most frequently landed.

Rebel (1974) noted that “estimating the number of individuals involved [in fishing for marine turtles] is difficult” because no fishers were engaged in the turtle fishery on a full-time basis. He reported that, at the time of his writing, 65–70% of the total marine turtle catch came from the island of Bequia. Morris (1984), based on his interviews with fishers, also reported that none fished exclusively for turtles and there was no commercial turtle fleet. Two decades later, Scott and Horrocks (1993) reported that, possibly as a result of over-fishing of the marine turtle resource around Bequia, much of the turtle catch at the time of their writing came from Canouan and Union Islands.

Carr *et al.* (1982) reported the sale of meat and shell to tourists travelling through in sailing yachts but saw few turtle products for sale in Kingstown, Saint Vincent. Morris (1984) reported that most of the whole shells on sale in gift shops in Saint Vincent originated in the Grenadines and that craftspeople paid an average of XCD35–40/lb for individual scutes, with the price varying with the tourist season. Whole shells fetched prices ranging from XCD100 to 160. Scott and Horrocks (1993) observed that the sale of craft items and polished shells was “less than in former years”, but that up to the end of 1992 (at which time Japan imposed a zero import quota on Hawksbill shell), Hawksbill scutes were worth up to 60 US dollars (USD60)/kg to the fisher and as much as USD100/kg to the seller.

Mohammed *et al.* (2003) compiled fishery and trade statistics from a variety of sources to reconstruct marine turtle catches for the period 1935 to 2000, concluding that there was “considerable inter-annual variability”. They postulated that between 1935 and 1945, catches varied between 0.4 t and 20 t, whereas during the period 1975–2000 annual catches remained below 12 t and in some years no catches were reported.

In the absence of data on populations, Scott and Horrocks (1993) noted that marine turtles in Saint Vincent and the Grenadines could not be unequivocally described as “over-utilized”. However, they reported that it was generally agreed among fishers and informed observers that there had been a “drastic decline in the numbers of nesting turtles as well as turtles sighted at sea”. Older men who traditionally hunted turtles on the beach implicated younger spear-fishers, while younger fishers in the Grenadines expressed the belief that increased yacht traffic and over-night anchoring adjacent to nesting beaches might be deterring nesting females.

While acknowledging the fragmented and anecdotal nature of the data that were available, Scott and Horrocks (1993) concluded that:

- at least 120 (and perhaps many more) marine turtles were landed each year;
- the fishery was largely seasonal;
- the fishery was largely concentrated in the Grenadines;
- exploitation involved take at sea and on nesting beaches;
- Green and Hawksbill Turtles and, to a lesser extent, Leatherbacks were taken; and
- no-one depended solely on turtle exploitation for their livelihood.

In addition, they reported that the primary customers for meat and shell were Grenadine residents, while restaurants were the main destinations of turtle meat and that mainly sailing yachts bought shells. Eggs were also regularly collected, “with little regard for conservation or the law” (which prohibits the collection and sale of eggs), but these were not sold on the open market but rather passed to friends and family.

Although no-one made a living exclusively from marine turtle exploitation in the country, Scott and Horrocks (1993) recognized that turtle meat brought important income to some fishers in the Grenadines, who sold the catch to hotel restaurants, and that it provided variety in the local diet.

Recent (since 1992) exploitation

There are few data available on exploitation of marine turtles in Saint Vincent and the Grenadines during the past decade. The Fisheries Division implements a comprehensive data-collection programme for marine species of commercial importance (GSVG, 2004), but there is only sporadic collection of data on marine turtle landings (L. Straker, Fisheries Division, pers. comm., 12 September 2005), and the only official statistics on marine turtle exploitation in the country are those collected at the main market in Kingstown, where only weights are recorded (Grazette, 2002). These data for 1995 to 1999 indicate a significant decline in the weight of both Green and Hawksbill Turtles; no Hawksbill Turtles were recorded in three of these five years (Grazette, 2002).

Grazette (2002) undertook an investigation of marine turtle exploitation through interviews with 41 fishers at 13 sites (nine in Saint Vincent and four in the Grenadines) and additional field visits. She reported that turtles were caught in nets and with spear guns or caught opportunistically in gear set for pelagic species. In the Grenadines, the areas where fishers reported regularly fishing for turtles include south-west of the Palm Islands, the Tobago Cays and the north-east coast of Mustique. Although 27 fishers reported that they brought their catch to a main fish landing site, 11 reported never taking their catch there, and 23 reported that their turtle catch was never officially recorded. Based on her interviews, Grazette estimated the following numbers of marine turtles captured per year in Saint Vincent and the Grenadines:

Hawksbill Turtles:	251–347 (10–13 per 26 fishers)
Green Turtles:	148–214 (8–12 per 18 fishers)
Loggerheads:	6–10 (one fisher)
Leatherbacks:	1–5 (two fishers)
Total:	406–576

Grazette (2002) further reported that turtle meat was often sold in restaurants and hotels; interviews with vendors revealed that meat is bought from fishers at XCD3.50–4.00/lb. She reported that turtle eggs were a delicacy and were illegally taken when a turtle was caught carrying eggs or when she was laying. Ten of the 41 fishers she interviewed discussed what they did with eggs: three sold them (with prices reported as XCD3.50 per egg or XCD5.00/lb); three ate them themselves; and four gave them to friends and family. Thirty-nine fishers discussed what they did with turtle shell: five, all of whom had been fishing for turtles since before the international ban on the trade in turtle shell, reported having formerly sold the shell to “merchandisers” outside the island; 10, including the previous five, reported that they now stored shells “in the hopes that there would be a resumption of trade”; 21 reported that they threw away the shells; and the remainder reported that they fashioned the shell for sale on the local market or ate it (most likely to be Green Turtle shell, sliced into strips and fried to form “crisps”). She recorded no Hawksbill shell products for sale in Saint Vincent or any of the Grenadine islands, with the sole exception of a single bracelet on sale in Bequia at an outdoor market for XCD20.00

The main reasons the fishers she interviewed gave for “starting” turtle fishing were as a means to gain income (N=29), or as a source of food (N=11). Thirty-nine fishers considered turtle meat an important part of their diet, while only two did not view it as an important source of food for their family. All 41 fishers said that eating turtle meat was an important tradition in the country.

Finally, Grazette (2002) noted information from the Fisheries Division (J. Cruickshank, pers. comm.) stating that there was a serious problem of poaching, including capture during the closed season, and that the inaccessibility of many villages and beaches, especially in the Grenadines, made law enforcement a difficult task.

The Fisheries Division (L. Straker, Fisheries Division, *in litt.*, 4 November 2005) notes regarding incidental take, that longlining is not heavily practised in the Grenadines, with less than 2% of the fish catch taken with this type of gear. However, accidental catches of marine turtles in various forms of nets, which are more extensively used, may be of greater concern.

International trade

Historical perspective

Rebel (1974) reported an annual export of “about 1500 lbs” (692 kg) of Hawksbill shell from Saint Vincent to Saint Lucia in the 1970s, noting “no market is available for any of the other species” and “no statistics have been kept”. Scott and Horrocks (1993) cited Adams (1980) in noting that, by the 20th century, Hawksbill shell was being exported from Saint Vincent and the Grenadines to several Caribbean islands, including Trinidad and Tobago and Barbados; that annual levels of turtle shell exported during the first quarter of the century averaged 500 lb (227 kg); and that fewer than 100 live turtles were exported every year during that period.

CITES trade statistics derived from the UNEP-WCMC CITES Trade Database from 1975 record very little trade in marine turtles originating in Saint Vincent and the Grenadines. The only commercial quantities appear to be a total of 53 kg of Hawksbill scutes imported into the Federal Republic of Germany in 1981 and 1982.

Japanese Customs statistics record no imports of Hawksbill shell from Saint Vincent and the Grenadines from 1950 to 1972 (Groombridge and Luxmoore, 1989). However, imports began in 1973 and reached a total of 4889 kg by the time the Japanese import market was closed by law to Hawksbill shell imports on 1 January 1993. Because both countries had entered reservations concerning the Appendix-I listing of Hawksbill Turtles, this trade was legal under the terms of CITES.

Japanese imports (kg) of Hawksbill Turtle shell, 1970–1992, from Saint Vincent and the Grenadines, as recorded in Japanese Customs statistics

Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
	0	0	0	243	250	191	130	230	144	0	0	0
Year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Total
	36	108	242	191	470	510	147	238	1284	269	206	4889

Sources: Milliken and Tokunaga, 1987; H. Kiyono, TRAFFIC East Asia-Japan Office, *in litt.* to TRAFFIC International, 29 July 2002.

Scott and Horrocks (1993) reviewed Saint Vincent and the Grenadines Customs data for exports of Hawksbill shell to Japan from 1970 to 1990 and these document a much lower export level—of only 1382 kg—from 1983 to 1990, and no exports in previous years. In addition, although they noted that there were inadequate marine turtle population data to demonstrate it, the general belief was that Hawksbill populations in Saint Vincent and the Grenadines could not support the volume of trade reported by Japan. They surmised that the country, in the light of its CITES status, was used as a transit point for exports from other countries in the Caribbean where the export of Hawksbill Turtles was illegal, but it appears just as possible that Saint Vincent and the Grenadines was mis-declared on import as the country of origin.

Recent (since 1992) international trade

The reservation entered by Saint Vincent and the Grenadines with respect to the Appendix-I listing of the Hawksbill Turtle upon the country's ratification of CITES in 1989 remains in effect. There is, nevertheless, little evidence of international trade in marine turtles from Saint Vincent and the Grenadines since the closing of the Japanese market for Hawksbill shell as of 1 January 1993. CITES trade statistics for the period 1993–2004, inclusive, record only five shipments of marine turtles or their products originating in Saint Vincent and the Grenadines, two of which (one shipment of two kilogrammes of turtle meat and one Hawksbill body) were seized on import.

Scott and Horrocks (1993) reported that, although the legal export market had effectively disappeared, inter-island black markets remained and that turtle shell products were sold locally to tourists who then took them out of the country. The few seizures reported to CITES appear to be the only official statistics alluding to such trade, the current scale of which is undocumented and unknown.

Enforcement issues

Scott and Horrocks (1993) reported little enforcement of regulations relating to marine turtles in Saint Vincent and the Grenadines and identified numerous obstacles to addressing the problem, not the least of which being the fact that it is a multi-island State covering several thousand square kilometres of land and sea. They reported that no wardens patrolled the beaches, many of which were secluded. Other problems were the widespread use, without permits, of spear guns, (illegal) fishing in marine conservation areas, and the inherent difficulties of enforcement in small communities. In their assessment, effective enforcement of fisheries legislation would involve the strategic placing of more personnel—game wardens, fisheries officers, or other natural resource enforcement officers—especially in the Grenadines, where, at the time of their writing, only one Fisheries Extension Officer was responsible for all of the southern Grenadine islands. They noted that there was general awareness amongst fishers and other local users of the regulations affecting marine turtles and considered the maximum fine of XCD5000 fine for contravention of the *Fisheries Regulations* to be a serious deterrent. According to the Fisheries Division (L. Straker, *in litt.*, 4 November 2005), there have been several cases brought to court under these regulations that have resulted in the fining of individuals, although the fines were less than the maximum amount.

The Government of Saint Vincent and the Grenadines (GSVG, 2004) reports that “proper enforcement [of forestry and fisheries legislation] presents an enormous challenge” and that, in addition to the difficulties presented by the multi-island nature of the country, lack of human and financial resources impedes adequate monitoring and surveillance in the smaller islands, which in the case of fisheries is “critical since important habitats like coral reefs and seagrass beds are concentrated in the Grenadines”.

According to the Fisheries Division (L. Straker, *in litt.*, 4 November 2005), no stockpiles of marine turtle products are held by the government and there is no knowledge within the government of any individuals who are stockpiling marine turtle shells or other products.

Marine turtle management

There appears to be little active management of marine turtles in Saint Vincent and the Grenadines. Restrictions on exploitation are few and biologically inappropriate; there is no systematic recording of landings nor monitoring of landing trends; few baseline scientific data exist and there is no population monitoring; and there is inadequate enforcement of existing regulations, particularly in the Grenadines. Although marine turtles may benefit from protection in the numerous marine conservation areas and wildlife reserves that have been established, the extent to which this is actually the case is unknown. Marine turtles are not included in recent fisheries assessments that feature cetaceans (whales), crustaceans (Spiny Lobster), molluscs (Queen Conch) and other, commercial, non-fish marine resources and are omitted from linked discussions of fisheries-related economics, development, research, management and institutional arrangements (e.g. FAO, 2002), thus suggesting that they are considered to be outside the core fisheries management framework.

Management of exploitation

Scott and Horrocks (1993) identified a number of problems with the legal framework for management of marine turtles in Saint Vincent and the Grenadines. Fundamental amongst these is the contradiction between the

provisions of the 1987 *Fisheries Regulations* and current understanding of marine turtle biology, which points to the need to conserve as a priority the adult, breeding animals in the population. The Regulations in effect target exploitation of adult and large juvenile turtles, in particular because:

- adult, including gravid female, turtles are not protected during the seven-month open season;
- the minimum size limit during the open season focuses on the large juveniles and adult turtles that are the most important size classes to protect in order to sustain populations and promote population recovery; and
- the five-month (1 March–31 July) closed season does not encompass the breeding season of all species of marine turtle reported to nest in the country, thus putting at risk nesting females outside this period. In the case of the Hawksbill Turtle, the peak nesting season, reportedly September to October, lies entirely within the open season, and there is no protection of reproductively active adults or nesting females, only of nests and eggs.

Additional shortcomings in the Regulations and their implementation include the facts that:

- the fishery is open access—no quotas are set or licences required;
- there is no programme to record the number, size, species and other data on marine turtles that are landed and, as a consequence, no efforts to analyse these to discern trends in marine turtle populations; and
- there is insufficient knowledge—both historical and present—of marine turtle distribution and abundance and trends and critical nesting and foraging sites to enable a scientifically based assessment of the impact of exploitation on marine turtles.

These shortcomings point to the difficulties experienced in Saint Vincent and the Grenadines in incorporating the marine turtle resource in the policy framework for the fisheries sector, which includes among its objectives the intention to “protect and restore endangered marine species” and to “co-operate with other nations in the management of shared or highly migratory stocks” (FAO, 2002).

Species research and conservation

As Scott and Horrocks (1993) noted, data on marine turtles in Saint Vincent and the Grenadines are scarce, as there has never been an in-depth study undertaken of these animals’ distribution and abundance in the islands, nor comprehensive surveys of beaches for nesting activity, and there are no monitoring programmes. The turtle conservation programme that they proposed in the STRAP included as a major component activities to fill these important knowledge gaps, including:

- identification of important nesting and feeding habitats; and
- collection of data on numbers of turtles nesting and on the distribution and abundance of foraging turtles so as to quantify numbers of turtles, nests, nest success and trends over time, and serve as the basis for other conservation and management measures.

The STRAP recommended that, on the basis of comprehensive surveys on all the islands, Index beaches be selected on each of the main islands for the purposes of long-term and intensive population monitoring using internationally accepted census protocols. While they proposed Mahault Bay on Canouan (where marine turtle nesting was thought to be most abundant), Big Sand on Union, and Pasture Bay and L’Ansecoy on Mustique, they

noted that baseline field work would be required in Saint Vincent, Bequia, and the smaller Grenadine islands in order to identify the most important nesting beaches in these areas.

Finally, Scott and Horrocks (1993) considered alternative livelihoods for fishers taking turtles and noted that “their funded participation should be considered in any management programmes” suggesting further that fishers be engaged in monitoring efforts for nesting and foraging turtles. Somewhat similarly, the current fisheries policy framework includes among its objectives the intention that fishers be “integrated into the policy and decision-making process concerning fisheries and coastal zone management” (FAO, 2002).

Habitat conservation

Saint Vincent and the Grenadines is credited with having enacted what is believed to be the “first piece of legislation providing for protected areas in the Americas” with designation of the King’s Hill Forest Reserve in 1791 (UNEP, 1996), and subsequent habitat legislation appears significant. The *Fisheries Regulations* of 1987 (Schedule 11, Regulation 20) designate 10 “conservation areas” that include the waters around entire islands (e.g. Petit Saint Vincent, Palm), island groups (Tobago Cays), or coastal segments (e.g. north-eastern and north-western coasts of Bequia, eastern coast of Mayreau, south-east coast of Union Island). If these areas are understood to be “marine reserves” under the terms of the *Fisheries Act*, marine turtles would be protected from fishing in those areas. In addition, several of the 21 sites designated as wildlife reserves (also including entire islands or island groups, such as the Tobago Cays) under the *Wildlife Protection Act* of 1987 encompass marine turtle nesting beaches (Scott and Horrocks, 1993).

Potentially the most significant existing protected area for marine turtles is the Tobago Cays National Marine Park, the only marine protected area in the country, which was legally established in August 1998. The mission of the Park is to “protect, conserve and improve” the natural resources of the area. Although a Management Plan was first prepared in August 1998 and revised in July 2000, a range of circumstances, including persisting controversy over proposals to privatize the park, appear to have precluded moving forward with implementation of the proposed management measures, with the result that, as of 2003, “much of the Management Plan has never been implemented and many of the protective regulations in the *Marine Parks Act* of 1997 remain unenforced” (Caribbean Compass, 2003). Finalization and implementation of a Management Plan for the park are envisaged through a multi-lateral, five-year project that commenced in December 2004, the Protected Areas and Associated Livelihoods Project (OPAAL) of the Organization of Eastern Caribbean States, co-ordinated through its Environment and Sustainable Development Unit (Anon., 2004). According to one document related to this project (Anon., 2004), a survey in 1995 “indicated that some 14 000 yacht people, 25 000 charter-boat day trippers and 10 000 cruise-ship passengers visit the Tobago Cays per year”.

Scott and Horrocks (1993) cautioned that protecting habitats where there are no turtles provides few benefits for marine turtle conservation, while the effectiveness of established protection zones depends on adequate enforcement, as well as the development and adoption of management plans and regulatory guidelines that address sand-mining (prohibited in designated marine conservation areas under the *Fisheries Act* of 1986), beach access, and other impacts, including major development projects. In this light, they recommended a re-evaluation of existing and proposed conservation and protected areas for their potential to contribute to the safeguarding of critical marine turtle habitat and prioritization of these and new sites to take into account critical nesting and foraging areas that should also be legally protected.

Education and public awareness

Scott and Horrocks (1993) noted that the Fisheries Division of the Ministry of Agriculture, Forestry and Fisheries had produced fact sheets, posters and stickers featuring marine turtles and conveying conservation messages and Fisheries Extension Officers on the mainland regularly visited schools and community groups to make presentations about and discuss marine turtle conservation. They recommended an expansion of this programme to include visits by extension officers to the Grenadine islands. They also recommended that educational materials be disseminated to the public to explain the restrictions in place in protected areas and conservation zones. They noted that a fact sheet had been developed by the Ministry of Tourism to be handed out to visitors on yachts about conservation zones but was not widely distributed. Similarly, they noted that Ministry of Tourism had placed informative flyers at Customs stations, airports and seaports, but that more information should be provided through hotels and dive shops.

Although Scott and Horrocks (1993) found general awareness amongst fishers and local communities of the restrictions relating to the exploitation of marine turtles, they noted that not much effort appeared to have been oriented towards promoting compliance with these regulations. Along these lines, the STRAP recommended a range of education and outreach activities, including workshops for stakeholders in the islands, regional training exchanges for fisheries and other staff and volunteers involved in marine turtle conservation efforts.

The Government of Saint Vincent and the Grenadines (GSVG, 2004) reports that both the Forestry Department and Fisheries Division are implementing public education programmes in an effort to encourage voluntary compliance with conservation measures but notes that “this alone will not ensure sustainable use. Increased institutional capacity, increased official presence in the Grenadines, monitoring and surveillance activities, public education coverage, stronger support for law enforcement agencies, human/financial resources and political will are all necessary for more sustainable uses of biodiversity.”

The Old Hegg Turtle Sanctuary was established in 1995 and is listed popularly among sites to be visited in Bequia. While the scientific rationale for raising Hawksbill and Green Turtle hatchlings for a period of months before releasing them, at a larger size, into local waters is debatable (based on concerns over whether the young turtles can survive in the wild, over disease transmission to wild stocks, and over whether such initiatives make any substantive contribution to mitigating the underlying survival threats facing the species), the Sanctuary is credited with raising public awareness of marine turtles' plight in the Grenadines and beyond among residents and international tourists.



Credit: Scott A. Eckert/WIDECAST

A Green Turtle returns to the sea after nesting.

Constraints to marine turtle conservation and management

There appear to be many constraints to marine turtle conservation and management in Saint Vincent and the Grenadines and these are compounded by the inherent challenges of geography and socio-economy that Saint Vincent and the Grenadines and other Small Island Developing States face. In their second national report to the CBD (GSVG, 2004), the government notes that agencies responsible for the management of biodiversity are limited by lack of resources and, in some cases, inadequate regulations and that, sometimes, availability of resources “can be described as severely limiting”. In its national report to the Regional Consultation on Implementation of the Barbados Programme of Action for Sustainable Development in Small Island Developing States (Culzac-Wilson, 2003), the government identified numerous constraints in the areas of coastal and marine resource management, including:

- “Inadequate financial and human resources.
- Inadequate enforcement capability. For example, police presence in some geographical areas is weak or non-existent, particularly so in the Tobago Cays area.
- Limited scope for alternative livelihoods for stakeholders to implement management measures, which target the high exploitation pressure on coastal marine resources.
- Inadequate information on the ecosystems being managed.
- Uncontrolled pollution of coastal marine habitats via, for example, poor farming practices leading to sedimentation, dumping of garbage in rivers and sewage discharge along coast.
- Unplanned coastal development close to beaches.
- Limited capability for controlling poaching, including illegal exploitation of marine resources in conservation areas and the Tobago Cays Marine Park.”

In addition, the report notes that there is a limited number of trained personnel in the country in fisheries-related fields and appropriate training programmes and funding to access training are limited. The Fisheries Division (L. Straker, *in litt.*, 4 November 2005) notes in addition that the multi-island nature of the country “introduces some technical difficulties for the surveillance and patrols of the many secluded beaches”.

Summary and recommendations

There is a paucity of information on marine turtles in Saint Vincent and the Grenadines, most notably in relation to the historical and current status of nesting and foraging populations and levels and trends in marine turtle landings and other forms of exploitation. A legal fishery has operated for centuries and continues and, although it has been regulated for more than a century, the minimum-size restrictions currently in place not only do not significantly restrict exploitation but result in the targeted exploitation of large juvenile and adult turtles that are the most important age classes to conserve in order to maintain populations and promote population recovery. In the absence of a time-series of population data or landing data from which population trends could be inferred, it is impossible to assess what the status of marine turtle populations is at this time or in relation to a decade or a century ago. Notwithstanding, the published literature is consistent in concluding that marine turtle stocks have “declined dramatically”, based on what data exist. Moreover, based on the assessment provided by Scott and Horrocks (1993) and continued exploitation of demographically important animals since the time of their writing, there is no basis to conclude that marine turtles in the country have recovered in number.

In accordance with the FAO Code of Conduct for Responsible Fisheries (FAO, 1995), an explicitly precautionary code, which states that “the right to fish carries with it the obligation to do so in a responsible manner so as to ensure effective conservation and management of the living aquatic resources”, the management of marine turtles in Saint Vincent and the Grenadines should seek to maintain the availability of the resource “in sufficient quantities for present and future generations in the context of food security, poverty alleviation and sustainable development”. Management measures should, *inter alia*, prevent over-fishing, rehabilitate depleted populations, incorporate the best scientific evidence (taking into account traditional knowledge, as well as relevant environmental, economic and social factors), assign priority to research and data collection (including at international scales) and promote environmentally safe fishing gear and practices in order to protect both the target resource and the ecosystems upon which it depends.

The current management regime for marine turtles in Saint Vincent and the Grenadines falls short of these standards and the principles and practice of sustainable use. The lack of a scientifically based stock assessment and inadequate limits on the numbers of turtles that may be taken or of fishers licensed to take turtles suggests a need for additional measures that would assist in preventing further population declines and, possibly, promoting population recovery. Among the fundamental components of any regime aimed at management of wild populations are: restrictions on exploitation that are consistent with the species’ biological requirements; a monitoring programme—systematic, sustained and rigorous collection and review of data—either on the specifics of exploitation or of wild populations so as to discern trends that can inform management; mechanisms to identify, monitor and address other threats to the species being exploited, so that these threats can be factored with exploitation to assess what level of overall mortality the species might sustain; and a high level of compliance (sometimes achievable only through vigorous enforcement) with the restrictions put in place to ensure that management goals are achieved. None of these appears to be in place for marine turtles in Saint Vincent and the Grenadines.

It is important to note that the Government of Saint Vincent and the Grenadines recognizes that management shortcomings exist for many components of biodiversity in the country and that they face numerous constraints in addressing these (e.g. Culzac-Wilson, 2003; GSVG, 2004). It is also important to note the efforts being undertaken by the Fisheries Division and other agencies to increase environmental awareness and engage the public’s support for conservation measures. Finally, significant advances may be made with several projects that have recently commenced, such as the OPAAL project in the Tobago Cays (Nichols, 2004), which, depending on its implementation, could confer real benefits on marine turtles in the area. Incorporating globally threatened marine turtles into the country’s fisheries and biodiversity policy and operational plans will necessitate resource and other commitments but could generate significant returns as the country’s economy moves further along a tourism trajectory. The significant foreign investments in tourism and fisheries, as well as other sectors, should facilitate such an effort.

In support of this end, the following conclusions and recommendations are presented.

1. In the light of the long-perceived depleted status of marine turtles in Saint Vincent and the Grenadines and the potential for continuing declines resulting from continued exploitation of large juvenile and adult turtles and in the absence of population monitoring, the government should move expeditiously towards a comprehensive revision of the marine turtle regulatory framework in order to ensure that any continued exploitation is consistent with accepted standards for marine turtle management. In addition, the government should

reconsider the broader institutional mandates and priorities that provide for the types of activities that form part of a scientifically based management programme and further consider, in this context, whether a moratorium may be advisable as an interim or longer-term measure designed to facilitate a formal stock assessment.

2. In recognition of the findings of Grazette (2002), and in support of a review and revision of the legal framework for marine turtle management, a comprehensive frame survey should be undertaken to quantify and characterize exploitation and use of marine turtles at the national level, including:
 - the landing of turtles at sea and hunting on nesting beaches;
 - exchange and marketing of turtles and turtle products;
 - numbers and types of fishers (and gears) involved, including the extent to which marine turtle landings result from incidental or opportunistic take in other fishing operations or from a targeted fishery;
 - processing and marketing patterns; and
 - the importance to livelihoods of the products and income derived from marine turtle exploitation.

This investigation should also aim to establish the nature and extent of illegal exploitation and trade of marine turtles and eggs and marine turtle products and the extent to which they may negatively impact marine turtle populations and compromise marine turtle management and conservation measures.

3. If legal exploitation of marine turtles is to continue in Saint Vincent and the Grenadines, the restrictions on this exploitation should reflect the biological parameters of marine turtles, take into account their depleted status and aim, at a minimum, at preventing any further population declines. Any exploitation regimen promoting population recovery and maintenance should be established and conducted according to sound management principles and practice, which should include the following:
 - A. Bringing exploitation in line with biological principles, including:
 - complete protection of nesting females, their eggs and young at all times;
 - complete protection of all species during the primary nesting season, 1 March to 30 November;
 - complete protection of the Leatherback, which occurs in the country only as an adult, and typically as an egg-bearing female;
 - maximum size limits, based on length (which is easier to undertake in the field) rather than weight, so as to safeguard large juveniles and adults;
 - a conservative limit on the numbers of animals that may be exploited, based on a scientific stock assessment; and
 - a requirement that capture quotas be based, if not on stock assessment, on data derived from national processes and research activities, and that, as far as practicable, these data be collected in such a way as to be compatible with the goal of assessing stocks throughout their full geographic ranges.
 - B. Managing the legal fishery through an enforceable, high-compliance monitoring programme aimed at establishing trends and monitoring these over time. A national programme to monitor marine turtle exploitation should document comprehensively and systematically, and in a manner allowing such records to be analysed and compared over time, the following:

- the number of fishers taking marine turtles and by what means;
- the number, size and species distribution of the marine turtles landed;
- the locality where the animals were taken;
- catch-per-unit effort; and
- the disposition of the marine turtles landed, including value of the animal and/or products if sold or traded.

In further support of reliable monitoring of the fishery, the following should be considered as requirements for participation:

- that ownership identification tags be installed on approved gear (e.g. nets)
- that turtles be landed alive or intact; prohibiting, for example, the use of spear guns and extended net sets that can result in drowning, and providing for reliable recording and verification of turtle landings; and
- that the licensing process include as a criterion full participation in the monitoring programme.

C. Establishing a systematic marine turtle monitoring programme that will:

- document distribution and abundance of local populations;
- identify major nesting grounds and foraging areas;
- designate Index nesting beaches and Index foraging grounds and document the numbers of marine turtles occurring in these over time;
- manage data records such that statistically significant trends in abundance can be identified and inform management; and
- identify and monitor threats and other factors influencing marine turtle survival.

4. In recognition of the absence of comprehensive data—and of Grazette’s (2002) findings—an effort should be organized to document and characterize present levels of marine turtle exploitation and trade in the country. This effort should assess the importance of the marine turtle resource to subsistence and livelihoods, as well as the numbers of turtles, fishers and others involved in these activities. It should also document the disposition of Hawksbill shell and other marketable products.
5. Mechanisms to quantify levels of incidental catch of marine turtles should be developed. Measures to reduce or eliminate incidental catch of marine turtles, such as through time–area closures and/or alternative types of gear (especially alternative to gill nets), should be implemented.
6. Critical habitats, both terrestrial and marine, should be identified and protected, and incorporated into broader biodiversity management programmes. Recognizing as well the importance of marine turtles and intact marine turtle habitat for the “tourism product”, the government should consider:
 - expanding the number of protected nesting beaches;
 - enhancing habitat protection measures, including restriction/regulation of tourism and other activities near nesting beaches during the egg-laying season and vigorous enforcement of such measures, such as against vehicles driving on nesting beaches and sand-mining;
 - adopting regulations to prevent or otherwise manage the leaving of nets and other debris on the beach;

- improving coastal zone management (and monitoring capacity), including through environmental impact assessment, particularly in relation to tourism development and other beach-front construction and sand-mining; and
 - expanding the system of protected areas and in particular into areas known to be used by marine turtles; and
 - strengthening the management framework for protected areas to ensure that these areas fulfill their stated objectives.
7. As acknowledged by the government, there is need for greater enforcement capacity and effort, the difficulty of which should not be underestimated in an archipelagic State. This capacity should involve clearer and possibly enhanced authorities for fisheries and other enforcement personnel and, possibly, dedicated enforcement staff. In addition, it should include training and logistical support, including a mobile enforcement unit, for both on-land and at-sea monitoring efforts. Finally, this capacity should involve outreach and other activities that will engage greater efforts on the part of Police for fisheries and broader environmental enforcement. A mutually agreed set of protocols and procedures for these agencies to follow in such circumstances may be an option to consider.
 8. The Government of Saint Vincent and the Grenadines should move forward expeditiously to enact draft legislation enabling full implementation and enforcement of CITES provisions.
 9. Building on successful models within the country (and elsewhere in the region, such as are exemplified by projects affiliated with WIDECAST), increased efforts should be made to engage local communities in marine turtle conservation and management. Similarly, building on existing efforts, fisheries and rural extension activities should involve regular exchanges with fishers and others of information on marine turtles and their conservation and management needs and the participation of these communities in efforts to manage marine turtles so as to enhance compliance with regulations and support for marine turtle conservation efforts. Support directed towards sustainable fishery practices and/or alternative livelihoods should be provided, as relevant and necessary, to assist users of marine turtles meaningfully in their efforts to comply with revised marine turtle regulations.
 10. Financial, logistical, and political support and encouragement should be extended to relevant government agencies to develop and implement a modern, scientifically based conservation and management regime for nationally depleted marine turtle stocks, including for the revision of the legal framework, scientific studies, monitoring programmes, enforcement capacity, and institutional strengthening of government agencies whose mandate includes marine turtles and their habitats. Both private and public foreign investment in the fisheries and tourism sectors in Saint Vincent and the Grenadines should take account of the increased responsibilities—and costs—of the Fisheries Division, Forestry Department, and other agencies in managing for sustainability the resources concerned and the broader biodiversity impacts that may ensue.
 11. Given the difficulties in managing the marine resources of an archipelagic State, the involvement of NGOs should be encouraged. Community outreach and population monitoring efforts supervised by NGOs, developed in collaboration with the government and harmonized throughout the country, should receive the attention and support of bilateral and multilateral assistance agencies. Co-management agreements between the government and NGOs and CBOs, developed by consensus, are encouraged.

References

- Adams, J.E. (1980). *Seafaring Grenadines: An Historical Geography of Traditional Fisheries in the Caribbean*. University of Minnesota, USA.
- Anon. (2002). CITES Document CoP12 Doc. 28. Working document of the 12th meeting of the Conference of the Parties, Santiago (Chile), 3–15 November 2002. Accessible at www.cites.org. Viewed 12 December 2005.
- Anon. (2004a). Additional Annex 13: Environmental Assessment. OECS Countries: OECS Protected Areas and Associated Alternative Livelihood. www.gefweb.org/Documents/Work_Programs/wp_Feb04/Bio_-_Regional_-_OECS_-_Annexes.pdf.
- Anon. (2004b). CITES Document CoP13 Doc. 22 (Rev. 2). Working document of the 13th meeting of the Conference of the Parties, Bangkok (Thailand), 2–14 October 2004. Accessible at www.cites.org. Viewed 12 December 2005.
- Anon. (2005a). CITES Document SC53 Doc. 31. Working document of the 53rd meeting of the CITES Standing Committee. Accessible at www.cites.org. Viewed 12 December 2005.
- Anon. (2005b). SC53 Summary Record. Official report of the 53rd meeting of the CITES Standing Committee. Accessible at www.cites.org. Viewed 12 December 2005.
- Caribbean Compass. (2003). “Tobago Cays at the Crossroads”. *Caribbean Compass* October 2003. www.caribbeancompass.com/crossroads.htm
- Carr, A., A. Meylan, J. Mortimer, K. Bjorndal and T. Carr. (1982). *Surveys of sea turtle populations and habitats in the Western Atlantic*. NOAA Technical Memorandum NMFS-SEFC-91. US Department of Commerce.
- CCA (Caribbean Conservation Association). (1991). *St. Vincent and the Grenadines: Country Environmental Profile*. St. Michael, Barbados. xxviii + 222 pp.
- Culzac-Wilson, L. (2003). St. Vincent and the Grenadines. National Report to the Regional Consultation on SIDS Specific Issues. *Caribbean Regional Report on the Implementation for the Barbados Programme of Action for the Sustainable Development of SIDS*. www.sidsnet.org/Mauritius2004/NAR.html.
- FAO. (1995). Code of Conduct for Responsible Fisheries. Adopted by the 28th Session of the FAO Conference. Food and Agriculture Organization of the United Nations, Rome. 34 pp. + annexes. www.fao.org/fi/agreem/codecond/codecon.asp
- FAO. (2002). *Fisheries Country Profile: Saint Vincent and the Grenadines*. FID/CP/STV. Food and Agriculture Organization of the United Nations, Rome. www.fao.org/fi/fcp/en/VCT/body.htm
- Grazette, S. (2002). Saint Vincent and the Grenadines. Pp. 45–63. In: Harvest and National Trade of Sea Turtles and their Products in the Eastern Caribbean. MSc. thesis, Natural Resource Management Programme, University of the West Indies, Barbados.
- Groombridge, B. and R. Luxmoore. (1989). *The Green Turtle and Hawksbill (Reptilia: Cheloniidae): World Status, Exploitation and Trade*. Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Lausanne, Switzerland. 601 pp.
- GVSG (Government of Saint Vincent and the Grenadines). (2004). *St. Vincent & the Grenadines 2nd National Biodiversity Report*. Environmental Services Unit, Ministry of Health and the Environment. www.biodiv.org/doc/info-centre.shtml
- Hays, G.C., J.D. Houghton, C. Isaac, R.S. King, C. Lloyd, P. Lovell. (2004). First records of oceanic dive profiles for leatherback turtles, *Dermochelys coriacea*, indicate behavioural plasticity associated with long-distance migration. *Animal Behaviour* 67:733–743. www.swan.ac.uk/bs/turtle/hays_publications2.htm

- Johnson, H. (2002). National Report of Saint Vincent and the Grenadines. In: *National Reports and Technical Papers Presented at the First Meeting of the WECAFC Ad Hoc Working Group on the Development of Sustainable Moored Fish Aggregating Device Fishing in the Lesser Antilles—Le Robert, Martinique, 8–11 October 2001*. FAO Fisheries Report No. 683, Supplement. Food and Agriculture Organization of the United Nations, Rome. www.fao.org/documents/show_cdr.asp?url_file=/DOCREP/005/Y4260E/y4260e0e.htm
- Meylan, A.B. (1999). Status of the hawksbill turtle (*Eretmochelys imbricata*) in the Caribbean Region. *Chelonian Conservation and Biology* (3)2:177–184.
- Milliken, T. and H. Tokunaga. (1987). *The Japanese Sea Turtle Trade 1970–1986*. A special report prepared by TRAFFIC (Japan). Center for Environmental Education, Washington, DC. 171 pp.
- Mohammed, E., L.E. Straker and C. Jardine. (2003). St. Vincent and the Grenadines: Reconstructing Fisheries Catches and Fishing Effort, 1942-2001. *Fisheries Centre Research Reports* 11(6):95-116. University of British Columbia, Vancouver.
- Morris, K. (1984). Western Atlantic Turtle Symposium National Report for St. Vincent and the Grenadines. Pp. 381-385. In: P.Bacon *et al.* (Eds). *Proceedings of the Western Atlantic Turtle Symposium, 17–22 July 1983, San José, Costa Rica*, III. University of Miami Press, Miami, Florida.
- Nichols, K.E. (2004). OECS Protected Areas and Associated Livelihoods Project (OPAAL). Environment and Sustainable Development Unit of the Organisation of Eastern Caribbean States (OECS_ESDU). December 2004. www.oecs.org/esdu/documents/Brief%20on%20OPAAL.pdf
- Rebel, T.P. (1974). *Sea Turtles and the Turtle Industry of the West Indies, Florida, and the Gulf of Mexico*, revised edn. University of Miami Press, Coral Gables. 250 pp.
- Scott, N. and J.A. Horrocks. (1993). *WIDECAST Sea Turtle Recovery Action Plan for St. Vincent and the Grenadines* (Karen L. Eckert, Ed.). CEP Technical Report No. 27. UNEP Caribbean Environment Programme, Kingston, Jamaica. xiv + 80pp
- UNEP. (1996). *Status of Protected Area Systems in the Wider Caribbean Region*. Technical Report No. 36. UN Environment Programme Caribbean Environment Programme, Kingston, Jamaica. www.cep.unep.org/pubs/techreports/tr36en.

The Republic of Trinidad and Tobago

Introduction

Trinidad and Tobago are the two main islands of an archipelagic State situated at the southernmost end of the Windward Islands. Trinidad, the larger and more southern of the two, lies 13 km north-east of the coast of Venezuela, while Tobago lies 32 km north-east of Trinidad at its closest point. The two islands have a combined land area of 5126 km², with an Exclusive Economic Zone (EEZ) of 75 000 km², some 15 times larger than the land area (Government of Trinidad and Tobago, undated). Trinidad and Tobago became an independent State in 1962. The country is one of the most prosperous in the Caribbean, with natural gas and petroleum resources, as well as a growing tourism industry.

Five of the six Caribbean marine turtle species occur in Trinidad and Tobago. Trinidad supports the largest nesting colony of Leatherbacks in the insular Caribbean and one of the largest in the world. Marine turtles, in particular Green and Hawksbill Turtles, have been subject to exploitation for centuries and a legal fishery continues to operate. Sporadic efforts have been made in past decades to quantify levels of exploitation, which, according to fisheries statistics collected during the period 1969–1980, averaged almost 5000 kg per year at the time (summarized by Fournillier and Eckert, 1998). These statistics provide some insights into the fishery but are not adequate to analyse overall numbers or commercial trends, nor to infer trends in marine turtle populations. There is no comprehensive mechanism in place to record systematically landings associated with the legal marine turtle fishery, and no statistics on the legal fishery have been collected for the quarter-century since 1980.

An anomaly exists in the law in that the 1958 *Conservation of Wildlife Act* would appear to prohibit the capture of turtles during nesting (and some would argue at all times), but major provisions were subsequently abrogated through the enactment in 1975 of *Fisheries Regulations* that established a five-month open season on marine turtles. Conflicts and deficiencies in the legislation, coupled with inadequate law enforcement, have resulted in the continuance of a largely uncontrolled take of marine turtles in and out of season, especially for Hawksbill and Green Turtles, and this provides meat and eggs (as well as turtle shell) that are consumed locally and marketed formally and informally throughout the country. In addition, illegal hunting of nesting Leatherback turtles has been considered an acute management challenge since the 1970s. Although this pressure has eased considerably in Trinidad with the advent of nesting beach protection and community-based conservation efforts in the early 1990s, in Tobago the presence of carcasses on the nesting beaches has been identified as “an immediate management crisis” (Eckert and Herron, 1998a) and sparked protests amongst the tourists on which the island has come to depend so heavily (SOS Tobago, 2003).

In addition to the continued directed take of marine turtles at sea during the closed season and illegal hunting on unprotected nesting beaches, incidental catch kills more Leatherback turtles than all other causes of mortality combined—an estimated 1000–3000 gravid females are accidentally caught in gill nets off nesting beaches in Trinidad every year (Eckert and Lien, 1999; Lee Lum, 2003). At the present time, along the south-eastern coast in particular, the entangled animals are butchered for meat that is both sold locally and shipped to the larger cities in Trinidad (S. Eckert, WIDECAS, pers. comm., 2004). The full extent of illegal hunting and incidental capture cannot be known and is viewed as a serious challenge to constructive management. It is widely recognized that the key to minimizing such activity is to: engage a larger number of communities and stakeholders; improve surveillance capacity; and emphasize information-sharing so that science-based best practices (e.g. protecting,

rather than targeting, reproductively active adults in late-maturing, long-lived species such as marine turtles) are more broadly understood and implemented.

A Sea Turtle Recovery Action Plan (STRAP) for Trinidad and Tobago is nearing completion under the auspices of the Wider Caribbean Sea Turtle Conservation Network (WIDECAST) and the United Nations Caribbean Environment Programme. The draft document (Fournillier and Eckert, 1998) provides extensive information on the status of, and threats to, marine turtles in the country, as well as a suite of recommendations for enhancing their conservation and management. While recognizing the many research, conservation and law enforcement efforts undertaken on behalf of marine turtles in the country over the past several decades, the STRAP notes that “the turtle fishery is an unmonitored industry”, and that continuing legal and illegal exploitation and high levels of incidental catch, are “significant obstacles to conservation efforts”. Further, “all indications (albeit largely anecdotal) are that nesting by Hawksbill and Green Turtles have declined (both in terms of the number of beaches visited and the number of eggs laid per year) and turtles caught at sea are, on average, smaller than they once were, a common indication of an over-exploited resource”.

Since as early as May 1987, government officials in various ministries have been urging regulatory reform on behalf of marine turtles in Trinidad and Tobago. Despite agreement between the lead agencies more than a decade ago on a legislative proposal to amend the *Fisheries Act* to give complete protection to marine turtles (Fournillier and Eckert, 1998), Parliament has yet to adopt this legislation (Forestry Division-Wildlife Section, 2002). It is hoped that renewed efforts to secure passage of this legislation (Poon, 2004) will, at last, close this major loophole in the framework for conserving the country’s marine turtles.

There have been numerous solid achievements in the conservation of marine turtles in Trinidad and Tobago. Particularly noteworthy is the decades-long engagement of several government agencies (in particular the Forestry Division), NGOs, community groups and individuals in marine turtle conservation activities and the successful co-management arrangements—partnerships between government and CBOs—that have enabled and furthered many of these efforts. Trinidad has been a pioneer in developing co-management for marine turtles. The first co-management initiative, for nesting turtles at Matura Beach, commenced in 1990 and has served as a model for similar initiatives at other nesting beaches in Trinidad and also earned international recognition. In addition to local communities, these efforts have engaged local businesses in marine turtle conservation efforts. There is, however, a need to extend these efforts to Tobago, where poaching remains problematic despite an NGO commitment to voluntary patrols and Index beach monitoring.

Summary of the status of marine turtles in Trinidad and Tobago

Five of the six Caribbean species of marine turtle occur in the waters of Trinidad and Tobago. In Trinidad, Loggerheads, Green Turtles, Leatherbacks, Hawksbill Turtles and Olive Ridleys forage off the north and east coasts, and Hawksbill and Green Turtles forage off the south coast (FDWS, 2002); all five species have been documented to nest (Fournillier and Eckert, 1998). In Tobago, there was “no credible current information” on the distribution of nesting by hard-shelled turtle species in 1998 (Fournillier and Eckert, 1998), but in recent years community beach patrols have confirmed low-density nesting (species unspecified) on about a dozen beaches, with foraging, mainly by juveniles, offshore. Leatherbacks also nest seasonally, preferring the south-western shoreline (W. Herron, SOS Tobago, *in litt.*, 4 October 2004).

Occurrence of marine turtles in Trinidad and Tobago

English common name	Scientific name	Occurrence
Loggerhead	<i>Caretta caretta</i>	I
Green Turtle	<i>Chelonia mydas</i>	N, F
Leatherback	<i>Dermochelys coriacea</i>	N, F?
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	N, F
Kemp's Ridley	<i>Lepidochelys kempii</i>	A
Olive Ridley	<i>Lepidochelys olivacea</i>	N, I

Key: N=nesting; F= foraging; I=infrequent; A=absent

The Leatherback is the most plentiful nesting turtle species in Trinidad and Tobago. Trinidad supports the largest known nesting colony in the insular Caribbean. Nathai-Gyan *et al.* (1987) estimated that 500–900 Leatherbacks nested in Trinidad each year between 1984 and 1987, but surveys of major nesting beaches over the last decade suggest that that figure may have been an underestimate. Between 1999 and 2004, 894–1859 Leatherbacks were tagged annually at Matura Beach, located on the east coast of Trinidad; this effort probably represents the tagging of only 40% of the turtles nesting in that colony, and an equal number are most likely to nest along the north coast of the island (S. Eckert, pers. comm., 2004). The Leatherback is also the most common nesting species in Tobago, but, in contrast, only some “dozens” at most (Fournillier and Eckert, 1998) nest along the south-western Caribbean coast, with the highest nesting densities at Turtle Beach at Black Rock (Herron, 2002). There is little historical information for Tobago, as no formal data-gathering programme was implemented prior to 1993, but it is clear from the personal experience of concerned citizens who have been patrolling beaches for a decade or more that the population declined precipitously in the 1980s because of uncontrolled killing of egg-bearing females (Fournillier and Eckert, 1998).

The distribution and abundance of foraging Hawksbill Turtles have not been studied in either island. In Tobago, the extent of potential foraging habitat is large (Hawksbill Turtles depend on a diet of sponges and other reef-related organisms) and the island once supported a rich Hawksbill Turtle population. Local fishers, cited in Fournillier and Eckert (1998), characterize Hawksbill Turtles as being fewer and smaller than in recent memory. Herron (2002) reports that although the species is found more or less island-wide, numbers are quite depleted; five to seven years ago it was common to see juvenile Hawksbill Turtles at most of the popular snorkelling areas, but now they are “rare”. At Arnos Vale, for example, Hawksbill Turtles were “common” as recently as the early 1990s but today are absent, in the assessment of Fournillier and Eckert (1998) a consequence of unregulated exploitation. In Trinidad, most Hawksbill nesting (primarily July to November) is reported from offshore islands; however, low-density nesting is reported from some Index beaches (e.g. 10 nesting females were tagged at Matura Beach in 1999, 18 in 2004—Nature Seekers, unpubl. data). In Tobago, although there has been mention of Hawksbill nesting in the scientific literature (Eckert, 1998) and some recent reports (Herron, 2002), there has been little formal documentation of nesting by this species.

Juvenile Green Turtles of varying sizes forage throughout the year in the waters of Trinidad and Tobago, primarily in seagrass areas; however, nesting by this species is considered to be occasional and less common than nesting by Hawksbill Turtles (Fournillier and Eckert, 1998). According to Eckert (1998), there are nesting records from

various locations along the north and east coasts of Trinidad and from some of the islands off the north-western coast. Green Turtles nest in very low densities on the south-west, north-west and north-east coasts of Tobago. At least one female became entangled in a fisher's net after nesting on Grafton Beach in 2004 (W. Herron, *in litt.*, 8 August 2004).

The Loggerhead is the rarest of the marine turtles found in Trinidad and Tobago. There are records of nesting from Trinidad between 1970 and 1989 and reports from fishers of occasional sightings of foraging animals along the north coast of the island. However, there is no recent evidence of nesting or foraging of the species in Tobago (summarized by Fournillier and Eckert, 1998). Eckert (1998) questions whether this species has been lost from the island.

Though rare, Olive Ridleys are known to nest and forage in Trinidad and Tobago. As recently as 2004, an Olive Ridley was videotaped nesting on the north coast of Trinidad by a member of an expedition from the University of Glasgow (S. Eckert, pers. comm., 2003). A fisher interviewed in Tobago indicated that the Ridleys are "rarely" seen and he could not remember the last sighting (Fournillier and Eckert, 1998).

There are several records of international movements by marine turtles. Carr *et al.* (1982) reported that a Green Turtle tagged at Tortuguero, Costa Rica was later captured in the Gulf of Paria on the west coast of Trinidad. Some two decades later, a female Hawksbill Turtle was satellite-tracked, after nesting, from Barbados to Galera Point, Trinidad (Horrocks *et al.*, 2001), and a juvenile Green Turtle tagged on a foraging ground in Barbados was subsequently captured in Trinidad (Luke *et al.*, 2004).

Of nine Leatherbacks satellite-tagged in Trinidad between 1995 and 2004, those that evaded capture in coastal gill nets and survived the breeding season typically stayed within 50 km of the coast during inter-nesting intervals and then, after several bouts of egg-laying, left local waters travelling in a north-easterly direction. The three longest records documented females returning to high-latitude Atlantic foraging grounds (as far north as the Flemish Cap) and continuing on to foraging grounds associated with the Mauritania Upwelling off the west coast of Africa (Eckert, 1998 and 2006). In the reverse direction, an adult male Leatherback was tracked from Nova Scotia to Galera Point, Trinidad, where it resided for 96 days before returning to Nova Scotia and ultimately made the return journey to Trinidadian waters the following year (James *et al.*, 2005). In 2004, two Leatherbacks nested in Tobago after having nested (and been tagged) in Grenada earlier in the season (W. Herron, *in litt.*, 8 August 2004).

Overview of the legal framework for marine turtle management

Membership in international and regional treaties

Trinidad and Tobago has a long-standing involvement in international environmental agreements. The country acceded to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1984. In 1986, it joined the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, or Cartagena Convention, and its Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region. In 1999, the country ratified the Protocol Concerning Specially Protected Areas and Wildlife (SPA Protocol) of the Cartagena Convention.

Membership of Trinidad and Tobago in multilateral agreements relating to marine turtles

Convention	Trinidad and Tobago
Cartagena Convention	24.01.1986 (R)
Protocol Concerning Specially Protected Areas and Wildlife (SPAW)	10.08.1999 (R)
Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region	24.01.1986 (A)
Protocol Concerning Pollution from Land-based Sources and Activities	28.03.2003
Convention on Biological Diversity (CBD)	01.08.1996 (R)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	18.04.1984 (E)
Convention on Migratory Species (CMS)	No
Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	No
MARPOL 73/78 (Annex I/II)	06.06.2000 (A)
MARPOL 73/78 (Annex III)	06.06.2000 (A)
MARPOL 73/78 (Annex IV)	06.06.2000 (A)
MARPOL 73/78 (Annex V)	06.06.2000 (A)
Convention on Wetlands of International Importance (Ramsar)	21.04.1993 (E)
UN Convention on Law of the Sea (UNCLOS)	25.04.1986 (R)
Western Hemisphere Convention	24.04.1969 (R)
World Heritage Convention	16.02.2005 (R)

Key: Date of: Ratification (R); Accession (A); Entry into force (E)

Laws and regulations relating to marine turtles

From a legislative standpoint, the conservation of marine turtles in Trinidad and Tobago is hampered by a jurisdictional conflict between two different pieces of legislation, one that provides complete protection and the other that establishes an open season permitting the killing of turtles during five months of the year. This conflict gives rise to confusion as to the rules that apply and, thus, the protections afforded and by whose authority. In 2004, in a court matter related to marine turtles, the presiding magistrate ruled that the *Fisheries Act* takes precedence over the *Wildlife Act*, owing to the fact that it specifically names marine turtles and the *Wildlife Act* does not (S. Poon and N. Nathai-Gyan, Forestry Division-Wildlife Section, *in litt.*, 30 August 2004).

The *Conservation of Wild Life Act* (Act 16 of 1958, amended by Act 14 of 1963), Chapter 67:01 of the Laws of Trinidad and Tobago, provides complete protection against wounding, killing, and acts of harassment for “protected animals” (defined as any animal not specified or mentioned in the Second or Third Schedules of the Act). This would appear to include all species of marine turtle, as they are not listed on either of those schedules. The Act protects all life stages (“animal” being defined as mammal, bird or reptile and including eggs, carcass, meat, nest or young thereof). The penalty for hunting protected animals without a licence is 1000 Trinidad and Tobago dollars (TTD 1000) or imprisonment for three months. In addition, the Act provides for game sanctuaries and a wildlife conservation committee and for game wardens and honorary game wardens authorized to act as enforcement officers (Fournillier and Eckert, 1998).

Section 4 of the *Fisheries Act* of 1916 (Chapter 67:51 of the Laws of Trinidad and Tobago) and subsequent amendments of 1966 and 1975 empower the minister responsible for fisheries to make regulations to prescribe

mesh size of nets, to restrict the size of fish, shrimp, crabs and turtles caught and prohibit their sale or prevent the catching of these species either absolutely or by season or area (Jobity, 2004). The *1975 Protection of Sea Turtle and Turtle Eggs Regulations*, promulgated under Section 4 of the *Fisheries Act*, stipulate that:

- No person shall (a) kill, harpoon, catch or otherwise take possession of any female turtle which is in the sea within any reef or within one thousand yards from the high water mark of the foreshore where there is no reef; (b) take or remove or cause to be removed any turtle eggs after they have been laid and buried by a female turtle or after they have been buried by any person; (c) purchase, sell, offer or expose for sale or cause to be sold or offered or exposed for sale, or be in possession of, any turtle eggs.
- No person shall, between 1 March and 30 September, kill, harpoon, catch or otherwise take possession of or purchase, sell, offer or expose for sale or cause to be sold or offered or exposed for sale any turtle or turtle meat.

Offenders of these provisions are liable, on summary conviction, to a fine of TTD2000 and imprisonment for six months. In addition, the Act stipulates that “it is the duty of the Fisheries Officer and any person authorized in writing by him to do so, subject to any general or special directions given by the Minister, to carry out the provisions of this Act”.

A bill that has been before Parliament for several years revises the *Fisheries Act* to provide complete protection of marine turtles, but this has yet to be adopted (FDWS, 2002).

The *Environmental Management Act*, adopted by Parliament in 1995, establishes an Environmental Management Authority (EMA) to set environmental standards, regulate activities that have an impact on the environment, protect vulnerable habitats and species and institutionalize national environmental policy. Further, the Act proposes an Environmental Code to evaluate, modernize, and rationalize relevant environmental laws and progress so as to provide comprehensive protection and regulatory measures for the environment (Government of Trinidad and Tobago, undated). Finally, the Act allows the EMA to designate any defined land area or any species of living plant or animal as being “environmentally sensitive” and to specify the type and intensity of activities required to sustain or enhance the resource.

Section 2 of the *Forests Act* (Chapter 66:01 of the Laws of Trinidad and Tobago) provides authority for restricting access to certain areas designated as Prohibited Areas. Entry into these areas is allowed only on the basis of permits issued from the Forestry Division and these permits are issued with a set of mandatory conditions (Fournillier and Eckert, 1998).

The *Marine Areas (Preservation and Enhancement) Act* (Chapter 37:02 (No. 1 of 1970, as amended in 1973) provides for marine areas to be protected as restricted areas, so as to preserve natural beauty, protect flora and fauna, promote enjoyment of the area and promote scientific research (UNEP, 1996). Such areas are to be set aside as no-fishing zones (where “fish” are defined to include corals, crabs, lobsters, shrimps, turtles, turtle eggs and any species of marine fauna), with entry into the area prohibited except with written permission by persons authorized to act on the Minister’s behalf. Permissions are subject to conditions and anchoring sites may only be designated through notification by the relevant minister (Fournillier and Eckert, 1998). The Act is currently applied only to the management of coral reefs (Jobity, 2004).

The *Fisheries (Conservation of Marine Turtles) Regulations* of 1994 require all semi-industrial and industrial trawl fleets to use turtle excluder devices (TEDs) on their nets to reduce the incidental capture of turtles (Fourniller and Eckert, 1998). Other regulations specify TEDs which may be used and the resuscitation of marine turtles incidentally captured. These regulations are export-driven, in that annual certification of the national marine turtle protection programme by the US Department of State is required for continued access of locally caught shrimps to US markets (Jobity, 2004).

Other relevant legislation includes:

The *Fishing Industry (Assistance) Act* of 1955 makes provision for the granting of financial assistance to the fishing industry by such means as fuel rebates, tax waivers and subsidies on fishing equipment.

Act 24 of 1986, the *Archipelagic Waters and Exclusive Economic Zone Act* declares archipelagic waters and the establishment of a 200-mile EEZ. The Act charges the relevant minister with responsibility for the conservation and management of living resources. Within this context, it determines the allowable catch in respect of each fishery in the EEZ, and the proportion to be harvested by citizens of Trinidad and Tobago. Access of foreign fishing vessels to the archipelagic waters, territorial sea or EEZ is allowed only through licences issued by the relevant minister, who also provides the authority for surveillance and enforcement of regulations pertaining to foreign fishing.

Note: The *1995 Draft Marine Fisheries Management Act*, on finalization, will repeal the *Fisheries Act* of 1916 and the relevant sections of the *Archipelagic Waters and Exclusive Economic Zone Act* of 1986. The *Marine Fisheries Management Act* will provide for the preparation of fishery management plans and will, in accordance with these plans, control and limit access to fish resources through the establishment of a licensing system for both local and foreign fishing vessels (Jobity, 2004).

The CITES National Legislation Project, initiated in 1992, assessed Trinidad and Tobago's CITES-implementing legislation as "believed generally not to meet all requirements for the implementation of CITES" (Anon., 2002) and assigned a deadline of 31 December 2003 for adequate implementing legislation to be enacted. This deadline was subsequently extended and, by the time of the 13th meeting of the Conference of the Parties to CITES, Trinidad and Tobago had submitted a CITES Legislation Plan outlining the process and timeline for enacting this legislation. By the time of the 53rd meeting of the CITES Standing Committee (June/July 2005), Trinidad and Tobago had drafted CITES-implementing legislation; progress will be reviewed at the 54th meeting of the Standing Committee in October 2006 (Anon., 2004, 2005a and b).

Responsible authorities

Responsibility for the management of marine turtles is shared between the Forestry Division (Wildlife Section) of the Ministry of Public Utilities and the Environment and the Fisheries Division of the Ministry of Agriculture, Land and Marine Resources. Exploitation is regulated by the Fisheries Division, but the Forestry Division customarily takes the lead in law enforcement. This may change in the future, as the Fisheries Division will soon establish a Fisheries Monitoring, Surveillance and Enforcement Unit (FD, 2004). The Wildlife Section of the Forestry Division regulates hunting, conducts wildlife research and implements CITES. The Fisheries Division implements fishery stock assessment, fishery management and research and provides extension services for

fishing communities. The Institute of Marine Affairs (IMA) is responsible for marine and coastal zone research and is the main repository of information and data in this area (Government of Trinidad and Tobago, undated).

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective

Fournillier and Eckert (1998) have thoroughly reviewed available information on exploitation and use of marine turtles in Trinidad and Tobago. This review includes published records dating back to the early 17th century, which, although incomplete, illustrate that turtle fishing and use are engrained in the culture and customs of the country.

Marine turtles have long played a role in the subsistence economy of fishing villages in Trinidad and Tobago. According to Rebel (1974), the industry in Tobago was started by French settlers in 1776 in the south-western part of the island. Turtle meat has always been favoured and traditionally flesh, flippers, carapace, plastron and eggs were all items of value. Even carcass scraps and entrails were used, and in some instances certain internal organs, such as the stomach and intestines, were preferred. Turtle hatchlings were used as bait in the local shark fishery. Each year, the turtle nesting season represented an additional source of income to a small and largely artisanal fishing industry, the meat, organs and eggs being consumed and marketed locally. With the advent of foreign tourism in the 20th century, turtle meat also became popular in restaurants (Fournillier and Eckert, 1998).

While the full extent of the marine turtle fishery in Trinidad and Tobago has never been fully quantified, published studies by Dr Peter Bacon (University of the West Indies), Dr Lori Lee Lum (IMA), Forestry Division (Wildlife Section) biologists, and foreign investigators span at least four decades. These accounts, coupled with data for a brief period (1969-1980) on marine turtle landings collected by the Fisheries Division (Ministry of Agriculture, Land and Marine Resources), comprise all available quantitative data; these have been summarized by Fournillier and Eckert (1998).

One of the earliest published set of catch statistics for marine turtles can be found in Rebel (1974), who reported that one fisher caught 10 000 lb of Green Turtles off Matelot, Trinidad in 1946. Groombridge and Luxmoore (1989) cite Ingle and Smith (1949, cited in Bacon, 1973, and subsequently revised by Rebel, 1974) for the figure of 60 000 lb of turtle meat sold in 1947 at the Port of Spain market in Trinidad. The Fisheries Division statistics for 1969 to 1980 document the total weight of turtle meat sold at seven sites in Trinidad and three sites in Tobago (Fournillier and Eckert, 1998), which, over the period, amounted to almost 59 500 kg, with all but ca. 800 kg landed in Trinidad (Lee Lum, 1985, cited in Groombridge and Luxmoore, 1989). Annual landings in Trinidad averaged 4883 kg and were at their highest (7251.2 kg) in 1980 (Lee Lum, 1985, cited in Groombridge and Luxmoore, 1989). Carenage was the most important landing site in Trinidad and Speyside was the most important site in Tobago (Fournillier and Eckert, 1998). Bacon (1973) identified numerous problems with these data and, in particular, cautioned that they represented only a small proportion of the turtle meat sold in the country, as most of it did not pass through any formal market and turtle meat was sold on many more beaches than those listed. Hence, he argued, they should be considered minimum figures and treated with caution for the purposes of analysis. The information required to convert these weights to numbers of turtles is not available; the total numbers of turtles and numbers represented by individual species cannot be known.

Bacon (1970, cited in Bacon and Maliphant, 1971, cited in Groombridge and Luxmoore, 1989) estimated that in 1969 nearly all of the turtles nesting on the inhabited north coast beaches [of Trinidad] were killed every year. Lee Lum (1985, cited in Groombridge and Luxmoore, 1989) judged that the take of marine turtles had declined since enactment of the *Protection of Turtle and Turtle Eggs Regulations* in 1975. Based on her survey of 15 fishing sites in Trinidad from 1982 to 1983, Chu Cheong (1984) concluded that turtle fishing was a source of supplemental income rather than livelihood for the fishers involved. She also reported the illegal take and preparation of marine turtles for the annual Saint Peter's Day Fishermen's Festival in early July, which falls during the closed season.

According to Fournillier and Eckert (1998), turtles have long been associated with virility in Trinidad and Tobago and this belief fostered a market in products made from the genitals of male turtles and a considerable level of egg poaching, despite year-round protection. Nathai-Gyan (1984) reported that "eggs are greatly exploited for this reason".

Apart from consumptive uses, fishers derived supplementary income from the sale of marine turtle products, including stuffed juveniles, tortoiseshell jewellery and trinkets and polished whole carapaces, all of which fetched good prices in both local and export markets throughout the 20th century. Hawksbill shell has long been used to fashion jewellery and household items and has been a source of foreign exchange.

During the 1970s, Tobago's Handicraft Section (Ministry of Community Development) purchased marine turtle shells for use in their village programmes as the raw material for making bracelets, earrings, brooches, pendants and hair clips (Nathai-Gyan, 1984). Lee Lum (1985, cited in Groombridge and Luxmoore, 1989) reported that some carapaces from the turtles landed in Trinidad were bought and sent to Tobago. Fournillier and Eckert (1998) reported that, by the early 1990s, Hawksbill scutes were selling for TTD60–75/lb in Trinidad and were used locally and shipped to buyers in Tobago, where they were fashioned into items sold primarily to tourists. An unquantified trade in Hawksbill shell items also occurred in Trinidad, for example in Port of Spain and through roadside vendors.

The killing of nesting female Leatherbacks has long been a problem. Although "clandestine, it is relatively well-documented" (Fournillier and Eckert, 1998). After reviewing the available data, Bacon (1971 and 1973) estimated that, in 1970, 30% of the female Leatherbacks nesting at Matura Beach and 100% of those nesting near villages along the north coast were killed. Bacon (1970) assessed that "...human predation is taking a heavy toll" and that the situation was "aggravated by inadequate laws and law enforcement". Nathai-Gyan (1984) reported that 22 carcasses had been documented by beach patrollers at Matura, Fishing Pond and Manzanilla. James and Fournillier (1993) estimated that, in the 1980s, as many as 50 to 70 Leatherbacks were killed annually in Trinidad, despite beach patrol efforts by the Wildlife Section that began in 1983 on Fishing Pond Beach. With the declaration of Prohibited Area status for Matura and Fishing Pond Beaches in 1990 and the initiation of comprehensive community-based patrols in that year, this number was reduced to zero by 1993 (Fournillier and Eckert, 1998).

In Tobago, high levels of poaching of nesting Leatherbacks were revealed in 1982 through beach patrols undertaken by Club Crusoe, a programme of the IMA Extension Services and Resource Programme and, by all



A Leatherback returns to the sea after nesting in the Matura Beach Prohibited Area, Trinidad.

accounts, these continue. By 7 June 1984, 12 nesting Leatherbacks had been killed (Nathai-Gyan, 1984). Protection efforts on nesting beaches were intermittent in the 1980s and it was not until 1990 that community patrols were organized informally once again. Community-organized beach patrols were instrumental in documenting the continuing killing.

Recent (since 1992) exploitation

A legal fishery for marine turtles continues to operate in Trinidad and Tobago during the five-month open season established in 1975. However, the extent of the fishery is unknown, as there are no records of marine turtle landings since 1980, the last year that the Fisheries Division collected these data (FDWS, 2002; FD, 2004). James and Fournillier (1993) estimated that, at the time of their writing, the legal take was well over 1000 hard-shelled turtles per year. There are no more recent estimates of the fishery (e.g. number landed, species, size, reproductive condition, seasonal or geographic distribution, economic context), but informed observers agree that the primary impetus for the killing is for meat (which is both shared informally and sold); sales are made primarily through fishers and the primary consumers are rural residents (FDWS, 2002).

Fournillier and Eckert (1998) present largely anecdotal information collected from interviews with fishers, market surveys and other sources on recent marine turtle exploitation in Trinidad and Tobago. For example, they cite a 1995 report (to Wendy Herron, SOS Tobago) by a Tobago fisher that he caught 26 turtles (presumed to be Hawksbill Turtles) in one haul from two nets set near Kilgwyn Reel off the south-western coast of the island. In addition, they report that an open season market survey conducted by Eckert in Sangre Grande, Trinidad in November 1995 revealed one marine turtle meat vendor who reported having bought six Hawksbill Turtles

brought to him by a fisher who had caught them the previous week; he had sold virtually all the meat in only 24 hours at a price just slightly higher than the typical price for fish. The shell had been sold separately for fashioning into “trinkets”.

Fournillier and Eckert (1998) also report that during the open season it is common to see turtles overturned in villagers’ backyards, in boat engine locker rooms, or on the shoulders of fishers on the way to market. In addition to the Sangre Grande market, turtle meat is offered for sale in Princess Town, Port of Spain, Arima (where it comes from Matelot), Carenage and Chaguanas in Trinidad and, in Tobago, it is sold in produce markets and sometimes at roadside stands. Green Turtle meat is also traded in produce markets during the open season, although in smaller quantities than Hawksbill meat, perhaps, they surmise, because Green Turtle meat is more likely to be used or traded locally. Coastal community residents that they interviewed described the number of turtle fishers operating along the north-east coast of Trinidad as “plenty” and indicated that turtles of all sizes were brought to market, including “very small ones”. Fournillier and Eckert (1998) report that fewer than 10 Hawksbill nests are laid each year at Grande Riviere (Trinidad) and “most” turtles are illegally killed, usually before they nest, for their meat and shell.

In Tobago, according to Herron (2002), marine turtle consumption is not a major source of income or sustenance; from a dietary standpoint it is considered “something different in the normal diet, a luxury item so to speak”. Turtle nets are set in nearshore seagrass and reef areas (e.g. Kilygwyn, Petit Trou, Canoe Bay, Lambeau), as well as illegally off nesting beaches. Meat, rather than eggs, is the preferred product, and although usually shared between family and fellow villagers, it can be found in the meat market in Scarborough during the open season and in small shops around the island. In the closed season, it can be easily obtained “if you know who the turtle hunters are”. Herron also notes rumours that “hundreds of turtles” are caught annually by large commercial nets set by foreign vessels operating in the nation’s waters.

In the late 1990s, Hawksbill shell articles were openly sold in many tourist-oriented retail markets, including both airports (Piarco International Airport, Trinidad and Crown Point in Tobago), as well as by roadside vendors and in hotel shops and boutiques, particularly in Tobago (Fournillier and Eckert, 1998). More recently, however, at least in Tobago, education of locals and tourists has “greatly changed this situation” and these items are now much less commonly seen (Herron, 2002).

In contrast to the at-sea fishery, which targets hard-shelled turtles, all purposeful take of Leatherbacks occurs on land during the nesting (i.e. closed) season and, thus, focuses solely—and illegally—on reproductively active females. In Trinidad, the poaching has adapted to enforcement measures. For instance, although nesting beach protection and comprehensive community-based patrol programmes had reduced poaching at Matura Beach to zero by 1993, gaps in the patrol schedule were noticed and exploited by poachers, who killed one turtle on the nesting beach in 1995, four in 1996, one in 1997, two in 1999, one each in 2002 and 2004. A low level of illegal poaching continues at Fishing Pond as well, and “two to three” are killed each year by villagers at Grande Riviere (Fournillier and Eckert, 1998, updated by D. Sammy, Nature Seekers, *in litt.*, 4 October 2004).

The poaching of nesting Leatherbacks is “dire” in Tobago (Eckert and Herron, 1998a; T. Clovis, SOS Tobago, *in litt.*, 10 April 2005) in the absence of any formal protection for important nesting beaches and regular beach patrols in rural areas. Protection patrols were organized by volunteers in 1990 and taken over by Forestry Division personnel in 1995, but the situation did not improve, despite repeated requests by activists that local

police and Forestry Division officials intervene. By mid-June 1997, 16 Leatherback carcasses had been identified on various nesting beaches in Tobago, and much of the meat obtained later appeared at the community celebrations typical of the season, such as “Fishermen’s Fetes”, which traditionally emphasize “wild meat” (Eckert and Herron, 1998a). Although the killing is largely confined to relatively remote beaches, this is not always the case. Patrols are undertaken on some beaches by security guards from nearby hotels and by Forestry Division and other personnel but, if isolated, beaches are dangerous for patrollers and a haven for poachers.

Maiming (“slice off a fin and run”) also occurs as poachers fear being confronted by community activists (Fournillier and Eckert, 1998).

The local CBO, Save Our Sea Turtles Tobago (SOS Tobago), maintains records of the illegal killing of marine turtles as observed or reported to them (see below). Data from 1996 and 1997 were compiled from island-wide reports and represent only the “tip of the iceberg”; for the period 1998–2004, data have been collected from Index beach monitoring (W. Herron, *in litt.*, 4 October 2004). Particularly troublesome is the fact that gravid females continue to be killed, even on the most well-patrolled Index beaches, as detailed below:



Credit: Tanya Clovis/SOS Tobago



Credit: D. Jones/SOS Tobago

Mt. Irvine Back Bay (top) and Turtle Beach (below), Leatherback Index beaches in Tobago.

2003: six Leatherbacks killed from three Index beaches

2004: one Leatherback killed from three Index beaches

In addition to the direct take of marine turtles on both land and at sea, incidental take of marine turtles in the artisanal fishery is a serious threat to marine turtles in Trinidad and Tobago. In the case of Leatherbacks, the animals were generally clubbed and/or dismembered so as to minimize damage to a costly net (Fournillier and Eckert, 1998). Today there is more sensitivity on the part of fishers to the plight of the giant turtles and a concerted effort on the part of at least some fishers to make every effort to free ensnared turtles unharmed and even to reduce the use of gill nets during the nesting period (S. Eckert, pers. comm., 2005). Herron (2002) reports

1996: 16 Leatherbacks reported killed island-wide; hard-shelled species: unknown

1997: 16 Leatherbacks reported killed island-wide; hard-shelled species: unknown

1998: one Leatherback killed from the two Index beaches

1999: two Leatherbacks killed from the two Index beaches

2000: four Leatherbacks and five Hawksbill Turtles killed from three Index beaches

2001: four Leatherbacks killed from three Index beaches

2002: 0 Leatherbacks and one Green Turtle killed from three Index beaches

a high number of Green and Hawksbill Turtles caught illegally in Tobago, mainly as by-catch in fishing nets pulled each morning on numerous beaches and in illegal turtle nets.

In 1997, it was estimated that 200–450 Leatherbacks were captured in gill nets between Balandra Bay and Salybia on the east coast of Trinidad and it was suggested that the Leatherback take off Toco Point was so high that the total for the north-east region probably exceeded 1000 Leatherbacks annually, raising the possibility that a large portion of all Leatherbacks nesting in Trinidad are captured at least once during the nesting season. Other areas of Trinidad also exhibit high capture rates of Leatherbacks. During interviews in 1998, fishers from Manzanilla (three boats) reported catching one Leatherback per day (five days each week) from January to April, with 50% mortality. In Mayaro, where 50 boats operate, each boat reportedly caught five Leatherbacks between January and April. Mortality was reported to exceed 95% because of a black market for Leatherback meat in that area (Eckert and Lien, 1999).

In an extensive follow-up study by the IMA, the conclusions of Eckert and Lien were confirmed; however, their estimates were found to be low (Lee Lum, 2003). The IMA estimated that more than 3000 Leatherbacks were captured incidentally in gill net fishing in coastal Trinidad waters in 2000. In an effort to resolve the crisis, the Division of Fisheries and WIDECAST co-hosted a stakeholders' workshop in February 2005 to develop a "Strategic Plan for Reducing the Incidental Capture and Mortality of Leatherbacks in the Gillnet Fisheries of Trinidad and Tobago". The unique national gathering was well attended; the discussions honest and creative; and the recommendations, still under development, are sure to provide a useful blueprint for reducing, if not eliminating, the by-catch crisis (S. Eckert, WIDECAST, *in litt.*, 1 March 2005).

Not all marine turtle exploitation is by local fishers. Venezuelan fishers can be seen from Grande Riviere hauling turtles from Trinidadian waters into their boats (N. Alexander, Grande Riviere Tourist Development Organization, pers. comm., 2004). In 2004, a gravid Leatherback was slaughtered on the nesting beach at Parletuvier, Tobago, and the meat sold throughout the village and to Venezuelan fishers who were in the bay buying bait (W. Herron, *in litt.*, 8 August 2004). International vessels active within the EEZ may also contribute to the incidental capture and mortality of marine turtles; however, there are no data to quantify this threat.

International trade

Historical perspective

International trade in marine turtles from Trinidad and Tobago dates back centuries, at least as far back as a record of 405 lb of Hawksbill shell exported to Britain in 1785 (Fournillier and Eckert, 1998). However, there appears to be no evidence of a substantial historical trade as occurred from several other islands in the Caribbean.

Japanese Customs statistics for the years 1952 to 1970 document sporadic imports of Hawksbill shell from Trinidad and Tobago during the period; these totalled over two tonnes, 1952–1963 (Groombridge and Luxmoore, 1989; see table overleaf).

Bacon and Maliphant (1971, cited in Groombridge and Luxmoore, 1989) considered that there was little export of Hawksbill shell from Trinidad at the time of their writing. Their assessment appears to be borne out by Japanese Customs statistics, which record no imports of Hawksbill shell from Trinidad and Tobago in the 1970s

and imports totalling just over one tonne in the three years 1983–1985 for the entire period 1970–1992 (see table below). Trinidad and Tobago acceded to CITES in 1984.

Japanese imports (kg) of Hawksbill Turtle shell, 1952-1963, from Trinidad and Tobago, as reported in Japanese Customs statistics

Year	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	Total
	102	0	32	137	131	95	423	0	0	231	755	530	2346

Source: Groombridge and Luxmoore, 1989.

Japanese imports (kg) of Hawksbill Turtle shell, 1970-1992, from Trinidad and Tobago, as recorded in Japanese Customs statistics

Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
	0	0	0	0	0	0	0	0	0	0	0	0
Year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Total
	0	329	544	208	0	0	0	0	0	0	0	1081

Sources: Milliken and Tokunaga, 1987; H. Kiyono, TRAFFIC East Asia-Japan Office, *in litt.* to TRAFFIC International, 29 July 2002.

Pritchard (1984, cited in Groombridge and Luxmoore, 1989) wrote that a considerable quantity of Hawksbill shell from Trinidad was said to be exported to Japan by a dealer from Saint Lucia, who regularly visited Trinidad and other islands to purchase shell for export. These exports via Saint Lucia are likely not to have been reported as originating in Trinidad and Tobago in Japanese Customs Statistics (Groombridge and Luxmoore, 1989).

CITES trade statistics derived from the UNEP-WCMC CITES Trade Database for the period 1975–1992 document very little international trade in marine turtles originating in Trinidad and Tobago. Most of the shipments were imports into the USA of one or two personal or confiscated items, such as bodies, carapaces or carvings, suggesting a tourist-oriented export market. A few shipments were of scientific specimens, no doubt as part of collaborative research efforts with the Forestry Division-Wildlife Section.

Recent (since 1992) international trade

There is no evidence of significant international trade in marine turtles or turtle products involving Trinidad and Tobago in the past decade. CITES trade statistics for the period 1993–2004, inclusive, record shipments to the USA of a small number of items that were seized on entry—presumably from tourists—and several shipments recorded as being for educational or scientific purposes. The only other recorded trade was to the UK, which reported seizing on entry two Hawksbill carapaces from the country in 2003 but did not report the import of 50 Leatherback specimens reported by Trinidad and Tobago as exported for scientific purposes in 2003.

Based on the information reported by Fournillier and Eckert (1998) on the availability of tourist souvenir specimens in the airports and in hotel shops and boutiques, it appears quite possible that the number of marine turtle items illegally exported has been much higher than CITES statistics suggest. The Fisheries Division (FD, 2004) notes that it is “possible that illegal trade continues”, but there are no data available and, therefore, no estimates of the extent of any such trade (e.g. quantities, products involved). Regulatory authorities agree that illegal export, tourist-mediated or otherwise, is minor and is “not considered a problem” for the conservation and management of marine turtles in the country (FDWS, 2002; FD, 2004).

The government is unaware of any stockpiling of marine turtle parts or products (FDWS, 2002; FD, 2004).

Enforcement issues

The most fundamental problem for enforcing legislation concerning marine turtles in Trinidad and Tobago is the conflict and ambiguity inherent in the legislation, namely between complete protection afforded by the 1958 *Conservation of Wild Life Act* and the 1975 *Protection of Sea Turtle and Turtle Eggs Regulations*, which provide for a seasonal harvest. The confusion arising from which laws apply where and when both fosters, and is further magnified by, confusion and conflict over legal jurisdiction and operational capacities in the area of law enforcement, and these problems are compounded by financial and human resource constraints within the government agencies mandated to manage these species (Fournillier and Eckert, 1998).

Eckert and Herron (1998b) reviewed the 1975 *Fisheries Regulations* restrictions governing the open season for marine turtles, concluding that they are difficult if not impossible to enforce because:

- the stipulation that female turtles not be captured within 1000 yards of the high-water mark or in any reef requires vigorous at-sea enforcement efforts to ensure compliance or intercept violations; and
- the requirement that females not be taken as described above ignores the fact that juvenile turtles would need to be killed in order to determine their sex.

In addition to the inherent inadequacies with the legal framework, enforcement of marine turtle legislation appears to have a weak profile. Insufficient equipment, limited human resources, the challenges of enforcing regulations in small communities and an overall lack of support for wildlife laws are amongst the issues that have resulted in there being few arrests for violations and, until 1995, no prison-time served (Fournillier and Eckert, 1998). Against this background, poaching has persisted; poachers have adapted their activities to the schedule of the community patrols; and illegal Leatherback meat is served in public, with apparent impunity.

Controlling poaching is a difficult enterprise and appears to have been conducted, at least in the case of Trinidad, almost exclusively by the Wildlife Section of the Forestry Division. In 1983, the Wildlife Section made marine turtles a priority and began law enforcement efforts, an initiative that engendered conflict with local communities who felt they had a traditional claim over the resource. Because of these conflicts and the realization that they did not have the capacity to overcome this opposition effectively in order to stop the poaching, the Wildlife Section shifted strategy and directed their efforts towards developing community awareness and establishing community management groups. Today, community co-management projects have matured and are successful in supporting the government in its obligation to manage marine turtles through patrolling nesting beaches, collecting and analysing data, deterring poaching and leading education and awareness efforts.

In Tobago, Herron (2002) reports that illegal turtle nets can be found stretched across bays adjacent to nesting beaches and that the local government, plagued by conflicting priorities and insufficient manpower, does little to monitor or prevent these practices and rarely responds to citizen reports. The government has recently become more engaged with outreach to fishers on marine turtle management issues and has conferred Honourary Game Warden status on some members of the local NGO SOS Tobago, giving them “direct powers of arrest under the *Wildlife Act*” (T. Clovis, *in litt.*, 11 April 2005).

Marine turtle management

Management of exploitation

There is no active management of the legal marine turtle fishery to ensure its economic or biological sustainability. The legal take is unmonitored, unquantified and unenforced, while the illegal take appears widespread and, at least in some areas, can be characterized as both rampant and conducted with impunity (Fournillier and Eckert, 1998; Eckert and Herron, 1998a and b; Herron, 2002). At the same time, stakeholders recognize that significant progress has been made, especially at monitored beaches. Forestry Division-Wildlife Section officials describe illegal exploitation as “a decreasing problem since the involvement of the community in protection efforts” and suggest that “Trinidad and Tobago serve as a model for management of marine turtles, through its community-driven approach” (FDWS, 2002). Community engagement has partly resulted from the tangible benefits of marine turtle eco-tourism, which has supported monitoring activities, reduced poaching, and increased public awareness on both islands.

Among the unresolved issues are the following:

- Although the closed season covers the marine turtle nesting season and, thus, protects nesting females, it is not adequately enforced.
- Provisions in the fisheries regulations that protect females in reefs and within 1000 yards of the high water mark cannot be effective without vigorous at-sea enforcement, nor can immature marine turtles be conclusively identified as to their sex without an internal examination; moreover, male turtles are also important to the reproductive success of populations.
- Basic management elements remain unaddressed by the legislation, such as maximum size limits, quotas, licence requirement or restricted access.
- There is no monitoring of the legal fishery and no information available on the number, size, sex, or reproductive condition of animals landed, where and how they were captured, or trends in catch-per-unit effort. Moreover, the socio-economic context (e.g. number of dependent fishers, marketing and income distribution, potential livelihood alternatives) is unknown.
- The monitoring of nesting populations is both incomplete and inconsistent; only data from Matura Beach in Trinidad would appear to be of any use in the assessment of population trends.
- There is no systematic or statistically rigorous monitoring of foraging populations of marine turtles.

There is, thus, no objective basis for evaluating the extent and importance of the marine turtle fishery or from which to infer population and other trends and no scientific basis on which to assess the impact of legal and illegal take, including incidental take, on marine turtle populations.

These problems are recognized by the government. Fournillier and Eckert (1998) review the long history of discussion between government agencies in the country regarding revision of the *Fisheries Act* to provide complete protection of marine turtles. Dialogue between the Forestry Division-Wildlife Section and Division of Fisheries culminated in a “Draft Guide to Amendments of Regulations Fisheries Act Ch. 67:51, 119/1975 Protection of Turtles and Turtle Eggs Regulations made under Section 4” submitted to the Director of Fisheries in February 1991 by the Director of Forests. This document provided draft text to prohibit the take of marine turtles and turtle eggs and the possession, purchase, sale, etc., of turtle eggs, meat or other products. In addition, it suggested that regulations be developed to require approved specification of fish nets so as to reduce incidental catch of marine turtles and to require that marine turtles brought ashore as a result of incidental catch be reported to the Forestry Division-Wildlife Section within a period of 48 hours. These proposals were endorsed by the Fisheries Division in March 1991 with additional suggested revisions on behalf of marine turtles. Although agreed between these two agencies, these amendments have yet to be adopted by Parliament.

The existing record of marine turtle management challenges facing the government suggests that the moratorium currently pending before Parliament must be accompanied by more extensive and vigorous enforcement and public awareness efforts in order that the closure might realistically contribute to the recovery of the nation’s marine turtle resource. Further, although there is consensus that no-one depends on marine turtles for their primary means of livelihood, the income derived from the take of marine turtles may be seasonally important, suggesting that it may be necessary to develop alternative livelihoods for fishers and other user communities.

Species research and conservation

Active efforts on behalf of marine turtles date as far back as 1965, when the Field Naturalists’ Club of Trinidad and Tobago initiated a formal programme of beach monitoring and conservation, which continued at least through the 1970s. These efforts have been taken up and expanded through a range of government and non-government agencies and organizations, including collaborative efforts with the Forestry Division-Wildlife Section, IMA, and numerous foreign scientists.

In recent years, monitoring and conservation activities have been conducted primarily by CBOs as part of a co-management strategy initiated in 1989 and facilitated by the Forestry Division-Wildlife Section. Workshops, seminars and field projects have been organized with communities near major Leatherback nesting beaches in Trinidad and resulted in the formation of groups that provide sustained and suitable services and programmes. These groups include Nature Seekers Inc., Fishing Pond Environmental and Community Group, Grande Riviere Tourist Development Organization, and Grande Riviere Environmental Awareness Trust, who are partners in resource conservation, providing beach surveillance, population monitoring and collection and management of biological data, tour-guiding and interpretation programmes (including tour-guiding services), habitat maintenance (e.g. beach clean-ups), fundraising, and public relations. Overall, the regular collection of scientific information and the effectiveness of the marine turtle protection component of these co-management programmes have far surpassed the expectations of the Forestry Division (Fournillier and Eckert, 1998).

In Trinidad, Matura, Grande Riviere and Fishing Pond Beaches on the north-east and north coasts have been designated as Index beaches, and systematic annual monitoring programmes have been established (FDWS, 2002). Comprehensive tagging began at Matura Beach in 1999, in partnership with WIDECAST, which provided scientific guidance, field training and record-keeping tools. At the same time, a national, co-ordinated marine



Credit: Scott A. Eckert/WIDECAST

WIDECAST international training workshop in Trinidad, April 2005. The workshop focused on best practices for population monitoring and sea turtle ecotourism and was hosted in partnership with the community-based organization, Nature Seekers, and the Forestry Division-Wildlife Section.

turtle conservation programme has yet to be established, and major gaps exist in knowledge of marine turtle abundance and distribution, in particular in foraging areas (Fournillier and Eckert, 1998).

The situation is less advanced in Tobago, where surveys and beach patrol initiatives planned by the Fisheries Division in the mid-1970s were aborted as a result of financial shortfalls and transportation problems. These and



Credit: Gervais Alkins/SOS Tobago

Turtle tracks on one of the Index beaches in Tobago (Mt. Irvine Back Bay).

other setbacks, including physical threats and harassment from turtle poachers, contributed to long delays in establishing estimates of annual nesting density (Fournillier and Eckert, 1998). The first surveys were undertaken by Club Crusoe in 1982 and continued through the efforts of coastal residents, the Forestry Division, and others. The local NGO, SOS Tobago, monitors nesting activity throughout the nesting season on three Index beaches on the south-west Caribbean coast of Tobago: Turtle Beach (Great Courtland Bay), Grafton Beach (Stone Haven Bay) and Mt. Irvine Back

Bay. Most of the monitoring is undertaken at night so as to deter poachers, but some morning nest counts are also done (Herron, 2002). In addition, SOS Tobago collaborates with divers and fishers year-round to collect data on the local marine turtle population.

Habitat conservation

The three major marine turtle nesting beaches in Trinidad, which host some of the highest-density Leatherback nesting in the Western Hemisphere, were declared as “prohibited areas” under the *Forests Act*: Matura and Fishing Pond in 1990 and Grande Riviere in 1997. Hence, every year, from 1 March to 31 August, access to these beaches is only possible by permit from the Forestry Division. This permit system enables access only under numerous conditions, including limits on group sizes and behaviour (driving of vehicles, making fires and the use of high-powered artificial lights on the beach are prohibited), and allows guides to charge a fee for their services. While a major step forward for these sites, no such protection measures have been taken for the major nesting beaches in Tobago nor for the nesting beaches of other species (Fournillier and Eckert, 1998). On 22 October 2004, the Matura Beach nesting environs were “declared and commissioned an Environmental Sensitive Area by the Minister” (K. Fournillier, *in litt.*, 25 October 2004).

Only one marine protected area, Buccoo Reef in Tobago, has thus far been established in Trinidad and Tobago; as a no-fishing zone, Buccoo Reef affords a certain level of protection to marine turtles. Expansion of marine protected areas is likely to be important for protecting marine turtle foraging grounds, once these are identified, and for reducing somewhat the significant levels of incidental mortality of marine turtles in fishing nets around the islands (Fournillier and Eckert, 1998).

Fournillier and Eckert (1998) identify numerous habitat issues affecting marine turtles in Trinidad and Tobago and offer specific mitigating solutions. These issues include sand-mining, beach erosion, pollution and the consequences of increasing rural and commercial beach-front development, including artificial lighting, increased vehicle and pedestrian traffic, and litter; unregulated anchoring is also a problem in Tobago. In some instances, such as in the case of Gordon Bay (Blanchisseuse), they note that entire nesting beaches have been lost to sand-mining or other impacts. The issue of carrying capacity (i.e. the ability of popular nesting beaches to withstand an increasing number of turtle-watchers) is also becoming a concern at some sites. In Trinidad, measures are in place to restrict visitation through the “prohibited areas” designations, but these do not exist in Tobago, where one beach, Turtle Beach, is already beyond its carrying capacity for turtle watchers (Herron, 2002).



Credit: Scott A. Eckert/WIDECAS

A vulture preys on a Leatherback hatchling on a beach on the north coast of Trinidad

In Tobago, where no protected areas have been set aside for marine turtle nesting sites, rapid coastal development for tourism continues to have a negative impact on nesting habitat. The highest-density nesting beach, Turtle

Beach (Great Courtland Bay), is reported to have a severe beach lighting problem from hotels and houses and a Fisheries Division building (Herron, 2002). These lights continue to deter nesting females and disorient hatchlings (T. Clovis, SOS Tobago, pers. comm, 2004). Another problem is the nets (left to dry) and debris left on nesting beaches by fishers, which entangle gravid females and prevent hatchlings from reaching the sea (Fournillier and Eckert, 1998; Herron, 2002).

Finally, particularly in Tobago, concerns are raised over inattentive management of coastal development, including environmental impact assessment and proper construction and enforcement, as construction sometimes proceeds with “little attention to permit conditions” (Fournillier and Eckert, 1998).

Education and public awareness

There is a long history of public education and awareness efforts on behalf of marine turtles in Trinidad and Tobago. The co-management programmes in place in Trinidad demonstrate the success of these efforts and contribute to their continued success. The community group Nature Seekers has been particularly successful in creative outreach, ranging from beach clean-ups to various sponsored events, school programmes, guided tours of the nesting beach and local capacity-building initiatives in the Matura area. Community groups at Grande Riviere on the north coast also offer opportunities for residents to become involved, for example by participating with hatchling rescue and release, school programmes and guided tours of the nesting beach.

In Tobago, SOS Tobago and Forestry Division personnel undertake an array of activities aimed at increasing appreciation for the conservation needs of marine turtles. These include lectures and slide shows at local schools and with various community groups and weekly seminars for hotel staff and clientele, in particular focusing on the impacts of beach lighting during the nesting season and proper behaviour when observing nesting females (Eckert and Herron, 1998a). In addition, SOS Tobago conducts field trips with school children, youth groups, tour guides, villagers and beach-front workers that, as well as highlighting the particular needs of marine turtles, aim at broader environmental awareness. WIDECAST has provided a variety of relevant materials to these efforts, including curriculum tools, technical references, audio-visual resources and general outreach materials.

There is interest on the part of community-based groups, government agencies, and some in the hotel industry to convene a participatory workshop on mitigating beach-front lighting (cf. Eckert and Horrocks, 2002) to illustrate in a practical way how the threat posed to turtles by coastal lighting can be solved, based on a greater awareness of the problem and the solutions (T. Clovis, pers. comm., 2004).

Constraints to marine turtle conservation and management

Marine turtle management and conservation in Trinidad and Tobago are impeded by numerous constraints, including:

- legal and jurisdictional confusion arising from inherent conflicts between the 1958 *Conservation of Wild Life Act* and the 1975 *Fisheries Regulations* for marine turtles;
- inadequate information on marine turtle population trends and the location of critical nesting and (especially) foraging habitats;
- limited manpower, equipment and financial resources;

- lack of motivation/commitment at some levels of government, including for law enforcement; and
- a general lack of support for existing legislation on the part of some (but certainly not all) communities and resource-users.

In addition to direct and indirect take, an inadequate legal and regulatory framework impedes other aspects of marine turtle management. For example, the development of turtle-watching as part of the tourism product in Trinidad and Tobago, the latter in particular, requires better regulation and management, as does infrastructure development and other construction in the coastal zone (Fournillier and Eckert, 1998; Herron, 2002). According to the Wildlife Section of the Forestry Division (FDWS, 2002), an inadequate legal framework and insufficient funding are the primary constraints to improved marine turtle management and adequate funding is perceived as the most important ingredient for success. The Fisheries Division (FD, 2004) concurs with this assessment, to which they add “limited manpower and lack of trained personnel”.

Summary and recommendations

Fournillier and Eckert (1998) echo previous authors’ findings that marine turtles are a resource of economic importance in Trinidad and Tobago; that exploitation is essentially unregulated despite the existence of a seven-month closed season; that both existing legislation and enforcement of that legislation are inadequate; and finally, that there is an “acute shortage of reliable data on the biology and exploitation rate of this resource”. Based on these and other considerations, the establishment of a moratorium on the take of marine turtles was agreed by the Forestry Division and Fisheries Division over 10 years ago, but the legislative proposal has yet to be enacted by Parliament.

A legal fishery persists, but the restrictions in place not only do not significantly restrict the exploitation of marine turtles, but also target exploitation on large juvenile and adult turtles that are the most important age classes to conserve in order to maintain populations and promote population recovery. Further, there has been no monitoring of the legal fishery to record landings and other parameters of the fishery and assess trends in these and their implications for marine turtle populations and their management needs. In short, the current regime fails to achieve management and is inconsistent with the principles and practice of sustainable use.

That these shortcomings have been recognized by the government is a positive first step in what should be a comprehensive effort to modernize the management framework relevant to marine turtle stocks in the country. The lack of a scientifically based stock assessment and limits on the numbers of turtles that may be taken or of fishers licensed to take turtles suggests a need for additional measures that would assist in preventing further population declines and, possibly, promoting population recovery. Fundamental to any exploitation regime aimed at sustainable use is the development and implementation of a monitoring programme for the fishery to record relevant data on landings so as to assess compliance, monitor trends and infer what those trends may mean for marine turtle populations and for the effectiveness of management measures.

In accordance with the FAO Code of Conduct for Responsible Fisheries (FAO, 1995), an explicitly precautionary code, which states that “the right to fish carries with it the obligation to do so in a responsible manner so as to ensure effective conservation and management of the living aquatic resources”, the management of marine turtle resources in Trinidad and Tobago should seek to maintain the availability of the resource “in sufficient quantities for present and future generations in the context of food security, poverty alleviation and sustainable

development". Management measures should, *inter alia*, prevent over-fishing, rehabilitate depleted populations, incorporate the best scientific evidence (taking into account traditional knowledge, as well as relevant environmental, economic and social factors), assign priority to research and data collection (including at international scales) and promote environmentally safe fishing gear and practices in order to protect both the target resource and the ecosystems upon which it depends.

Among the fundamental components of any regime aimed at management of wild populations are: restrictions on exploitation that are consistent with the species' biological requirements; a monitoring programme—systematic, sustained, and rigorous collection and review of data—either on the specifics of exploitation or of wild populations so as to discern trends that can inform management; mechanisms to identify, monitor and address other threats to the species being exploited, so that these threats can be factored with exploitation to assess what level of overall mortality the species might sustain; and a high level of compliance (sometimes achievable only through vigorous enforcement) with the restrictions put in place to ensure that management goals are achieved.

Despite admitted shortcomings, it is noted that Trinidad and Tobago have long assumed a leadership role, under the direction of the Wildlife Section-Forestry Division, in the Caribbean region with regard to population monitoring of Critically Endangered (cf. IUCN) Leatherbacks, including innovative co-management agreements with rural communities engaged in research, conservation, community outreach and profitable, community-based eco-tourism at major rookeries (Troëng and Drews, 2004).

In support of existing efforts and mindful of stated objectives by both the Forestry and Fisheries agencies, the following recommendations are offered:

1. In the light of the recognized depleted status of Hawksbill and Green Turtles (and Leatherbacks in Tobago) and the potential for continuing declines resulting from the legally mandated exploitation of large juvenile and adult turtles and in the absence of population monitoring, there is little discernible basis for the maintenance of a legal fishery for marine turtles in Trinidad and Tobago. The government should move expeditiously to conclude current efforts to revise and strengthen the regulatory framework and review the broader institutional mandates and priorities that provide for the types of activities that form part of a scientifically based management programme.
2. In support of a comprehensive review and revision of the legal framework for marine turtle management, and as recommended by Fournillier and Eckert (1998), a comprehensive frame survey should be undertaken to assess the extent and economic importance of marine turtle exploitation at the national level. This survey should aim to quantify and characterize exploitation and use, including:
 - the landing of turtles at sea and hunting on nesting beaches;
 - numbers and types of fishers (and gears) involved, including the extent to which marine turtle landings result from incidental or opportunistic take in other fishing operations or from a targeted fishery;
 - exchange, processing, and marketing patterns of turtles and turtle products; and
 - the importance to livelihoods of the products and income derived from marine turtle exploitation.

This investigation should also aim to establish the nature and extent of illegal exploitation and trade of marine turtles and eggs and marine turtle products and the extent to which they may negatively impact marine turtle populations and compromise marine turtle management and conservation measures.

3. If any legal exploitation is to continue, clarity is needed, as a matter of urgency, regarding existing legislation. A gap is evident in the 1975 *Protection of Sea Turtle and Turtle Eggs Regulations* under the *Fisheries Act*: female turtles, egg-bearing or not, are protected only in reef zones or, lacking reef habitat, within 1000 yards of the high-water mark. Females in the process of nesting (above the high-water mark) appear to be vulnerable, despite the fact that eggs are clearly protected; others interpret the protective features of the *Conservation of Wildlife Act* to take precedence while the animals are on land. Existing administrative mechanisms should be deployed to issue an interpretation jointly and publicize it widely. According to Eckert and Herron (1998b), government officials at all levels, community and conservation activists and the fishers themselves concur that the confusion surrounding the legal status of marine turtles is unacceptable and that clarity on this question should be considered a high priority.
4. Additional legislative revision should include:
 - establishment of stiffer penalties for infractions against environmental laws, including higher monetary fines and confiscation of equipment; and
 - provision of a stronger basis for curbing internal, illegal trafficking of meat, shell, and other products.
5. If any legal exploitation is to continue, the restrictions on this exploitation should reflect the biological parameters of marine turtles, take into account their depleted status and aim, at a minimum, to prevent any further population declines. Any exploitation regimen promoting population recovery and maintenance should be established and conducted according to sound management principles and practice, which should include the following:
 - A. Bringing exploitation in line with biological principles, including:
 - complete protection of nesting females, their eggs and young at all times;
 - complete protection of all species during the primary nesting season, 1 March to 30 November;
 - complete protection of the Leatherback, which occurs in the country only as an adult, and typically an egg-bearing female;
 - maximum size limits, based on length (which is easier to undertake in the field) rather than weight, so as to safeguard large juveniles and adults;
 - a conservative limit on the numbers of animals that may be exploited, such as through quotas and/or licences for taking turtles; and
 - a requirement that such capture limits be based, if not on a stock assessment, on data derived from national processes and research activities, and that, as far as practicable, these data be collected in such a way as to be compatible with the goal of assessing stocks throughout their full geographic ranges.
 - B. Managing the legal fishery through an enforceable, high-compliance monitoring programme aimed at establishing trends and monitoring these over time. A national programme to monitor marine turtle exploitation should document comprehensively and systematically, and in a manner allowing such records to be analysed and compared over time, the following:

- the number of fishers taking marine turtles and by what means;
- the number, size and species distribution of the marine turtles landed;
- the localities where turtles were taken;
- catch-per-unit effort; and
- the disposition of the marine turtles landed, including value of the animal and/or products if sold or traded.

In further support of reliable monitoring of the fishery, the following should be considered as requirements for participation:

- that ownership identification tags be installed on approved gear (e.g. nets);
- that turtles be landed alive or intact, prohibiting, for example, the use of spear guns and extended net sets that can result in drowning and providing for reliable recording and verification of turtle landings; and
- that the licensing process include as a criterion full participation in the monitoring programme.

C. Expand, standardize and systematize marine turtle population monitoring efforts so as to develop a basis for assessing population trends (progress has been made towards this end by the development of nationally standardized data collection forms and data management software). A systematic marine turtle monitoring programme should:

- expand and standardize surveys of nesting and foraging habitats in order to verify important areas and evaluate their overlap with fishing grounds and recreational areas;
- designate Index nesting beaches and Index foraging grounds and document the numbers of marine turtles occurring in these over time;
- manage data records such that statistically significant trends in abundance can be identified and inform management; and
- identify and monitor threats and other factors influencing marine turtle survival.

6. Mechanisms to quantify levels of incidental catch of marine turtles should be developed and implemented. Recommendations arising from a 2005 interactive workshop to develop a “Strategic Plan for Reducing the Incidental Capture and Mortality of Leatherbacks in the Gillnet Fisheries of Trinidad and Tobago”, co-hosted by the Fisheries Division and WIDECAS, should be reviewed and implemented as a matter of urgency, recognizing that incidental capture in coastal gill nets remains the single largest source of mortality to Leatherbacks in the country.
7. Enforcement efforts should be expanded and intensified through increased manpower and better equipment and other resources. These should include monitoring and patrols at nesting beaches and fisheries landing sites and at-sea patrols by the Fisheries Division to observe and intercept illegal activities, including taking of marine turtles on reefs and use of illegal nets. They should also focus on the illegal sale, during the closed season, of marine turtles and turtle products, including Hawksbill shell items.
8. The government should promote greater enforcement capacity, which should involve clearer and possibly enhanced authorities for Fisheries Division and other enforcement personnel and, possibly, dedicated enforcement staff. In addition, it should include training and logistical support, including a mobile enforcement unit, for both on-land and at-sea monitoring efforts. Finally, this capacity should involve

outreach and other activities that will engage greater efforts on the part of police for fisheries and broader environmental enforcement. A mutually agreed set of protocols and procedures for these agencies to follow in such circumstances may be an option to consider.

9. Marine turtle components to fisheries extension programmes that include training of fisheries extension personnel and production of materials for engaging fishers in marine turtle conservation and management should be developed and implemented. Increased efforts should be made to engage local communities in marine turtle conservation and management. Fisheries and rural development extension efforts should be implemented that involve regular exchanges with fishers and others of information on marine turtles and their conservation and management needs and the participation of these communities in efforts to manage marine turtles so as to enhance compliance with regulations and support for marine turtle conservation. Support directed towards sustainable fishery practices and/or alternative livelihoods should be provided, as relevant and necessary, to assist users of marine turtles meaningfully in their efforts to comply with revised marine turtle regulations.
10. Public awareness should be enhanced and community involvement strengthened through expanded outreach efforts in rural villages, through town meetings and sustaining dialogue with government personnel, community organizations, and industry co-operatives and through materials for tourists at airports, in hotels, etc.
11. Habitat protection and management should be enhanced, including by:
 - expanding the number of protected nesting beaches;
 - enhancing habitat protection measures, including restriction/regulation of tourism and other activities near nesting beaches during the egg-laying season and vigorous enforcement of such measures, such as against vehicles driving on nesting beaches and sand-mining;
 - adopting regulations to prevent or otherwise manage leaving of nets and other debris on the beach;
 - improving coastal zone management (and monitoring) capacity, including through environmental impact assessment, particularly in relation to tourism development and other beach-front construction and sand-mining;
 - expanding the system of protected areas; and
 - strengthening the management framework for protected areas to ensure that these areas fulfill their stated objectives.
12. The need for a bilateral agreement with Venezuela should be reviewed, to assist in eliminating international trafficking in marine turtle products (e.g. meat) by Venezuelan fishers, who both catch marine turtles in Trinidadian waters and purchase turtle products when in port.
13. Adequate implementing legislation for CITES, as required by CITES and advised by the CITES National Legislation Project, should be enacted. Such legislation should enable full implementation and enforcement of CITES provisions, including wildlife trade controls, scientific non-detriment findings, and control and monitoring, as appropriate, of stockpiles of CITES species.

References

- Anon. (2001). Endangered sea turtles butchered on the beaches of Tobago. Environmental News Service, 23 May 2001. www.sidsnet.org/archives/coastal-newswire/2001.
- Anon. (2002). CITES Document CoP12 Doc. 28. Working document of the 12th meeting of the Conference of the Parties, Santiago (Chile), 3–15 November 2002. Accessible at www.cites.org. Viewed 12 December 2005.
- Anon. (2004). CITES Document CoP13 Doc. 22 (Rev. 2). Working document of the 13th meeting of the Conference of the Parties, Bangkok (Thailand), 2–14 October 2004. Accessible at www.cites.org. Viewed 12 December 2005.
- Anon. (2005a). CITES Document SC53 Doc. 31. Working document of the 53rd meeting of the CITES Standing Committee. Accessible at www.cites.org. Viewed 12 December 2005.
- Anon. (2005b). SC53 Summary Record. Official report of the 53rd meeting of the CITES Standing Committee. Accessible at www.cites.org. Viewed 12 December 2005.
- Bacon, P.R. (1970). Studies of the Leatherback Turtle, *Dermochelys coriacea* (L.), in Trinidad, West Indies. *Biological Conservation* 2(3):213–217.
- Bacon, P.R. (1973). *The Status and Management of the Sea Turtle Resources of Trinidad and Tobago*. Report to the Ministry of Agriculture, Lands and Fisheries, Trinidad and Tobago. 40 pp.
- Bacon, P.R. and G.K. Maliphant. (1971). Further studies on sea turtles in Trinidad and Tobago. *Journal of the Trinidad Field Naturalists Club*, 1971.
- Carr, A., A. Meylan, J. Mortimer, K. Bjorndal and T. Carr. (1982). *Surveys of sea turtle populations and habitats in the Western Atlantic*. NOAA Technical Memorandum NMFS-SEFC-91. US Department of Commerce.
- Chu Cheong, L. (1984). National Report for Trinidad and Tobago. Submitted 16 May 1983. Pp. 398–408. In: P. Bacon *et al.* (Eds). *Proceedings of the Western Atlantic Turtle Symposium, 17–22 July 1983, San José, Costa Rica*, III, Appendix 7. University of Miami Press, Florida.
- Eckert, K.L. (1998). Endangered Sea Turtles of Tobago. *Environment Tobago Newsletter* 2.2.
- Eckert, K.L. and W. Herron. (1998a). Tobago's Illegal Leatherback Hunt. *Environment Tobago Newsletter* 2.2.
- Eckert, K.L. and W. Herron. (1998b). Turtle Law in Tobago. *Environment Tobago Newsletter* 2.2.
- Eckert, K. L. and J. A. Horrocks (Eds). (2002). *Proceedings of "Sea Turtles and Beachfront Lighting: An Interactive Workshop for Industry Professionals and Policy-Makers in Barbados", 13 October 2000*. Sponsored by WIDECAST, Barbados Sea Turtle Project, and Tourism Development Corporation of Barbados. WIDECAST Technical Report 1. v + 43 pp.
- Eckert, S.A. (1998). Perspectives on the use of satellite telemetry and electronic technologies for the study of marine turtles, with reference to the first year-long tracking of leatherback sea turtles. Pp. 44–46. In: S.P. Epperly and J. Braun (Compilers). *Proceedings of the 17th Annual Symposium on Sea Turtle Biology and Conservation*. NOAA Technical Memorandum NMFS-SEFSC-415. US Department of Commerce.
- Eckert, S.A. (2006 [in press]). Dive behavior, internesting and post-nesting movements of leatherback sea turtles (*Dermochelys coriacea*) from Trinidad nesting beaches. *Marine Biology*.
- Eckert, S.A. and J. Lien. (1999). Recommendations for eliminating incidental capture and mortality of Leatherback turtles, *Dermochelys coriacea*, by commercial fisheries in Trinidad and Tobago, WIDECAST Information Document 1999 – 001. WIDECAST, Beaufort, North Carolina.
- FAO. (1995). Code of Conduct for Responsible Fisheries. Adopted by the 28th Session of the FAO Conference. Food and Agriculture Organization of the United Nations, Rome. 34 pp. + annexes. www.fao.org/fi/agreem/codecond/codecon.asp

- FD (Fisheries Division of Trinidad and Tobago). (2004). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of Marine Turtles of the Lesser Antilles, Central America, Colombia and Venezuela. Completed by N. Nagassar, Fisheries Officer, Fisheries Division, Government of Trinidad and Tobago. Dated 25 August 2004.
- FDWS (Forestry Division-Wildlife Section). (2002). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of Marine Turtles of the Lesser Antilles, Central America, Colombia and Venezuela. Completed by N. Nathai-Gyan, Head, Wildlife Section of the Forestry Division, Government of Trinidad and Tobago. Dated 30 June 2002.
- Fournillier, K. and K.L. Eckert. (1998). Draft WIDECASST Sea Turtle Recovery Action Plan for Trinidad and Tobago. United Nations Caribbean Environment Programme, Kingston, Jamaica.
- Government of Trinidad and Tobago. (Undated). Interim First National Report (revised) to the Convention on Biological Diversity Secretariat. www.biodiv.org/doc/world/tt-nr-01-en.pdf
- Groombridge, B and R. Luxmoore. (1989). *The Green Turtle and Hawksbill (Reptilia: Cheloniidae): World Status, Exploitation and Trade*. IUCN Conservation Monitoring Centre. Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Lausanne, Switzerland. 601 pp.
- Herron, W., Director, SOS (Save Our Sea Turtles) Tobago. (2002). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of Marine Turtles of the Lesser Antilles, Central America, Colombia and Venezuela. Dated 23 July 2002.
- Horrocks, J.A., L.A. Vermeer, B. Krueger, M. Coyne, B.A. Schroeder and G. Balazs. (2001). Migration routes and destination characteristics of post-nesting Hawksbill Turtles satellite-tracked from Barbados, West Indies. *Chelonian Conservation and Biology* 4:107–114.
- James, C. and K. Fournillier. (1993). Marine Turtle Management in North-East Trinidad – A Successful Community Based Approach Towards Endangered Species Conservation. CANARI Case Study. Prepared by the Wildlife Section-Forestry Division, Government of Trinidad and Tobago. 33 pp.
- James, M.C., S. A. Eckert and R.A. Myers. (2005). Migratory and reproductive movements of male leatherback turtles (*Dermochelys coriacea*). *Marine Biology* 147(4):845–853.
- Jobity, A. (2004). An assessment of sustainable use practices in the management of fisheries and other living marine resources in Trinidad and Tobago. Oral presentation to the conference, “Sustainable Use of Renewable Resources”. 10 March 2004, Port of Spain, Trinidad. 10 pp. Unpublished.
- Lee Lum, L. (1985). Sea turtle studies in Trinidad, 1981–83. Institute of Marine Affairs, Trinidad and Tobago.
- Lee Lum, L.M.(2003). *An assessment of incidental turtle catch in the gillnet fishery in Trinidad and Tobago*. Research Report. Institute of Marine Affairs, Trinidad and Tobago. 38 pp.
- Luke, K., J. Horrocks, R. Leroux and P. Dutton. (2004). Origins of green turtle feeding aggregations around Barbados, West Indies. *Marine Biology* 144:799–805.
- Milliken, T. and H. Tokunaga. (1987). *The Japanese Sea Turtle Trade 1970–1986*. A special report prepared by TRAFFIC (Japan). Center for Environmental Education, Washington, DC. 171 pp.
- Nathai-Gyan, N. (1984). Marine Turtle Management in Trinidad and Tobago with Specific Reference to the Leatherback Turtle, *Dermochelys coriacea*. Report to the Wildlife Section-Forestry Division, Government of Trinidad and Tobago. 17 pp.
- Nathai-Gyan, N., C. James and G. Hislop. (1987). National Report for Trinidad and Tobago. Presented to the Second Western Atlantic Turtle Symposium, Puerto Rico. Forestry Division, Ministry of Food Production, Marine Exploitation, Forestry and Environment. 228 pp.

- Poon, S., Wildlife Section, Forestry Division, Government of Trinidad and Tobago. (2004). Country Report: Trinidad and Tobago. Invited oral presentation to the 2004 Annual General Meeting of the Wider Caribbean Sea Turtle Conservation Network (WIDECAST), 21 February 2004, San José, Costa Rica.
- Pritchard, P.C.H. (1984). *Marine Turtles in Trinidad and Tobago*. Report to FAO.
- Rebel, T.P. (1974). *Sea Turtles and the Turtle Industry of the West Indies, Florida, and the Gulf of Mexico*, revised edn. University of Miami Press, Coral Gables. 250 pp.
- SOS Tobago. (2003). Killing turtles affects fishing and tourism. SOS Tobago press release, June 2003. www.sos-tobago.org.
- Troëng, S. and C. Drews. (2004). *Money Talks: Economic Aspects of Marine Turtle Use and Conservation*. WWF-International, Gland Switzerland. 62 pp. www.panda.org/downloads/species/moneytalks.pdf
- UNEP. (1996). *Status of Protected Area Systems in the Wider Caribbean Region*. Country Profile for Trinidad and Tobago. CEP Technical Report No. 36. UN Environment Programme Caribbean Environment Programme, Kingston, Jamaica. grid2.cr.usgs.gov/cepnet/pubs/techreports/tr36en/index.html

NATIONAL REVIEWS: CENTRAL AMERICA

Belize

Introduction

Situated south of the Yucatán Peninsula in the Central American isthmus, Belize covers a land area of ca. 23 000 km² (including some 450 offshore cays) and a nearly equivalent 23 657 km² of territorial sea extending 20 km into the Caribbean Sea. The continental shelf of the country is protected by the Belize Barrier Reef, which stretches 220 km along the coast from the Mexican border to the Sapodilla Cays and is the longest in the Western Hemisphere. Within the reef are extensive stands of seagrass beds, composed primarily of Turtle Grass *Thalassia testudinum*, which have long been recognized as important foraging areas for Green Turtles, many of them migrating along the Central American coast (Smith *et al.*, 1992). Belize has strong economic and cultural ties with the Caribbean, in particular the former British colonies that comprise the Caribbean Community. Belize gained independence from the UK in 1981.

The prominence that marine turtles have played in the fishing industry in Belize is well documented. Smith *et al.* (1992), in reviewing the available literature, noted that turtle hunting was reported by one author to have constituted the most important form of fishing in Belize during the period from ca. 1650 to 1900 and that, in addition to local markets, turtles supplied international markets, in England in particular. Large numbers of Green Turtles were exported live to England during the latter part of the 19th century and, although international trade for meat dwindled, demand remained high in Belize during the 20th century. This demand and the industry that fed it also focused on Hawksbill shell and thrived in the early 1900s.

A Sea Turtle Recovery Action Plan (STRAP) for Belize, developed and published under the auspices of the Wider Caribbean Sea Turtle Conservation Network (WIDECAST) and the United Nations Caribbean Environment Programme (Smith *et al.*, 1992), reviewed in detail the status of and threats to marine turtles in Belize and presented a series of recommendations to improve the management and recovery of marine turtle populations. These authors presented evidence, both quantitative and qualitative, of the greatly depleted status of marine turtles in the country, which they and many of the individuals they interviewed for the STRAP attributed to heavy over-exploitation over several centuries, in particular of large juveniles and migrating, mating, and nesting adults. The STRAP identified the primary threats to marine turtles in the country to be: continuing exploitation of adults and large juveniles; incidental catch of turtles in trawls and other fishing gear; nesting beach development; and the degradation of foraging grounds by anchoring, dredging, waste disposal, and pollution. Finally, the STRAP cautioned that “time is short for the marine turtles of Belize” and that a lack of enforcement capacity hindered efforts to conserve remaining marine turtle populations.

Although efforts had been made by the Government of Belize in 1981 to conserve marine turtles through a moratorium on marine turtle exploitation set out in the *Wildlife Protection Act*, this measure was repealed owing to a direct conflict with the *Fisheries Regulations*, which at the time permitted a marine turtle fishery. It was not until a decade later that significant changes in management were instituted. The Government of Belize (2001) and the Belize Coastal Zone Management Authority and Institute (CZMAI) (CZMAI, 2002) note the important contribution of the STRAP to marine turtles in Belize, in particular in leading to a major revision, in 1993, of the country’s fisheries regulations, which conferred complete protection on Hawksbill Turtles and protected large

juvenile and adult turtles through maximum (vs. minimum) size limits based on measurements of shell length rather than total weight (which enable turtles to be measured at sea and returned if undersized). Subsequent legislation enacted in 2002 protects all marine turtle species at all times, with an exception for certain species that may be taken for traditional or cultural purposes on the basis of a permit and quota system.

The effectiveness of the virtually complete protection conferred on marine turtles in 2002 depends on the level of compliance by fishers and other consumers and this is, to a large degree, dependent on the investment made to inform them of existing regulations and to provide sufficient enforcement (Searle, 2001; Craig, 2002). Although there is evidence (e.g. Chacón, 2002) that the absolute protection conferred on Hawksbill Turtles has been effective in stemming trade in Hawksbill products, inadequate public awareness and enforcement efforts following the entry into effect of the 1993 regulations resulted in fishers' continuing—for the ensuing decade—to take large turtles, in contravention of the regulatory change to a maximum size limit (Searle, 2001). The apparent result is that, with the possible exception of Hawksbill Turtles, exploitation pressure on marine turtles in Belize is likely not to have eased significantly and meaningfully until very recently. However, because there seems to have been a genuine decline in demand for—and hence trade in—Hawksbill products and turtle meat (Chacón, 2002; CZMAI, 2002; Searle, 2001), the recent legal protection measures, if widely communicated and enforced, may prove effective in promoting the recovery of depleted populations.

There have been other achievements for marine turtles in Belize in the past decade, including the development of co-management arrangements for conserving the most important Hawksbill nesting beach at Manatee Bar and the protection of other nesting and foraging sites in a growing number of marine reserves and other types of protected areas for which Belize enjoys worldwide renown. However, management shortcomings persist. There are important gaps in knowledge regarding marine turtle nesting and foraging sites and a need for sustained and systematic population monitoring so as to: assess trends, evaluate the effectiveness of management measures, identify critical habitats and prioritize other actions that may be required. That a co-ordinated marine turtle conservation programme is not yet in place in Belize suggests that there is still significant progress to be made in the country to enhance the management and conservation of these species.

Summary of the status of marine turtles in Belize

Three species of marine turtle regularly occur in the waters of Belize and nest on its many shores: the Loggerhead and Green and Hawksbill Turtles. Leatherbacks are observed in the open ocean between the barrier reef and Turneffe (Searle, 2001) and there have been reports of their occasionally venturing inshore from the barrier reef (Smith *et al.*, 1992; Searle, 2001). There are undocumented reports of Kemp's Ridleys (Smith *et al.*, 1992). Craig (2002) indicates that there are no known major foraging grounds but that these species—particularly Hawksbill Turtles and Loggerheads, according to CZMAI (2002)—forage along the entire barrier reef system and around the numerous offshore cays. The English Cay/Robinson Point area is thought to be an important foraging area for Green Turtles (CZMAI, 2002; Searle, 2003); it has been the source of supply for traditional turtle fishers for decades and is the source of most of the turtles that these fishers captured for sale in the markets in Belize City and Dangriga (Searle, 2001).

The most important nesting beaches for marine turtles in Belize are located on Ambergris Cay, on the southern cays from Silk Cay to the Sapodilla Cays, and on the mainland at Manatee Bar/Gales Point (Smith *et al.*, 1992). There are no major nesting concentrations of Green Turtles—historical rookeries for this species have been

“decimated” (Smith *et al.*, 1992). Nevertheless, Northern Ambergris Cay, Half Moon Cay, Sapodilla Cays and Turneffe Islands are considered important nesting sites for both Green Turtles and Loggerheads (CZMAI, 2002) and also for Hawksbill Turtles (L. Searle, Director, Symbios, *in litt.*, 8 October 2002). The major nesting concentration for Hawksbill Turtles is at Manatee Bar. Smith *et al.* (1992) reflected on the relatively few sites in the Caribbean where over 100 Hawksbill nests could be found on one beach; one of these was Manatee Bar Beach, “a national treasure that should be earnestly protected”.

Occurrence of marine turtles in Belize

English common name	Scientific name	Occurrence
Loggerhead	<i>Caretta caretta</i>	N, F
Green Turtle	<i>Chelonia mydas</i>	N, F
Leatherback	<i>Dermochelys coriacea</i>	I
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	N, F
Kemp’s Ridley	<i>Lepidochelys kempii</i>	A?
Olive Ridley	<i>Lepidochelys olivacea</i>	A

Key: N=nesting; F= foraging; I=infrequent; A=absent

Smith *et al.* (1992) wrote “it is clear that while some sea turtle stocks may be resident in the waters of Belize, many of the sea turtles observed at sea and especially on the nesting beaches are migrants”. This appears to be particularly the case with Green Turtles and Loggerheads, large numbers of which are reported to occur on a seasonal basis, while individuals of all age classes of Hawksbill Turtles are found in the waters of Belize throughout the year. Little is known, however, of their distribution or abundance at sea, or the details of their habitat use.

During interviews with fishers conducted for the 1992 STRAP, tags were solicited, and of the six tags presented by these fishers, five were from Green Turtles tagged in Costa Rica and one from a Hawksbill Turtle apparently tagged in Guatemala (the tag had a Guatemalan return address). The fishers reported catching an additional Hawksbill Turtle, apparently tagged in Guatemala, and a Green Turtle tagged in Mexico (Smith, 1990, cited in Smith *et al.*, 1992). Finally, reports have been made at a meeting of the Belize Sea Turtle Conservation Network

of fishers in Belize with jars of tags recovered from turtles that they have caught, including a tag from the Cayman Islands (Searle, 2003).



Credit: STCB

Release of a Hawksbill Turtle with satellite transmitter affixed.

More recent extra-territorial movements of marine turtles occurring in Belize include: the case of a Green Turtle, satellite-tagged after nesting at Tortuguero, Costa Rica, which travelled to Robinson Point and remained in the waters of Belize for several

months; other Green Turtles, tagged in Florida, Mexico, and Costa Rica, and Loggerheads tagged in Florida and the Bahamas, caught in Belize (CZMAI, 2002). According to Searle (2001), a Hawksbill Turtle tagged with a satellite transmitter in Antigua migrated into the waters of Belize and a Hawksbill Turtle fitted with a satellite transmitter during nesting at Manatee Bar in 2001 moved to southern Belize to forage in seamounts off Punta Gorda (L. Searle, *in litt.*, 8 October 2002). Genetic sampling and analysis suggest that Hawksbill Turtles born in Belize may be found as juveniles among foraging populations in Cuba and Mona Island, Puerto Rico (Bass, 1999).

Overview of the legal framework for marine turtle management

Membership in international and regional treaties

Belize is a member of numerous international environmental agreements of relevance to marine turtles. Particularly noteworthy is its accession to the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC). Although Belize was included in the UK's ratification of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1976, its CITES membership after independence in 1981 became a point of uncertainty, such that the government formally declared succession to the treaty on 19 August 1986. Belize is, thus, considered to have been a party continuously since 1976, although the treaty is specified as having entered into effect on the date of independence from the UK. Belize is not party to International Labour Organization Convention N° 169 Concerning Indigenous and Tribal Peoples in Independent Countries.

Membership of Belize in multilateral agreements relating to marine turtles

Convention	Belize
Cartagena Convention	22.09.1999 (A)
Protocol Concerning Specially Protected Areas and Wildlife (SPAW)	No
Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region	22.09.1999 (A)
Protocol Concerning Pollution from Land-based Sources and Activities	No
Convention on Biological Diversity (CBD)	30.12.1993 (R)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	21.09.1981 (E)
Convention on Migratory Species (CMS)	No
Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	03.02.2003 (R)
MARPOL 73/78 (Annex I/II)	26.08.1995 (A)
MARPOL 73/78 (Annex III)	26.08.1995 (A)
MARPOL 73/78 (Annex IV)	26.08.1995 (A)
MARPOL 73/78 (Annex V)	26.08.1995 (A)
Convention on Wetlands of International Importance (Ramsar)	22.08.1998 (E)
UN Convention on Law of the Sea (UNCLOS)	13.08.1983 (R)
Western Hemisphere Convention	No
World Heritage Convention	06.11.1990 (R)

Key: Date of: Ratification (R); Accession (A); Entry into force (E)

Laws and regulations relating to marine turtles

The legal requirements governing exploitation of marine turtles in Belize have evolved considerably over the past 30 years, culminating in virtually complete protection conferred in 2002.

The first regulatory measures relating to marine turtles were the *Fisheries Regulations* of 1977, which prohibited:

- the export, or attempted export, of any turtle or articles made from any part of a turtle unless under a licence granted by the relevant minister;
- the take of turtles “found on the shores of Belize and adjacent cays thereof”;
- the setting or attempted setting of any net or seine or other instrument with the intent of taking turtles within 100 yards of the shores of Belize or of the adjacent cays;
- the take or possession of any turtle or turtle eggs during a closed season from 1 June to 31 August; and
- the take, purchase, sale or possession of turtles under the following weights:

Loggerhead:	30 lb (13 kg)
Green Turtle:	50 lb (23 kg)
Hawksbill Turtle:	50 lb (23 kg)

The Regulations further provided for:

- the issuance of a commercial fisher’s licence in order to take turtles; and
- the levying of a maximum fine of 500 Belize dollars (BZD500) for persons convicted of violating the regulations.

The *Wildlife Protection Act* of 1981 included in its list of protected species four marine turtle species—the Loggerhead, Green Turtle, Hawksbill Turtle and Leatherback—thus establishing a moratorium on the hunting, sale or any dealing for profit, and import or export without a permit of any of these animals or part thereof, including nests and eggs. However, because of a conflict with the *Fisheries Regulations*, these four species were deleted from the Act through *Statutory Instrument No. 12* in January 1982 (Searle, 2001; Smith *et al.*, 1992).

The *Fisheries (Amendment) Regulations* of 1993 substantially revised the restrictions on the take of marine turtles, by prohibiting:

- the take, sale, purchase or possession of Hawksbill Turtles at all times;
- the take, sale, purchase or possession of any marine turtle during a six-month closed season from 1 April to 31 October;
- the take of any turtle found on land or interference with any turtle nest;
- the disturbance, damage, take, sale, purchase or possession of any turtle egg;
- the setting or attempted setting of any net, seine or other instrument with the intent of taking turtles within 100 yards of the shores or adjacent cays of Belize.
- the take, sale, purchase or possession of any Green Turtle or Loggerhead greater than 60 cm (24 ins) curved carapace length (CCL); and
- the import, transit, or export of any turtle without a valid permit issued by the relevant minister.

In addition, the Regulations prohibited the purchase, sale or possession of any articles made of turtle shell. Although possession of any articles held on the date of entry into force of the Regulations was allowed, those articles were prohibited from subsequent sale after 31 July 1993.

The most recent revision of the Regulations, the *Fisheries (Amendment) Regulations (Statutory Instrument No. 66)* of 2002, provides almost complete protection for the marine turtles of Belize. Designed to bring Belize in line with IAC, which Belize ratified in February 2003, these Regulations prohibit:

- fishing in the waters of Belize or the purchase, sale or possession of any marine turtle;
- the take of any turtle found on land; the disturbance, take, purchase, sale or possession of any turtle or turtle eggs; and the interference with any turtle nest, except under written permission by the Fisheries Administrator; and
- the import to, transit through, or export from Belize of any turtle or turtle products.

The Regulations also provide for:

- increased penalties for violations of the prohibitions set out in the law, namely a fine not exceeding one thousand dollars per turtle or part of a turtle, or imprisonment for a term not exceeding one year, or both the fine and imprisonment;
- prior issuance of a written permit from the Fisheries Administrator for the take or use of any marine turtle (other than Hawksbill Turtles, which are fully protected at all times) for traditional or cultural use. The permit must specify the “amount and specific purpose for such use”;
- the requirement that any shrimp trawler operating in the waters of Belize must be fitted with a pre-approved operational turtle excluder device (TED); and
- right to possession for personal use of any articles made of turtle shell held by anyone on the date of entry into force (1 June 2002) of the Regulations.

Marine protected areas (MPAs) in Belize may be designated under the *Fisheries Act Chapter 210* and the *National Parks System Act Chapter 215*. Under existing law, marine reserves in Belize are not no-take but, rather, zoned for multiple use and are administered by the Fisheries Department, in some instances through partnerships with NGOs via formal co-management arrangements (Gibson *et al.*, 2004). The *Coastal Zone Management Act Chapter 329* of April 1998 mandates the Coastal Zone Management Unit (now CZMAI) to address cross-sectoral sustainable development of coastal resources and to undertake research, monitoring, training and public awareness activities on all aspects of marine and related resources (J. Gibson, Wildlife Conservation Society, *in litt.*, 23 October 2004).

The CITES National Legislation Project assessed Belize’s CITES-implementing legislation as “believed generally not to meet the requirements for the implementation of CITES” (Anon., 2002) and assigned a deadline of 31 December 2003 for adequate implementing legislation to be enacted. This deadline was subsequently extended and, by the time of the 13th meeting of the Conference of the Parties to CITES, Belize had submitted draft implementing legislation to the CITES Secretariat (Anon., 2004). A CITES Legislation Plan has also recently been submitted (S. Nash, Chief, Capacity Building Unit, CITES Secretariat, *in litt.* to J. Gray, TRAFFIC International, 21 September 2005).

Responsible authorities

The Fisheries Department of the Ministry of Agriculture, Fisheries and Co-operatives is responsible for marine turtle management in Belize. Both the fisheries legislation and *Wildlife Protection Act* grant respective ministers authority to appoint enforcement personnel, which include Fishery Officers, any member of the management committee of a fishing co-operative, and protected area staff, while the wildlife regulations confer on game wardens and game rangers powers of search, seizure and arrest to enforce the *Wildlife Protection Act*. CITES is administered by the Forestry Department of the Ministry of Natural Resources, Environment and Industry.

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective

There is a centuries-long history of marine turtle exploitation in Belize, for both national and international markets. Marine turtles were once the focus of a major industrial fishery in the country that primarily targeted Green Turtles for meat, Hawksbill Turtles for shell, and turtle eggs. This history is reviewed in detail by Smith *et al.* (1992), who reported that this industry flourished from the mid-17th to the mid-20th century but that, by the 1960s, marine turtle populations appeared greatly depleted and few fishers continued to focus their efforts on catching turtles. In a comprehensive historical account, Craig (1966) concluded that “the traditional pattern of fishing practices developed during the colonial period continued in force until the end of World War I, at which time....the turtle population had been decimated, without any attempt at conservation”.



Credit: Scott A. Eckert/WIDECAST

An adult Loggerhead finds a resting hole in coral reefs

Based on market surveys and interviews with fishers, at least in part conducted by the Fisheries Department, Miller (1984) reported an annual estimate ranging from 1125 turtles (in 1980) to 1005 turtles (in 1982) legally landed at seven landing sites during several months of the year during the period 1980–1982, with additional numbers “occasionally” landed in other months; up to 40% were Loggerheads, 33% were Hawksbill Turtles and 31% were Green Turtles. In addition, he provided an estimate of 10 000 turtle eggs taken for subsistence purposes.

Smith *et al.* (1992) reported a similar estimate for the number of turtles sold each year during subsequent years of the 1980s and that 500–800 turtles, most of them adults (30% Loggerheads, 10% Hawksbill Turtles and 60% Green Turtles), were sold in the markets every year in the early 1990s. They pointed to evidence of a decline in catches and marine turtle stocks: older fishers attested to serious declines in the number of marine turtles over their lifetimes, while catch-per-unit effort had dropped and turtles caught were considerably smaller than as recent a year as 1980. In addition, fisheries data indicated that the average weight of turtles landed fell 60% (from 163 kg to 67 kg) between 1982 and 1986. They further noted a decline in the number of fishers believed to be taking turtles full-time: Miller (1984) had estimated 20–30; Gillett (1987) had estimated 15–20; while they themselves estimated no more than 10. By contrast, they observed that fishers targeting lobsters, conches and fin-fish continued to take marine turtles opportunistically. Finally, they reported that all the fishers that they interviewed reported that they caught many more females than males.

Miller (1984) reported a “fairly heavy trade” in juvenile turtles to “satisfy tourist demand”. Moll (1985, cited in Groombridge and Luxmoore, 1989 and Smith *et al.*, 1992) reported the findings of his visits to the country in 1983 and 1984, namely that: Green and Hawksbill Turtles and Loggerheads were all exploited; the ban on egg collection imposed in 1977 was widely ignored; turtles were taken for meat during the closed season; and tortoiseshell curios and jewellery found a “ready market” amongst tourists from abroad. Gillett (1987) echoed these findings and also reported “turtles [are] being exploited for their eggs, meat, and shell. Turtles are being netted by local fishermen and a considerable trade in turtle eggs and turtles is allegedly being conducted by illegal fishermen from those countries south of our borders. These activities and the extent to which they exploit the resource [are unquantified because] they operate from the southern cays which are mostly uninhabited and isolated. Although our traditional fishermen are not solely dependent on the catch of turtles for their livelihood, there is a thriving trade in turtle products. Other lobster and conch fishers do take turtles when available as incidental catch. Marine turtles are also being caught in the nets of the shrimp trawlers operating in our waters.” He also suggested a “conservative estimate” of 700 turtles, primarily Green and Hawksbill Turtles, taken incidentally by shrimp trawlers during a single shrimping season.

Although Smith *et al.* (1992) cited Miller’s (1984) estimate of 10 000 marine turtle eggs being taken each year in spite of the legal prohibition, they indicated that the extent of illegal take of marine turtles in any given year was unknown.

Recent (since 1992) exploitation

From 1993, when Hawksbill Turtles were afforded complete protection, until the new regulations came into effect in 2002, the legal marine turtle fishery operated for Green Turtles and Loggerheads during a five-month open season stretching from 1 November to 31 March. During the open season, Green Turtles were sold openly at fish markets in Belize City and all turtles, including Hawksbill Turtles, were taken for food and possibly for sale out

of season (L. Searle, *in litt.*, 8 October 2002). Searle (2001) conducted daily surveys at two markets in Belize City during the 2000–2001 open season and recorded the species, size and sex of the turtles landed. She reported that, because of inadequate public awareness and enforcement efforts, fishers were unaware of the 1993 regulatory change from a minimum to a maximum size limit, such that large turtles continued to be landed; all the turtles that she recorded during her surveys were greater than the legal maximum size limit of 60 cm CCL.

There does not appear to have been any systematic collection by the Fisheries Department or the fishing co-operatives of data on turtles landed or sold prior to the prohibition. In general, according to Craig (2002), very few landing data were collected. According to Searle (*in litt.*, 8 October 2002), turtles were sold to “retailers” at fish markets for as much as BZD75 for a large Green Turtle and the meat was sold for as little as BZD1.50/lb, making the turtle meat less expensive than beef and fish. Based on her market surveys, Searle (2001) estimated that 83 Green Turtles were landed during the 2000–2001 season. She compared this figure with Miller’s (1984) and Gillett’s (1987) landing data for Belize City, which they estimated as 25–32% of the country total, and estimated that 239–332 turtles may have been landed throughout Belize during the 2000–2001 open season. This reduction of more than two-thirds from 1980 landing estimates may represent a decline in turtle populations, but Searle (*in litt.*, 8 October 2002) provides evidence that demand for marine turtles has decreased. She observed during her market surveys that turtle meat remained unsold for several days and that attitudes towards turtle consumption appeared to be a function of culture and generation: older Creoles and Garifuna consider this an important part of their culture, while the majority of young Belizeans find it “repulsive” to eat turtle.

CZMAI (2002) reports that the turtle fishery was primarily opportunistic and that very few fishers relied on marine turtles as a major source of income. Craig (2002), however, suggests that marine turtles may have been a significant source of incidental catch income. According to Searle (*in litt.*, 8 October 2002), turtle fishing has continued to be important for turtle fishers, for whom it has generated real income. In her experience, turtles captured incidentally by lobster or conch fishers are primarily consumed on the boat or taken home to their families.

Both Craig (2002) and Gibson (2002) report a local preference for Green Turtle meat, but the meat of Green Turtles and Loggerheads (and Hawksbill Turtles, according to Searle [*in litt.*, 8 October 2002]) has also been consumed, shared amongst friends and family or butchered at the local market and sold fresh, including, at least until 2002, to some restaurants. Searle (*in litt.*, 8 October 2002) notes, for example, that one turtle fisher in Belize City caught Green Turtles primarily for restaurants in Belize City. Green Turtle soup has remained a delicacy in the country, while turtle flipper soup, according to Craig (2002), is prized by the resident Chinese population. The meat is also used by the Garifuna in the “dugu”, a traditional ceremony of remembrance for relatives who have died.

There are no data from which to evaluate the illegal collection of turtle eggs. Craig (2002) reports that turtle eggs are not sold openly and are not as prized as in Honduras and Costa Rica. Large turtle shells are used as wall ornaments. Chacón (2002) reported on the results of market surveys and interviews conducted throughout Central America during the period 2000–2002 by the *Red Regional para la Conservación de las Tortugas Marinas en Centroamérica* (RCA—Central American Marine Turtle Conservation Network) in partnership with WIDECAS. In Belize, these surveys were conducted in several cities known for heavy tourist traffic. In a few instances, Hawksbill items were found for sale and reported to be very popular with buyers or available for sale only upon specific request; however, the majority of interviews revealed an awareness of the legal prohibition on

the sale of Hawksbill products and/or of concerns regarding the conservation of the species. In addition, at least two vendors reported that Hawksbill shell products that they had displayed for sale had been confiscated by government authorities enforcing the protective legislation. In at least one city, a vendor selling sea turtle cream made in Guatemala reported that he sold very few of these items despite their “being good for the skin”.

In addition to direct take, there has continued to be incidental mortality of marine turtles in fishing operations. Although shrimp trawlers are required by law to use pre-approved TEDs, mortalities apparently still occur: several turtles stranded along Manatee Bar beach during the peak nesting period in July 2002 were presumed to have been the result of the early opening of the shrimp fishing season that year (S. Beaton, Belize Sea Turtle Conservation Network, *in litt.* to D. Chacón, 24 September 2002). Smith *et al.* (1992) noted reports of an increase in the use by fishers in Belize of gill nets, which are well known to catch and drown marine turtles; they also raised questions as to possible incidental mortality in longline fisheries, which at the time of their writing were known to be operating in the north-eastern Caribbean.

International trade

Historical perspective

As indicated above, the large fishery for marine turtles that operated over centuries in Belize also provided international markets. Smith *et al.* (1992) reported that large numbers of Green Turtles, as many as 2000–6000 annually in the 1860s, were transported live from the country to England during the late 19th century to be sold for their meat. This trade dwindled to “50–150 turtles annually” in the 1890s and appears to have been supplanted by exports of Hawksbill shell. According to Craig (1966), “Victorian demand for Hawksbill shell revitalized the earlier turtle industry of the buccaneers [and] substantial fortunes were made in British Honduras [now Belize] when the market for turtle shell was expanding”; by 1910 the price fell, “due largely to the competition of imitation celluloid products”.

The Hawksbill trade from Belize continued through the major part of the 20th century. Smith *et al.* (1992) cited the following statistics on Hawksbill shell exports, nearly all of it to England, in Rebel’s (1974) study:

Year	Volume of Hawksbill shell exported (lb)
1937	2576
1938	1457
1939	1211
1940	319
1941	850

Further, Smith *et al.* (1992) cited Moll’s (1985) report that a Placencia Fishermen’s Co-operative exported “many Hawksbill Turtles” to France in the mid-1970s. There appears also to have been international trade in marine turtle eggs. Smith *et al.* (1992) cited Moll’s (1985) information that marine turtle eggs collected in Belize were being purchased in 1982 by Honduran and Guatemalan citizens and smuggled back across the border. They also cited Smith’s (1990) information from a Belizean fisher that some Belizean fishers collected eggs on Manabique beach in Guatemala: “despite patrols many eggs were taken because so much money could be made: three to four men could return with as many as 1200 eggs”.

Smith *et al.* (1992) indicated that they received multiple reports from reliable sources that illegal exports of Hawksbill shell from the country continued.

CITES trade statistics derived from the UNEP-WCMC CITES Trade Database provide little evidence of international commercial trade in marine turtles involving Belize. No international trade was reported by CITES Parties between 1975 and 1979 and the only trade reported (including in CITES trade statistics submitted by the Government of Belize) in subsequent years to 1993 were imports into the USA, most of them seized on entry.

Japanese Customs statistics on the import of Hawksbill shell for 1970–1986 (Milliken and Tokunaga, 1987) and up to and including 1992 (H. Kiyono, TRAFFIC East Asia-Japan Office, *in litt.* to TRAFFIC International, 29 July 2002), the last year that Japan permitted these imports, show a dramatic rise in imports from Belize, beginning in 1985, with 1195 kg and 2231 kg reported imported in 1985 and 1986, respectively. After this, they ceased entirely. Milliken and Tokunaga (1987) reported that the Japanese dealers' import data recorded even higher volumes in those years (1628 kg in 1984, 3240 kg in 1985, 3280 kg in 1986), suggesting that real export volumes from Belize may have been much higher. This sudden increase in Hawksbill shell imports into Japan from Belize was attributed by Groombridge and Luxmoore (1989) and subsequent authors to the confused status of Belize's CITES membership: although Belize was included in the UK's ratification of CITES in 1976, when the country became independent, in 1981, it was not certain whether separate ratification of the treaty was necessary and, thus, whether Belize was bound by CITES or not. This issue was clarified in 1986, by which time, a total of 4666 kg of Hawksbill shell (5773 kg during the period 1970–1992) had been imported from Belize into Japan (according to Customs statistics).

Japanese imports (kg) of Hawksbill Turtle shell, 1970–1992, from Belize, as recorded in Japanese Customs statistics

Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
	97	82	0	28	276	0	12	40	0	314	258	0
Year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Total
	702	538	0	1195	2231	0	0	0	0	0	0	5773

Sources: Milliken and Tokunaga, 1987; H. Kiyono, TRAFFIC East Asia-Japan Office, *in litt.* to TRAFFIC International, 29 July 2002.

Recent (since 1992) international trade

There is very little evidence of international trade in marine turtles involving Belize since 1992. CITES trade statistics up to and including 2004 record only a small number of items in trade, most of them single items seized on entry in the USA. Chacón's (2002) review of the regional trade in marine turtle products in Central America presents little evidence of Belize as an import market for marine turtle products from the region. However, some vendors interviewed in neighbouring Guatemala reported that their Hawksbill products were made from scutes imported, via Punta Gorda, from Belize. This suggests that some illegal export trade in Hawksbill shell from the country may still occur.

Enforcement issues

Based on other authors' findings and the results of their own research, Smith *et al.* (1992) identified conservation law enforcement as one area that "could be much improved", if marine turtle management measures in Belize were to be successful and noted that the necessary improvements would require greater will and expanded resources on the part of the government and a greater commitment by the general public to comply with conservation legislation. At the time of their writing, all members of the Maritime Wing of the Belize Defence Force, the Manager and Biologist for Hol Chan Marine Reserve, and Fisheries Department personnel enjoyed enforcement powers for fisheries regulations, while a game warden and game rangers were mandated to exercise power of search, seizure and arrest to enforce the *Wildlife Protection Act*. In addition, they noted that the Fisheries Department had recently established, with funding from the US Agency for International Development (USAID), a Conservation Compliance Unit furnished with five new patrol boats, two new law enforcement officers for each boat, an administrative officer and a mechanic. This Unit greatly enhanced the Department's surveillance and enforcement capabilities, with the result that arrests, convictions, and confiscations were on the rise and illegal fishing increasingly contained.

According to Gibson *et al.* (2004), while at the time of the USAID funding, the Conservation Compliance Unit enjoyed an enforcement capability considerably greater than that found in most other Caribbean countries, insufficient government resources have in recent years precluded the Unit from maintaining this original level of capacity. Although it remains active and continues to conduct patrols, illegal fishing, e.g. of undersized conches and lobsters, is known to occur, as does fishing during closed seasons, and illegal foreign fishers pose a major problem, particularly in the south of the country.

Illegal exploitation and trade of marine turtle products have continued in Belize, but it does not appear possible to make any judgments about overall trends, as they may differ according to the products involved, and the situation may have changed significantly since implementation of the complete prohibition enacted in 2002. Craig (2002) reports that there is a range of evidence—documented, anecdotal, and that based on seizures—of illegal exploitation of marine turtles in the country, primarily by local fishers but also by Honduran fishers in the south. Searle (2001) also reports illegal take and sale of turtle meat. Although both Craig (2002) and CZMAI (2002) report that there is still some illegal trade in Hawksbill jewellery, made by local craftsmen and sold by them on the street or, less commonly, through larger handicraft shops or local gift shops to both locals and tourists, Chacón's (2002) surveys found a lower prevalence of Hawksbill products for sale in the country than in other countries in the region, apparently the result of government enforcement efforts.

Although the 1993 protections afforded Hawksbill Turtles appear to have been widely communicated and to have had an impact on consumption, Searle (2001) reports a lack of awareness of—and, therefore, compliance with—the restrictions governing the take of turtles at sea. Her findings that fishers were unaware of the 1993 reversal to maximum (from the earlier minimum) size limits suggests that there should have been more vigorous efforts to communicate these new restrictions with fishers and other consumers; although public service announcements on the turtle regulations were made at the beginning and end of the closed season, these were inadequate in affecting what should have been a major improvement in the management of the legal fishery. No information has been provided in the course of this study as to whether this shortcoming has been repeated with the absolute protection conferred for marine turtles in 2002.

Although the illegal take of marine turtles continued in Belize at least until the 2002 prohibition, CZMAI (2002) did not believe it to be a severe problem for marine turtle management and noted that increased enforcement efforts—monitoring at sea and of marketplaces, especially during the closed season—had led to the confiscation of several turtles, the live ones of which were released. While, on the one hand, Craig (2002) suggests that illegal exploitation of marine turtles may be reduced by the increasing rise in tourism earnings in Belize and the consciousness that turtles are potentially worth far more alive than dead, he expresses concern that the new legislation protecting marine turtles at all times will require more resources to enforce; in addition, although the stiffer penalties put in place with the 2002 *Fisheries Regulations* should serve as a deterrent, this will only be the case if effort is made to document violations and pursue these cases through the courts.

Although illegal turtle products are being seized, contributors to this review knew of no stockpiles of marine turtle products. Other than for live turtles, information has not been provided on what is done with the products, such as Hawksbill shell products from vendors, that are seized.

The existence—and active management—of the expanding network of MPAs in Belize has contributed to efforts to enforce fisheries regulations and other protective measures: MPA staff enjoy certain enforcement powers and only need to call in fisheries officers in special circumstances. In addition, they can develop closer relationships with local fishers, thus engaging them on a more regular basis in the rationale for, and activities and results of, MPA management measures. National parks near national borders have also played a role in reducing illegal take by foreign fishers, such as has been documented in Bacalar Chico Marine Reserve, where the activities of staff have reduced incursions by Mexican fishers, and in the south at Glover's Reef and Port Honduras marine reserves, where they have reduced illegal fishing by Honduran and Guatemalan fishers (Gibson *et al.*, 2004). Finally, the establishment of MPAs in Belize has been developed through participatory processes which have both educated and involved fishers and other stakeholder groups: fishers have been engaged from early on in public fora and through other processes and have representatives serving on advisory or management committees for the MPAs (Gibson *et al.*, 2004).

Marine turtle management

The 1992 STRAP proposed for Belize an initial three-year marine turtle conservation programme aimed to fill important gaps in knowledge, heighten public awareness, provide training, and resolve specific threats to marine turtles. Other than the significant revisions to the *Fisheries Regulations* for marine turtles and the legislative and other advances made through the efforts of CZMAI, it does not appear that the STRAP recommendations have been fully implemented. According to Searle (2001), the Belize Sea Turtle Conservation Network plans to implement these recommendations through alliances with NGOs; however, the constraints on existing efforts suggest a need for greater investment of human and financial resources and, quite possibly, a greater commitment by key actors to take this work forward.

Management of exploitation

From a legal standpoint, the most significant steps in marine turtle management in Belize came with the 1993 and 2002 revisions to the fisheries regulations for marine turtles. The 1993 revisions were notable in a number of respects: a) complete protection was conferred on Critically Endangered (cf. IUCN) Hawksbill Turtles; b) a maximum size limit was established, thus protecting the adults and large juvenile turtles that are essential for

population maintenance and recovery; and c) the maximum size limit was based on carapace length rather than weight, which is much more workable (and, thus, likely to be adhered to), as it can be performed at sea and enable an undersized animal to be released quickly. The 2002 revisions protect the marine turtle resource fully, with the sole exception of traditional or cultural use (of other than the Hawksbill Turtle) that requires pre-issuance of a permit specifying the species, number, and specific purpose of such use.

The management framework prior to the 2002 revisions of the *Fisheries Regulations* is widely recognized to have been insufficient to prevent declines in marine turtle populations (Craig, 1966; Smith *et al.*, 1992; Craig, 2002; CZMAI, 2002). An additional management shortcoming was that there was little monitoring of the legal fishery—landings were not recorded and monitoring compliance with restrictions was only undertaken “to a limited extent” (CZMAI 2002). Monitoring by the Department of Fisheries at sea and in markets during the closed season (CZMAI, 2002) aimed at deterring illegal exploitation and trade, but no assessments appear to have been made to determine how effective these activities were.

The absence of systematic, continual monitoring of the fishery in the decade up to the 2002 prohibition precludes an assessment of fishery trends based on those statistics and any inference from those trends for trends in marine turtle numbers. In the absence of more comprehensive, systematic and sustained population monitoring, it is, therefore, impossible to judge the full impact of exploitation—or the measures to control that exploitation—on marine turtle populations.

Noteworthy is the observation by Searle (2001) that recent regulatory revisions appear to have significantly reduced the trade in Hawksbill shell products, but have been less effective in eliminating the (now illegal) fishery, as in large part, it would appear, the revisions were not widely known and, thus, respected, owing to inadequate communication of the regulations to fishers and the broader public. With this in mind, and recognizing that adoption of the 2002 revisions of the *Fisheries Regulations* represents a major change in the management regime, the effects of which have yet to be fully evaluated, several concerns should be noted:

1. **Exemption for “traditional or cultural” use.** According to CZMAI (2002), permits for this take are to be issued by the Fisheries Department on the basis of quotas. The scientific basis for the establishment of these quotas—and the degree to which they take into account projected or possible illegal exploitation—should be explicit and available for review. In addition, measures to ensure compliance with the quota system should be clarified.
2. **Detention for personal use of marine turtle articles already in personal possession.** This provision was first made in the *Fisheries Regulations* of 1993. It is not clear, however, to what extent this provision represented a loophole through which illegally acquired marine turtle products were clandestinely sold or stockpiled for sale—legal or illegal—some time in the future. Government enforcement efforts appear to have been effective in reducing illegal trade in Hawksbill products, but further efforts, such as an inventory and registration of articles held by individuals or retail outlets, may be useful in stemming continued trade of these and other marine turtle products in the future.
3. **Resources for enforcement.** Although there is indication of a declining interest in marine turtle consumption in Belize, there appears to be little question that the major shift in the management regime for marine turtles in Belize—from a legal fishery operating a full five months of every year and possibly taking over 300 turtles



Credit: Sea Turtle Conservation Bonaire

Measuring a turtle's straight carapace length at sea.

per year—will require an increase in public education, awareness, and enforcement. The challenges of the country's geography—a long coastline with hundreds of offshore cays and the barrier reef itself—and past shortcomings suggest a need for greater resources for monitoring and enforcement, along the lines below.

- **at sea:** as most marine turtles taken in recent years are thought to have been taken opportunistically, i.e., in the course of fishing for other species, there appears to be a real need to monitor fishing activities at sea and to pursue violations. In addition to detection and prosecution, a system should be established to record violations so as to monitor trends in compliance.
- **on nesting beaches:** increased protection of nesting beaches through patrols during the nesting season would seem to be necessary. For example, Beaton (*in litt.*, to D. Chacón, 24 September 2002) reports that at Manatee Bar there is principally only one person monitoring the six-mile nesting zone. He himself undertakes patrols and volunteers visit on a very limited scale—for a night or two during peak nesting season—but more funding is needed to step up patrols in the area. The co-management arrangements being developed with the Gales Point community at Manatee Bar should take advantage of experiences elsewhere in the region and be expanded to other important nesting sites.
- **in markets:** Chacón's findings (2002) suggest that illegal trade in Hawksbill products in Belize is not extensive and that most vendors know that such trade is illegal. However, it may be advisable to undertake a repeat survey of vendors and retail outlets in the cities surveyed for his study to verify the

findings and to inventory and/or confiscate any remaining Hawksbill items and discern whether any other marine turtle products, particularly from neighbouring countries, are being displayed for sale.

Species research and conservation

Current marine turtle conservation activities in Belize are carried out by individuals, NGOs, government departments, and national and regional networks (Searle, 2001) and, in at least one instance, by a local community. The Belize Sea Turtle Conservation Network is putting more emphasis on the monitoring and surveying of nesting beaches and data are becoming available from satellite-tracking and tagging undertaken through the Fisheries Department and regional agencies and NGOs (CZMAI, 2002).

The Gales Point Turtle Project has operated for several years at Manatee Bar which, as the most important Hawksbill nesting site in the country, has been designated as an Index beach. Through a co-management agreement with the Belize Government, the Gales Point Wildlife Sanctuary Management Committee is overseeing and implementing conservation activities for the area. These include public education and outreach and, since 1988, turtle population monitoring, through annual nest surveys by volunteers from the Gales Point community in collaboration with the Department of Fisheries. In addition to nest counts, volunteers protect nests with cages or move them to higher ground if made too close to the water line. During the 2000 nesting season, 110 nests were recorded (Andrewin, 2001, cited in Searle, 2001). Although this project holds promise for the future of this important area, it faces a number of constraints, including a shortage of human, financial and logistical resources (McSweeney, 2004; CZMAI, 2002); the project is dependent on funds from external sources—only a small amount of funding appears to be available through the Fisheries Department for Manatee Bar (S. Beaton, *in litt.* to D. Chacón, 9 September 2002)—and this has prevented surveys from being conducted on a regular basis. Training, books and publications, education and outreach materials and other support have been provided through NGOs, such as WIDECAS and the Wildlife Conservation Society.

Population monitoring studies aimed at determining long-term marine turtle population trends are now under way through annual nest counts on North Ambergris Cay (Bacalar Chico Marine Reserve on the border with Mexico) and incorporate active nesting beach protection efforts based on internationally accepted standards (Craig, 2002). Because these began only in the 2001 nesting season (Searle, 2001) it will be some time yet before any real trends can be assessed.

Searle (2001) began her research on the status and distribution of marine turtles in Belize in October 2000 through literature reviews, interviews and market surveys. A Save-A-Sea-Turtle programme was launched in 2000 to purchase and release captured turtles (five female Green Turtles were purchased and released in 2000). It has also distributed marine turtle sighting sheets to all resorts and dive shops in an effort to collect more information on nesting and foraging of marine turtles in the country. Searle (*in litt.*, 8 October 2002) has also initiated underwater studies to determine the importance of the Robinson Point area as a foraging area for marine turtles.

Despite these efforts, there is still a need for co-ordinated, countrywide surveys of nesting marine turtles to follow up on those undertaken during the mid- to late-1980s (during preparation of the STRAP) and determine current population trends, and for surveys to be conducted along some coastal areas and offshore cays that have never been investigated.

As part of regional efforts to determine migration patterns of nesting Hawksbill Turtles, the Belize Fisheries Department, in conjunction with the US National Marine Fisheries Service, fitted a satellite transmitter to a Hawksbill Turtle in September 2000 and tracked the animal as it nested at Gales Point and moved towards the Belize–Honduras border.

Habitat conservation

Belize is in the forefront globally in the development and implementation of MPAs. The designation of an area of Half Moon Caye on Lighthouse Reef atoll as a natural monument in 1982 (a portion of which had been protected since 1928 owing to its Red-footed Booby *Sula sula* colony) marked the first time that a marine habitat in Belize had been included in a protected area. Since that time, Belize has continued “to develop one of the world’s most advanced and visionary systems of marine protected areas” including no-take marine reserves, as an essential component of the country’s Coastal Zone Management Strategy; these MPAs aim to fulfill a range of objectives, including tourism management, biodiversity protection and fisheries management (Gibson *et al.*, 2004). An existing network of 13 MPAs, designed to incorporate the range of marine habitats in Belize and conserve overall ecosystem functions, was in place in 2002, when additional legislation was enacted to strengthen this system through the creation of 11 new no-take marine reserves aimed at protecting known spawning aggregations for the threatened Nassau Grouper *Epinephelus striatus* and other reef fish and providing additional protection for the Nassau Grouper during its spawning season (Gibson *et al.*, 2004).

There are currently eight multiple-use marine reserves designated in Belize: Hol Chan, Glover’s Reef, Bacalar Chico, Caye Caulker, South Water Caye, Sapodilla Cays, Port Honduras and Gladden Spit. In addition to these strictly marine sites, several areas that include marine zones have been designated as strictly no-extraction zones and administered by the Forest Department or designated co-managing organizations as: national parks (e.g. Laughing Bird Caye and Bacalar Chico); wildlife sanctuaries (Corozal Bay [Manatee] Sanctuary, Swallow Caye [Manatee] Sanctuary, and the Gales Point/Southern Lagoon Wildlife Sanctuary); natural monuments (Half Moon Caye and Blue Hole); and nature reserves. In some cases, adjacent marine and terrestrial protected areas have been designated and are managed jointly. In 1996, seven of Belize’s MPAs were declared by UNESCO as the Belize Barrier Reef Reserve System World Heritage Site (Gibson *et al.*, 2004).



Credit: WWF-Canon/Anthony B. Rath

Newly hatched Hawksbill Turtles resting in Sargassum. Manatee Lagoon Beach, Belize.

Several marine turtle nesting areas in Belize are included in nature or wildlife reserves (Craig, 2002; Government of Belize, 2001), namely Bacalar Chico Marine Reserve, Sapodilla Cayes Marine Reserve and Half Moon Caye Natural Monument (CZMAI, 2002). Although the Gales Point/Manatee Bar nesting site falls within the Manatee Special Development Area (Smith *et al.*, 2002), it does not lie within the boundaries of the Gales Point (Southern Lagoon) Wildlife Sanctuary (J. Gibson, *in litt.*, 23 October 2004).

Through the work of CZMAI and other agencies, legislation has been put in place to regulate mining, placement of beach stabilization structures, waste disposal, access, design setbacks, marine pollution and other impacts, and a national mooring buoy system has been established (Government of Belize, 2001). These measures are expected to provide additional benefits for marine turtles.

Education and public awareness

Increasing awareness of the status of marine turtles and their conservation requirements was highlighted as a need in the 1992 STRAP and, based on more recent information reviewed here, continues to be a necessary prerequisite for the realization of sustainable management goals. In addition to more active and extensive publicizing of the laws in force in relation to marine turtle exploitation (and other regulated marine resources), Searle (2001) identifies the need for more focused outreach and consultation with the relatively small number of turtle fishers and merchants involved in marketing marine turtle products.

Constraints to marine turtle conservation and management

Craig (2002) and CZMAI (2002) point to a range of issues constraining more effective management and conservation of marine turtles in Belize, namely:

- lack of knowledge of marine turtles, including limited data to enable quotas to be set for take for traditional and cultural purposes;
- limited manpower in the Fisheries Department for monitoring and enforcement;
- lack of trained personnel;
- lack of public support; and
- insufficient funding.

According to CZMAI (2002), shortcomings in management are gradually being addressed, but there remains, in particular, a need for funding and opportunities for additional training.

Summary and recommendations

There have been numerous achievements in marine turtle conservation and management in Belize in recent decades. Most significant is the revision of the fisheries regulations for marine turtles, first in 1993 and subsequently in 2002. The 1993 revisions, in particular those providing for complete protection for Hawksbill Turtles and maximum (vs. minimum) size limits so as to protect the large juveniles and adults that are the most important age classes for marine turtle population maintenance and recovery, stand as an example for other countries in the region with legal turtle fisheries to consider. The narrow exemption for traditional and cultural uses (cf. Article IV of IAC), under a permit and quota system, which was enacted in 2002 in the context of the

absolute protection conferred on marine turtles—if judiciously implemented—may also serve as a viable compromise measure for other countries with long-standing turtling traditions to consider adapting to their own situations. That these measures would serve as an example for other countries would be consistent with Belize’s achievements at a broader level in the field of coastal zone management and MPA development and management.

However, although complete protection of the Hawksbill Turtle appears to have been enforced and largely effectively so, the effectiveness of regulations affecting the legal fishery in the decade up to 2002 appears to have been severely compromised by the lack of sustained outreach to fishers and others about the changes that had been adopted. The shift from a legal to virtually completely illegal fishery through the prohibition adopted in 2002 can only be effective in ensuring the conservation and recovery of marine turtles if the protections are complied with. While vigorous enforcement may be necessary, the first step should be to ensure that these restrictions are widely communicated, through community outreach and other education efforts, with fishers and other consumers of marine turtle products and the broader public. Outreach campaigns should seek to involve stakeholders in meaningful ways, such as through public events, beach clean-ups, sightings and reporting networks, population monitoring, youth activities and entrepreneurial outlets. An additional effort should be made to publicize violations and successful prosecutions, including the penalties levied, so as to deter future violations.

Equally important is the need to expand marine turtle survey and population monitoring efforts, including by using the more intensive Index site monitoring protocols, so as to assess the status of these species in the country, identify trends over time, inform management and conservation efforts, and evaluate mitigation measures. The recommendations set out by Smith *et al.* in the 1992 STRAP should be re-evaluated and implemented in the context of a more co-ordinated nationwide marine turtle conservation programme. The Belize Sea Turtle Conservation Network is making steps in that direction and it is hoped that it will provide the framework for the co-ordination and collaboration that are needed.

As indicated by CZMAI (2002) and evident from the findings of this review, funding and human resources, particularly given the geographical complexities of the country, are a major challenge for the government, NGOs and communities in taking forward marine turtle conservation efforts in Belize. Promising starts, such as the Gales Point Turtle Project and the development of the Belize Sea Turtle Conservation Network, which arose from the country’s involvement in WIDECAST, have been made and those enforcement efforts that have been made appear to have been effective. However, significant funding, in particular from external sources, is necessary and should be made available to develop and expand these activities.

Finally, Belize should move forward expeditiously with the enactment of CITES-implementing legislation so as to establish a strong basis for controlling trade in its wildlife resources. It is hoped that this legislation will provide a legal basis for the registration of wildlife products, such as CITES Appendix-I specimens or nationally protected species that are legally held by private parties but are considered to provide a possible cover for continued illegal exploitation or trade. Without a full inventory and full registration of marine turtle products held at the time of prohibition, the law of possession is “impossible to enforce as it stands” (J. Gibson, *in litt.*, 20 October 2004). These measures would establish a baseline for distinguishing newly acquired, illegal products from those existing from before the 1998 ban and, thus, may assist in efforts to discern the true extent of poaching, as well as to discourage continued poaching activities.

References

- Andrewin, L. (2001). Manatee Bar nesting data. Unpublished report.
- Anon. (2002). CITES Document CoP12 Doc. 28. Working document of the 12th meeting of the Conference of the Parties, Santiago (Chile), 3–15 November 2002. Accessible at www.cites.org. Viewed 12 December 2005.
- Anon. (2004). CITES Document CoP13 Doc. 22 (Rev. 2). Working document of the 13th meeting of the Conference of the Parties, Bangkok (Thailand), 2–14 October 2004. Accessible at www.cites.org. Viewed 12 December 2005.
- Bass, A.L. (1999). Genetic analysis to elucidate the natural history and behavior of hawksbill turtles (*Eretmochelys imbricata*) in the wider Caribbean: a review and re-analysis. *Chelonian Conservation and Biology* 3(2):195–199.
- Chacón, D. (2002). *Diagnóstico sobre el comercio de las tortugas marinas y sus derivados en el istmo centroamericano*. Red Regional para la Conservación de las Tortugas Marinas en Centroamérica (RCA), San José, Costa Rica. 247 pp.
- Craig, A.K. (1996). *Geography of Fishing in British Honduras and Adjacent Coastal Areas*. Louisiana State University Coastal Studies Institute Technical Report 28:1–143. Baton Rouge, Louisiana.
- Craig, D. (2002). Belize Sea Turtle Working Group. Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of the Marine Turtles of the Lesser Antilles, Central America, Colombia and Venezuela. Dated 30 July 2002.
- CZMAI (Coastal Zone Management Authority and Institute). (2002). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of the Marine Turtles of the Lesser Antilles, Central America, Colombia and Venezuela. Completed by Janet Gibson, Director, Coastal Zone Management Institute. Dated 29 July 2002.
- Gibson, J., M. McField, W. Heyman, S. Wells, J. Carter and G. Sedberry. (2004). Belize's Evolving System of Marine Reserves. Pp. 287–315. In: J.A. Sobel and C. Dahlgren (Eds). *Marine Reserves: a Guide to Science, Design and Use*. The Ocean Conservancy. Island Press, Washington, DC.
- Gillett, V. (1987). National Report for Belize. Presented to the Second Western Atlantic Turtle Symposium, 16 October 1987, Mayagüez, Puerto Rico. WATS2 091. 41 pp. Unpublished.
- Government of Belize. (2001). National Report for Belize. Presented to First CITES Wider Caribbean Hawksbill Turtle Dialogue Meeting, Mexico City (Mexico), 15–17 May 2001. 3 pp. Unpublished.
- Groombridge, B. and R. Luxmoore. (1989). *The Green Turtle and Hawksbill (Reptilia: Cheloniidae): World Status, Exploitation and Trade*. Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Lausanne, Switzerland. 601pp
- McSweeney, L., Gales Point Wildlife Sanctuary Management Committee. (2004). Country Report: Belize. Invited oral presentation to the 2004 Annual General Meeting of the Wider Caribbean Sea Turtle Conservation Network (WIDECAST), 22 February 2004, San José, Costa Rica.
- Miller, W.G. (1984). National Report for Belize. Submitted 25 January 1984. Pp. 41–48 In: P. Bacon *et al.* (Eds). *Proceedings of the Western Atlantic Turtle Symposium, 17–22 July 1983, San José, Costa Rica*, III, Appendix 7. University of Miami Press, Florida.
- Milliken, T. and H. Tokunaga. (1987). *The Japanese Sea Turtle Trade 1970–1986*. A special report by TRAFFIC (Japan). Center for Environmental Education, Washington, DC. 171pp.
- Moll, D. (1985). The marine turtles of Belize. *Oryx* 19:155–157.
- Rebel, T.P. (1974). *Sea Turtles and the Turtle Industry of the West Indies, Florida, and the Gulf of Mexico*, revised edn. University of Miami Press, Coral Gables. 250pp.

- Searle, L.A.W. (2001). A Brief History of Sea Turtle Communities, Conservation and Consumption in Belize. Paper presented at the 21st Annual International Symposium on Sea Turtle Biology and Conservation, Philadelphia, USA, February 2001.
- Searle, L.A.W. (2003). Diet of Green Turtles (*Chelonia mydas*) captured in the Robinson Point foraging ground, Belize. Pp. 228–299. In: Seminoff, J.A. (Compiler). *Proceedings of the 22nd Annual Symposium on Sea Turtle Biology and Conservation*. NOAA Technical Memorandum NMFS-SEFSC-503. US Department of Commerce.
- Smith, G.W. (1990). Ground Surveying for Sea Turtle Nesting Sites in Belize, 1990. Report to the Belize Audubon Society, Belize Fisheries Department and US Fish and Wildlife Service (Region 2, Albuquerque). 24pp. Unpublished.
- Smith, G.W., K.L. Eckert and J.P. Gibson. (1992). *WIDECAST Sea Turtle Recovery Action Plan for Belize* (Karen L. Eckert, Ed.). CEP Technical Report No. 18. UNEP Caribbean Environment Programme, Kingston, Jamaica. 86pp.

Costa Rica

Introduction

With a land area of only 51 100 km² and more than 10 times that in territorial waters, Costa Rica is considered to be one of the most biodiverse countries in the world. Its geographic position, with two coasts and a mountain system, provides numerous and varied microclimates that harbour a wide range of species and ecosystems. The 212-km-long Caribbean coast is characterized primarily by high-energy sandy beaches but includes three coralline areas: Isla Uvita, Punta Cahuita, with the largest and best-studied fringing reef, and Puerto Viejo-Punta Mono (MINAE, 2001; Garzón-Ferreira *et al.*, 2002).

Both the Caribbean and Pacific coasts of Costa Rica include a range of habitats that are important for nesting, foraging and migration of marine turtles, and several of the country's marine turtle nesting beaches are of both regional and global importance. On the Caribbean coast, the 35-km beach at Tortuguero hosts the largest surviving nesting population of Green Turtles in the Western Hemisphere and one of the two largest in the world (the other being Raine Island, Australia—Troëng and Rankin, 2005) and it is also the site of a long-term marine turtle monitoring programme, begun in 1955 by Dr Archie Carr and continued under the leadership of the Caribbean Conservation Corporation (CCC). In addition, the Costa Rica/Panama Leatherback rookery is believed to be the fourth-largest worldwide, the others being in French Guiana/Suriname, Trinidad, and Gabon (Troëng *et al.*, 2004).

Costa Rica has a very comprehensive legal framework for the conservation and sustainable use of biodiversity. This has been strengthened through the enactment of a national *Biodiversity Law*, approved in 1998, and a National Strategy for the Conservation and Sustainable Use of Biodiversity that was officially adopted in 1999. In the case of marine turtles, this includes a specific law for the protection, conservation and recovery of populations of marine turtles, which was adopted in 2002, and a new fisheries law, adopted in February 2005 to supersede the previous law that dated from 1948. In addition to complete protection from exploitation and trade, with the important exception of a scientifically based and managed community-based programme involving the collection and marketing of Olive Ridley turtle eggs in the Ostional National Wildlife Refuge on the Pacific coast, marine turtles enjoy protection through an extensive national system of protected areas—the *Sistema Nacional de Areas de Conservación* (SINAC). This includes the principal marine turtle nesting sites in the country and an increasing number of marine reserves.

There is a long history of marine turtle exploitation in Costa Rica, in particular along the Caribbean coast, where the consumption of marine turtles, especially eggs and meat, dates from pre-Columbian times (Lefever, 1992, cited in Troëng and Rankin, 2005). In addition to domestic consumption, this exploitation has for centuries involved the export of turtles and turtle products, including Hawksbill shell, to international markets. Although nesting females and their nests have been completely protected since 1948 and three of the four Caribbean species were protected from all commercial exploitation in 1983, a commercial fishery for Green Turtles, which was regulated through a quota system, continued on the Caribbean coast until 1999. With the closure of that fishery following a judgment by the country's Supreme Court (*Sala Cuarta*), legal exploitation of marine turtles in the Caribbean sector of Costa Rica ceased. Although now largely illegal, exploitation, consumption and commercial use of marine turtles and turtle products persist in Costa Rica. A major advance in efforts to stem this illegal exploitation has been the enactment of the 2002 marine turtle law and the 2005 fisheries law, which, *inter alia*,

set out penalties for marine turtle infractions, including illegal collection of marine turtle eggs and marketing of marine turtle products.

Although a formal analysis has not yet been made, there is no doubt that marine turtle populations of the Costa Rican Caribbean are less abundant now than they were in the past; Palmer (1986), for example, cited reports that at certain sites in the region, boats could not move through the water without colliding with marine turtles. The most significant decline may be that of Hawksbill Turtles, whose occurrence is now “rare” in places (e.g. Manzanillo, Punta Uva, Puerto Viejo, Cahuita) where it was “very abundant”, both nesting and foraging, a century ago (Chacón, 2002b and *in litt.*, 23 June 2005). That said, Costa Rica has long been a leader in research and conservation of marine turtles and these efforts appear to have had, as one of many results, a recent increase in Green Turtle nesting at Tortuguero (Bjorndal *et al.*, 1999). However, concerns have arisen in recent years as to the impact on the Tortuguero nesting population of the renewal of a largely uncontrolled, essentially commercial fishery in Nicaragua of both juvenile and adult Green Turtles. More than 11 000 turtles have been killed per year in this fishery since the mid-1990s, in the absence of any stock assessment (Lagueux, 1998, cited in Campbell, 2003). Although the exact proportion of Tortuguero Green Turtles foraging in Nicaraguan waters is not known, based on many years of research and existing knowledge of other habitats in the Caribbean, the proportion is known to be very high (Bass *et al.*, 1998), thus suggesting that the long-protected Tortuguero nesting colony may be facing a serious threat from over-exploitation by the Nicaraguan Green Turtle fishery (Campbell, 2003) and a disruption of Tortuguero’s eco-tourism-based economy (Troëng and Drews, 2004). Similarly, because Leatherbacks exhibit tendencies to nest in both Costa Rica and neighbouring Panama over the course of a breeding season, the illegal killing of gravid females in Panama has been described as “the most severe terrestrial threat to the population” in Costa Rica (Troëng *et al.*, 2002).

Summary of the status of marine turtles in Costa Rica

Four species of marine turtle occur and nest along the Caribbean coast of Costa Rica in very different abundances: the Green Turtle is the most common, followed by the Leatherback; the Hawksbill Turtle and Loggerhead are the least common of the four species.

Occurrence of marine turtles in Costa Rica

English common name	Scientific name	Occurrence
Loggerhead	<i>Caretta caretta</i>	N, F?
Green Turtle	<i>Chelonia mydas</i>	N, F
Leatherback	<i>Dermochelys coriacea</i>	N
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	N, F
Kemp’s Ridley	<i>Lepidochelys kempii</i>	A
Olive Ridley	<i>Lepidochelys olivacea</i>	A

Key: N=nesting; F= foraging; A=absent

According to Chacón (2002a), the major marine turtle nesting sites along the Caribbean coast have been identified as: Tortuguero, Parismina and Pacuare for Green Turtles; Cahuita and the Gandoca/Manzanillo National Wildlife Refuge for Hawksbill Turtles; Pacuare, Gandoca and Tortuguero for Leatherbacks; and Tortuguero for Loggerheads (maximum of 10 nests per year). The Parque Nacional Cahuita and Gandoca/Manzanillo National Wildlife Refuge are the highest-density foraging areas for Green and Hawksbill Turtles on the Caribbean coast of the country (Chacón, 2002a).

The total number of Hawksbill Turtles nesting along the Caribbean coast is not known but is believed to be very small. Meylan (1999a) reported fewer than 25 Hawksbill nests per year at Tortuguero during the period 1955–1998, based on data from surveys along eight kilometres of the 35-km beach, and cited the assertion of Bjorndal *et al.* (1993) that there had been a continuous decline in nesting numbers at this site from 1956 to 1991.

Bjorndal *et al.* (1999) reported on signs of an increase in the nesting population of Green Turtles at Tortuguero, the second-largest Green Turtle rookery in the world. Troëng and Rankin (2005) estimated a mean of 17 402–37 290 nesting females per year. An assessment undertaken by Dr Cathi Campbell for her doctorate at the University of Florida (Campbell, 2003) suggests that the annual capture of thousands of large juvenile, mostly female (Lagueux, 1998) Green Turtles in Nicaragua, where the majority of the Tortuguero nesting population is known to forage (Bass *et al.*, 1998), is depleting future recruitment into this nesting population, possibly severely.

Troëng *et al.* (2004) estimated that there were 5759–12 893 Leatherback nests along the Caribbean coast from the San Juan River in Costa Rica to Playa Chiriquí in Panama; based on the commonly used average of five nests per female, they estimated the rookery size to comprise 1152–2579 nesting female Leatherbacks per year. An analysis of nine years of nesting data (1995–2003) from the three Index beaches indicated a slight decline in nesting over the period; although the authors concede that this decline could be attributable to inter-annual nesting variation during the relatively short time period for which nesting data are available, they note that experience from Pacific beaches demonstrates that Leatherback declines can be rapid (Eckert and Sarti, 1997; Spotila *et al.* 2000), particularly when human-induced mortality (e.g. collection of eggs, slaughter of nesting females and incidental capture in fisheries) persists, as it does with respect to Caribbean nesting populations of Leatherbacks.

There is a great deal of evidence from flipper-tagging and satellite-tracking programmes, as well as genetic analyses, that the marine turtles nesting in Costa Rica migrate through, forage and breed in various other countries (MINAE, 2001). It is well known, for example, that Green and Hawksbill Turtles travel through Costa Rican waters between the reefs of Bocas del Toro, Panama and the Miskito Cays, Nicaragua. There is a particularly large body of data on international movements of Hawksbill and Green Turtles nesting at Tortuguero. Carr *et al.* (1978) reported on over 1100 international tag returns over the period 1956–1977 from Green Turtles tagged at Tortuguero, which indicated that this nesting population is drawn from turtles that feed throughout the western Caribbean. The great majority of tag recoveries were from Nicaragua (957 of 1110), with more than 10 returns from Colombia (N=45), Panama (N=28), Mexico (N=26), Venezuela (N=25) and Cuba (N=15). According to Bjorndal *et al.* (1985, cited in Meylan, 1999b), post-nesting movements of Tortuguero Hawksbill Turtles show a pattern similar to that of Tortuguero Green Turtles: Hawksbill Turtles tagged at Tortuguero have been recaptured at various sites in Nicaragua, Panama and Honduras. Recent genetic analyses point to nesting female Hawksbill Turtles from Tortuguero foraging in Cuba, Mexico and Puerto Rico (Troëng *et al.*, 2005).

Overview of the legal framework for marine turtle management

Membership in international and regional treaties

Costa Rica is party to most international treaties of direct relevance to the conservation of marine turtles, with the notable exception of the Protocol Concerning Specially Protected Areas and Wildlife (SPA Protocol) of the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, or Cartagena Convention, and the Convention on Migratory Species (CMS). In particular, Costa Rica was one of the first cohort of countries to accede to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and to the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC), the pro-tempore secretariat of which is located in San José. Costa Rica is also party to International Labour Organization Convention N° 169 Concerning Indigenous and Tribal Peoples in Independent Countries.

Membership of Costa Rica in multilateral agreements relating to marine turtles

Convention	Costa Rica
Cartagena Convention	01.08.1991 (A)
Protocol Concerning Specially Protected Areas and Wildlife (SPA)	No
Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region	01.08.1991 (A)
Protocol Concerning Pollution from Land-based Sources and Activities	06.10.1999 (S)
Convention on Biological Diversity (CBD)	26.08.1994 (R)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	28.09.1975 (E)
Convention on Migratory Species (CMS)	No
Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	17.04.2000 (R)
MARPOL 73/78 (Annex I/II)	No
MARPOL 73/78 (Annex III)	No
MARPOL 73/78 (Annex IV)	No
MARPOL 73/78 (Annex V)	No
Convention on Wetlands of International Importance (Ramsar)	27.04.1992 (E)
UN Convention on Law of the Sea (UNCLOS)	21.09.1992 (Ds)
Western Hemisphere Convention	01.12.1967 (R)
World Heritage Convention	23.08.1977 (R)

Key: Date of: Signature (S); Ratification (R); Accession (A); Entry into force (E); Declaration (Ds)

Laws and regulations relating to marine turtles

There is a long history and substantial body of legislation governing the exploitation and conservation of marine turtles in Costa Rica and, it would seem, a similarly sizeable body of analyses of that legislative history. This culminated, in 2002, with the passage by the national legislative assembly of a specific marine turtle law, *Decreto N° 8325 Ley de Protección, Conservación y Recuperación de las Poblaciones de Tortugas Marinas* (Law for the Protection, Conservation and Recovery of Marine Turtle Populations), which was gazetted on 28 November

2002. In addition to providing the basis for the adoption of the necessary measures to guarantee the country's international commitments, most recently with respect to IAC, the law reiterates the obligation for national and foreign shrimp trawls operating within the territorial seas (12-mile limit) or Exclusive Economic Zone (200-mile limit) to deploy turtle excluder devices (TEDs). In addition, it requires that any project that promotes tourism activities in relation to nesting turtles must be authorized by the *Ministerio del Ambiente y Energía* (MINAE – the Ministry for the Environment and Energy) on the basis of technical criteria that ensure that the activities do not compromise marine turtle protection. Finally, the law incorporates articles setting forth the penalties for those who kill, hunt, capture, transport or trade in marine turtles as a prison term of one to three years, and for commercial possession and trade in marine turtle products or “sub-products” as a prison term of three to 24 months, in both instances with forfeiture of all equipment used in committing the infraction. The law nevertheless provides for a specific exemption to this prohibition for collection and marketing of eggs of Olive Ridleys in the Ostional National Wildlife Refuge on the Pacific coast, as regulated by MINAE.

This law closed a major gap in the legal framework for marine turtle conservation in Costa Rica, identified by Jiménez and Monge (2001) to be the lack of penalties for marine turtle infractions. The only piece of legislation that provided for penalties up to that time had been the *Ley de Conservación de Vida Silvestre N° 7317* (Wildlife Conservation Law) which does not apply in the marine environment where a major portion of these infractions occur. As a result, it would appear that the effectiveness of the abundance of marine turtle legislation had been severely undermined by the inadequate basis for implementation and enforcement, above all in relation to the legal and illegal capture of these species.

From 1999 until enactment of the marine turtle law in 2002, the capture, possession or killing of marine turtles intentionally, as well as trade in marine turtle eggs, parts or products, in the Costa Rican Caribbean, was prohibited (MINAE, 2001). The body of marine turtle law on which the new law rests includes the following legislation:

- *Decreto Ley N° 190 Ley de Pesca y Caza Marítimas* (law on marine fishing and hunting) of 28 September 1948 (revised through *Decreto Ley N° 426* of 8 March 1949, *Decreto Ley N° 741* of 4 October 1949, and *Ley N° 2304* of 1 December 1958) prohibited the commercialization of marine turtle eggs and the destruction of marine turtle nests (DGRPA, 1987). According to Groombridge and Luxmoore (1989), this law allowed limited trade in the meat of Green Turtles and prohibited hunting and trade of all other marine turtle species. An amendment to this law in 1987 permitted the commercial use of Olive Ridley eggs (at Ostional on the Pacific coast), in accordance with a management plan with a scientific justification (Chacón and Valerín, 2001). This law has been superseded by a new national fisheries law, the *Ley de Pesca y Acuicultura N° 8436*, which was unanimously approved by the Costa Rican Senate on 10 February 2005 after 10 years of discussion and debate, and entered into effect on 25 April 2005. Article 30 prohibits any exploitation of marine turtles and establishes heavy penalties for violations of the prohibition; it also reiterates the requirement that shrimp fishers use TEDs. The law makes numerous other progressive provisions, including for time and area fishing closures. It also prohibits shark-finning and sets forth fines and gaol terms for those involved in landing shark fins at Costa Rican ports (PRETOMA, 2005.)
- *Decreto Ejecutivo N° 14524-A* of 4 May 1983, of the *Ministerio de Agricultura y Ganadería* (Ministry of Agriculture and Ranching), gazetted on 26 May 1983, established a number of regulations for the exploitation of marine turtles, including those requiring:

- that commercial permits for the capture of marine turtles in the Caribbean would be issued only for waters under Costa Rican jurisdiction;
 - that commercial permits would only be issued for the capture of Green Turtles;
 - that the capture of Green Turtles would only be authorized under the following conditions:
 - by individuals duly authorized by the *Ministerio de Agricultura y Ganadería*
 - during an open season extending from 1 June to 31 August
 - outside Tortuguero and Cahuita National Parks
 - the Minister to issue a maximum of 30 permits per year, each permitting the capture of a maximum of 20 turtles per month, for a total of 1800 per year;
 - that all captured turtles be killed within 12 hours of being landed, in an abattoir duly registered by the *Ministerio de Salud* (Ministry of Health);
 - that each permittee report monthly to the *Oficina de Pesca* in Limón regarding: the zone of capture, number of turtles captured per trip, sex of the animals, date of landing, and the abattoir where the animals were sold; and
 - that the abattoirs authorized for turtles provide weekly government fishing inspectors with the following information: the names and numbers of the identity documents of the persons bringing the turtles in and the number of turtles killed per person.
- *Ley de Conservación de Vida Silvestre N° 7317* of 21 October 1992 and its revisions (*Leyes N° 7495* of 3 May 1995, *N° 7497* of 2 May 1995, and *N° 7788* of 30 April 1998) and implementing regulations, including the *Ley de Biodiversidad N° 7788* of 30 April 1998, listed all species of marine turtle occurring in Costa Rica as threatened with extinction.
 - *Ley de Creación del Instituto Costarricense de Pesca y Acuicultura N° 7384* of 29 March 1994 established the *Instituto Costarricense de Pesca y Acuicultura* (INCOPECA).
 - *MINAE Decreto Ejecutivo N° 26435*, gazetted in December 1997, lists all six marine turtle species occurring in Costa Rica as threatened with extinction.
 - *MINAE Decreto Ejecutivo N° 30364*, gazetted on 15 May 2002, revised the penalties for wildlife violations provided by the wildlife law *N° 7317*.



Credit: Scott A. Eckert/WIDECAST

Green Turtle swimming in Caribbean waters.

The apparent conflict between the wildlife and fisheries legislation and the problems that it gave rise to, prompted, in the late 1990s, a coalition of NGOs to file a formal complaint before the Supreme Court (*Sala Cuarta*) of Costa Rica against INCOPECA, questioning the legal justification for INCOPECA's issuing of permits for the capture of Green Turtles in the Caribbean region of the country. Through *Resolución N° 001250-99* of 19 February 1999, *document N° 98-003689-007-CO-C*, the Supreme Court declared INCOPECA's issue of

permits authorizing the exploitation of Green Turtles unconstitutional, on the basis that insufficient technical and scientific analysis had been undertaken to demonstrate that the level of exploitation would not deplete or significantly impact the species (MINAE, 2001). With this decision, legal exploitation of marine turtles in the Caribbean sector of Costa Rica effectively ceased.

As provided for in the Costa Rican constitution, international treaties and agreements ratified by the Legislative Assembly, from the moment of their publication, take precedence over ordinary law, thus placing them just after the Constitution itself in the legal hierarchy; unless the treaty specifies otherwise, no secondary domestic legislation is required to make them enforceable in the country (Chacón, 2002b). Costa Rica ratified CITES through *Ley N° 5605* on 22 October 1974. The CITES National Legislation Project assessed Costa Rica's legislation as "believed generally to meet the requirements for implementation of CITES" (Anon., 2002a). According to Chacón (2002b), there are as yet no specific procedures in place for the implementation of CITES Resolutions; rather, these must be implemented through existing law or the promulgation of additional regulations.

Protected areas legislation has evolved in Costa Rica since 1955, with the most notable recent developments being the creation of the national system of protected areas (SINAC) in 1995 through MIRENEM (now MINAE) *Decreto Ejecutivo N° 24652* and the 1998 national biodiversity law.

Responsible authorities

MINAE is the primary institution responsible for managing biodiversity in Costa Rica. Within MINAE, SINAC has authority over wildlife (including CITES administration), forest resources, and protected areas. MINAE also has primary authority for marine turtles, but as stipulated in the recent marine turtle law, this is co-ordinated with several other government agencies, most notably INCOPECA. MINAE, SINAC, INCOPECA, the *Ministerio de Seguridad Pública* (Public Security Ministry) and *Servicio Nacional de Guardacostas* (National Coast Guard) all have monitoring and enforcement mandates (Chacón, 2002b). MINAE is responsible for confiscated marine turtles and marine turtle products, while the *Ministerio Público* (judiciary) is responsible for prosecution and imposition of penalties in relation to marine turtle offences (Porras, 2002).

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective

The history of marine turtle exploitation on the Caribbean coast of Costa Rica dates from pre-Columbian times and has evolved over time. In addition to traditional consumption of, primarily, meat, oil, eggs and Hawksbill shell (DGRPA, 1987), exploitation has included the export of turtles and Hawksbill shell and, in the last century, the establishment of processing plants to transform Green Turtles into products for international markets (Chacón, 2002b). Chacón (2002b and *in litt.*, 10 May 2005) notes that towns such as Cahuita, Puerto Viejo and Manzanillo were created centuries ago as bases for turtle hunters who captured turtles and sold carapaces through Bocas del Toro, Panama. Some of this history is presented by Lefever (1992, cited in Troëng and Rankin, 2005), Palmer (1986, cited in Chacón, 2002b) and Parsons (1962).

Rebel (1974) reported that 25 men were engaged in the turtle fishery in Costa Rica in 1948, catching turtles on the beach after they nested between June and September. He cited Carr's (1954) reports on this practice: "to support the export trade in Green Turtles, the beach is rented in sections to contractors, who employ *veladores* among the local people to patrol mile-long strips and turn every turtle who comes up to lay. Periodically, a launch coasts along from Puerto Limón and picks up the accumulated catch. The females are not allowed to lay before being turned, despite the existence of Costa Rican law requiring this, because the delay in waiting the half-hour or more of the laying process would cut down the number of turtles that could be taken at night. All turtles not used locally along the thinly settled shore are carried to Puerto Limón for transshipment." Carr *et al.* (1978, cited in Groombridge and Luxmoore, 1989) estimated that the annual take of Green Turtles along the Caribbean coast was ca. 4000 turtles prior to 1976, the year that turtling for international markets was suspended "indefinitely" and the two turtle processing plants that had been supplying international markets closed.

Campbell (2003) notes that, in the 1960s, three turtle canneries were established along the Caribbean coast of Nicaragua to process juvenile and adult turtles for export, thus prompting Pritchard (1969) to express concerns that the Tortuguero rookery was threatened by exploitation on its main feeding ground in Nicaragua. This threat subsided when the Nicaraguan processing plants were closed in 1976 (Nietschmann, 1979), but the threat has since resurged (see next section).

Troëng *et al.* (2005) note a report in Tressler (1923) that the US consul in Limón estimated in 1923 that ca. 750 Hawksbill Turtles were taken annually in the fishery operating there. Groombridge and Luxmoore (1989) cited the report of Carr *et al.* (1966) in noting that, by the mid-1950s, the advent of plastic substitutes had significantly reduced demand for Hawksbill shell, with the result that Hawksbill Turtles only had commercial value for the small segment of the population that ate them, but that, by the mid-1960s, demand for genuine Hawksbill shell and other products, including polished and mounted specimens for the curio trade, had increased and created incentives for fishers to take Hawksbill Turtles: a single Hawksbill Turtle was worth up to 14 US dollars (USD14) at that time, more than a fisher's normal weekly wages.

The *Dirección General de Recursos Pesqueros y Acuicultura* (DGRPA—the General Directorate of Fisheries and Aquaculture) (DGRPA, 1987) provided the following official estimates of the weight and size of Green Turtles captured in the commercial fishery during the period 1980–1987. These data were collected by the *Departamento de Pesca y Caza Marítimas* (Department of Marine Fishing and Hunting) of the *Ministerio de Agricultura y Ganadería*.

Capture of Green Turtles on the Caribbean coast of Costa Rica

Year	Weight	Number of turtles
1980	57 651 kg	576
1981	69 002 kg	690
1982	175 997 kg	1759
1983	87 738 kg	877
1984	126 016 kg	1260
1985	160 051 kg	1486
1986	188 172 kg	1800
1987	186 108 kg	1537

The figures for 1985 and 1987 are exact numbers; the numbers of turtles for the other years were estimated on the basis of an average weight of 100 kg per turtle. As of 1983, the legal Green Turtle fishery in the Caribbean operated on the basis of a quota of 1800 turtles.

Source: DGRPA, 1987.

The DGRPA (1987) reported that illegal capture of turtles and collection of eggs was known to occur but was not well quantified. Berry (1987), reporting on the results of aerial and ground surveys of Leatherback nesting along the Caribbean coast, estimated “conservatively” that 3867 Leatherback nests had been excavated by humans during 1987. This included nests laid in Tortuguero National Park. At two sites, the rate of nest poaching was recorded as 100%.

Recent (since 1992) exploitation

As of 1983, the only legal exploitation of marine turtles on the Caribbean coast of Costa Rica was the Green Turtle fishery that operated under the 1800 quota until 1999. However, illegal exploitation continued. In 1997, 1500–2000 Green Turtles were estimated to have been taken from the nesting beach at Tortuguero by poachers at a time when the Tortuguero National Park Service lacked the necessary personnel and equipment to enforce the protective legislation (Anon., 1998). Troëng *et al.* (2004) report that illegal collection of Leatherback eggs at the three monitored (i.e. Index) Leatherback beaches declined continuously until 2002 but increased in 2003; however, even with the increase, poaching levels were still down 78% from those reported by Berry (1987)—to 11.5%—on these relatively well-protected beaches.

Currently, the only legal exploitation of marine turtles in Costa Rica is the collection and marketing of Olive Ridley eggs from the Ostional National Wildlife Refuge on the Pacific coast by the community of Ostional, through a conservation plan designed and implemented in collaboration with MINAE and INCOPECA. Members of the Association for Integrated Development Ostional (ADIO) collect an estimated 1% of the eggs laid in each *arribada* (mass nesting). The eggs are packed in plastic bags marked with the Association’s logo and sold nationally, in supermarkets, restaurants and other businesses. Seventy percent (70%) of the profits from the sale of eggs are distributed to members of the Association (218 individuals in 2002) and the other 30% are spent on operating expenses, scientific research, grants for students in the community, environmental education, community events, sports, primary schools and other community activities. During the 2001 season, ADIO reported collecting 20 658 bags of 200 eggs each, from which was derived a total income of USD179 869 for the community. Ostional produces an average of 3000 bags per month (200 eggs each bag), per *arribada*, but the number of *arribadas* over the course of the year varies (ADIO, 2001, cited in Chacón, 2002b).

The most important exploitation pressure on Costa Rican marine turtles occurs outside Costa Rica, in Nicaragua, where the majority of the Tortuguero nesting population of Green Turtles is known to forage. Research undertaken by Dr Cynthia Lagueux for her doctorate at the University of Florida (1998) and with the Wildlife Conservation Society has estimated that current levels of exploitation of Green Turtles in the Caribbean sector of Nicaragua exceed 11 000 large juvenile and adult Green Turtles per year. This level is believed to be higher than levels in previous decades and represents a major resurgence in commercial exploitation from the levels of the 1980s, when the civil war in Nicaragua caused many coastal inhabitants to move away from their villages but to which, since the end of the war in 1990, they have now returned. Although, as of 2005, Green Turtles in the Nicaraguan Caribbean are permitted by law to be captured for subsistence use only (defined as that which is conducted with the sole purpose of obtaining sustenance and direct food for the fisher and his family; see Nicaraguan chapter), this Green Turtle fishery has been largely commercial, thus suggesting that, if it continues unchanged, it contravenes its new subsistence mandate. The only other limitation on the Nicaraguan fishery is a four-month closed season that has been neither respected nor enforced; it does not operate on the basis of any stock assessment. Based on the lack of management of this fishery and her own demographic analysis, Campbell

(2003) has concluded that this fishery is placing at great risk the sub-adult age classes that would otherwise recruit into the Tortuguero nesting population of Green Turtles.

Chacón (2002b) reported on the results of market surveys and site visits undertaken in Costa Rica by the *Red Regional para la Conservación de las Tortugas Marinas en Centroamérica* (RCA—Central American Marine Turtle Conservation Network) in partnership with the Wider Caribbean Sea Turtle Conservation Network (WIDECAST) during the period 2000–2002. These were undertaken in several cities, including Limón on the Caribbean coast, and documented extensive illegal use and marketing of marine turtle products. The results of these surveys are summarized below.

- **Hawksbill shell.** Of 54 establishments found to be selling marine turtle products, 38 offered Hawksbill shell articles, most of them not very elaborate and priced at a level that would render them accessible to local as well as foreign consumers.
- **Products made from oils and fats.** These products are of two types. The first is a cream fabricated in laboratories having registered with the *Ministerio de Salud* and having secured from it permits to manufacture and market the product; this cream is generally sold in pharmacies and health food stores. The second product is homemade cream that can generally be found in markets where herbal and other natural products are sold; this product is common in the province of Limón. Costa Rica was indicated as the country of production for 75% of the creams that were recorded by the market surveys. According to Chacón (*in litt.*, 23 June 2005), in the past, these products were largely derived from the legal Green Turtle fishery; however, any fats now used derive from illegal hunting.
- **Eggs.** In cities close to the Pacific and in the central part of the country, it is not unusual to observe the sale of Olive Ridley eggs. Close to the Caribbean coast, the eggs of Green Turtles and Leatherbacks are sold openly. Hawksbill Turtle eggs are rarely sold in street markets, although they are consumed within households. The surveys recorded eggs being sold in bars, agricultural fairs and markets, particularly in the sections where seafood was sold. Only one establishment showed the documents and bags demonstrating the legal origin of the eggs (from Ostional, on the Pacific coast); another was presumed to have false documentation. More than 500 eggs were found in a single shop in the central market of San José.
- **Meat.** The capture of turtles is concentrated in the Caribbean city of Limón and targets primarily Green Turtles. Although illegal, the meat is sold widely by roaming vendors and in the market from June until October. The clandestine marketing and supply of meat extends south along the Caribbean coast. Because it is illegal, many of the hunters are reported to butcher the turtles in areas removed from public view or at sea; once they arrive at the port they only need to place the meat in freezers or boxes ready for transport and delivery. Results of the surveys indicate that both the authorities and some vendors agree that there is now a lower volume of meat being sold.

Follow-up surveys were undertaken in 2003 at 26 sites across Costa Rica to compare with the findings of those in 2000, 2001 and 2002. The results of these surveys indicate a decline at the national level in the number of shops selling marine turtle products, as well as a decline in the quantity of products on sale. Among the findings was a 70-kg stockpile of Hawksbill scutes presumed to have been accumulated over several years as a source for

manufacture. Information from interviews was that the scutes came from the north coast as well as south of Limón and that some of the animals were hunted in the vicinity of Cahuita National Park (ANAI, 2003).

International trade

Historical perspective

Costa Rica was an important supplier of marine turtles and turtle products to international markets until 1976, when commercial exports were prohibited. Troëng and Rankin (2005) cite a report from 1959 in the Cayman Islands National Archives of many Green Turtles having been imported there from Costa Rica, while Parsons (1962) reported that the best import market for Costa Rican Green Turtles at the time of his writing was Colón, Panama. Rebel (1974) reported that turtles and turtle products were exported principally to the USA, Netherlands and Japan and that an estimated 90% of the Green Turtles and 80% of the Hawksbill Turtles captured were exported.

From 1966 until 1972, Costa Rica exported up to 10 t of turtle products per year to the USA (Wells, 1979, cited in Groombridge and Luxmoore, 1989). CITES trade statistics derived from the UNEP-WCMC CITES Trade Database document significant exports of marine turtle products from Costa Rica in the first few years following the entry into force of the Convention, when most marine turtles were listed in Appendix II (the Caribbean population of the Hawksbill Turtle has been in CITES Appendix I since 1975), including:

- over 27 000 kg of Green Turtle calipee, flippers, trimmings, meat and shell and 2400 litres of Green Turtle oil to the USA and Netherlands in 1976, as reported by Costa Rica;
- over 12 t of Green Turtle soup and meat to the Federal Republic of Germany in 1976, as reported by that country;
- a total of 6500 Green Turtle eggs to Bermuda in 1975, 1976 and 1977 (for the experimental hatchery programme there); and
- 70 live Green Turtles to the USA in 1977.

After the transfer of most remaining marine turtle populations to CITES Appendix I, these large volumes of marine turtle products from Costa Rica were no longer recorded in international trade. Instead, much of the trade in marine turtle products from the country after 1977, as reported to CITES, consisted of scientific specimens, personal specimens, or seizures by the USA of eggs and other items.

Export of marine turtles from Costa Rica

Year	Weight (kg)	Value (USD)
1933	35 232	1741
1934	75 840	3565
1935	70 160	2582
1936	77 450	3030
1937	161 600	9161
1938	108 800	6482
1939	162 893	8578
1940	113 400	3759
1941	176 500	6301
1942	5000	900
1943	20 700	1054
1944	23 840	1561
1945	148 300	7979
1946	126 550	5072
1947	78 600	3790

Source: Rebel, 1974

Japanese Customs statistics on imports of Hawksbill shell into Japan document imports from Costa Rica. During the period 1964–1970, 3062 kg of Hawksbill shell were recorded as having been imported into Japan from Costa Rica (Mack *et al.*, 1979, cited in Garcia, 1987), while an additional 2775 kg were imported from the country during the period 1970–1992 (Milliken and Tokunaga, 1987; H. Kiyono, TRAFFIC East Asia-Japan Office, *in litt.* to TRAFFIC International, 29 July 2002). As indicated in the table below, no imports into Japan of Hawksbill shell from Costa Rica were recorded after 1983.

Japanese imports (kg) of Hawksbill Turtle shell, 1970–1992, from Costa Rica, as recorded in Japanese Customs statistics

Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
	360	189	387	265	175	515	170	260	47	89	0	234
Year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Total
	79	5	0	0	0	0	0	0	0	0	0	2775

Sources: Milliken and Tokunaga, 1987; H. Kiyono, TRAFFIC East Asia-Japan Office, *in litt.* to TRAFFIC International, 29 July 2002.

According to Chacón (2002a), most Hawksbill shell from Costa Rica that entered international trade did so via Bocas del Toro, Panama, such that statistics on imports into Japan of Hawksbill shell from Panama include that from animals taken along Costa Rica’s Caribbean coast.

Recent (since 1992) international trade

CITES trade statistics for 1993–2004, inclusive, document a certain level of international trade in marine turtles from Costa Rica, most of it exports to the USA and much of it illegal. All seizures recorded were reported by the USA and were generally of small quantities, e.g. tens of eggs or a few kilogrammes of meat, but, in 1995, they included two shipments of 589 and 112 eggs, respectively, and another of 100 turtle carapaces and, in 1998, they included a shipment of 490 eggs and one of 43 kg of meat, both of which were recorded as having been commercial shipments that were seized on entry. Most of the trade from Costa Rica recorded by CITES after 1998—still almost all with the USA—has been reported as for scientific purposes and comprised Green Turtle, Leatherback, Hawksbill and Olive Ridley specimens.

Chacón (2002a) indicates that Hawksbill shell continues to be exported illegally to Bocas del Toro, Panama. In addition, although imports of marine turtles are illegal, as much as 50% of the Hawksbill shell confiscated in Costa Rica has been reported as being of Nicaraguan origin. Chacón (2002b) cites the report of Abadía *et al.* (1998) in noting that one popular turtle oil cream produced by Laboratory INFARMA, S.A. is exported to Nicaragua, Panama and Guatemala.

Enforcement issues

There are numerous marine turtle enforcement issues in Costa Rica arising from the fact that marine turtles are almost completely (i.e. with the exception of the Pacific coast Ostional programme) protected by law in the country in the face of persistent pressures from traditional use and cultural and economic practices “fuelled by foreign demand for sea turtle products” (Chacón, 2002b). These issues include: the poaching of eggs and nesting turtles, illegal capture of turtles at sea, and processing of turtles (presumably Green Turtles) in illegal abattoirs along the Caribbean coast, as well as the marketing of illegally collected eggs and meat, and open trade in both Hawksbill shell products and cosmetics made from turtle fats and oils.

MINAE offices undertook several control operations in Costa Rica in 1999 in response to information on the sale of Hawksbill and other turtle products and seized 255 Hawksbill and black coral items (MINAE, 2001). Wo Ching and Castro (1999, cited in Chacón, 2002b) list a number of court cases involving marine turtle offences in Costa Rica. ANAI (2003) report on numerous cases that they monitored involving illegal marketing of marine turtle products, including affidavits and testimony presented to the courts. Also, the MINAE–SINAC archives contain records of reports and confiscations of Hawksbill Turtle products, demonstrating that the personnel of several conservation areas are attentive to this issue (Chacón, 2002b). Chacón (2002b) notes that, despite these efforts and the existence of formal, legal protection for marine turtles and a broad recognition in government, including in the office of the Attorney General, of the importance of marine turtle protection, problems persist, mostly related to institutional capacity and, in particular, insufficient government resources and weak local authorities.

Troëng *et al.* (2004), in reporting on the poaching of Leatherback eggs at the three Index beaches for this species along the Caribbean coast, noted that the harsher penalties for marine turtle offences established through the 2002 marine turtle law had not functioned as a deterrent in the short term, as illegal egg collection increased in 2003. They attributed this to the long lag time (one or more years) between arrests and cases going to trial. Although they noted that at least two court cases in 2003 had resulted in prison sentences for illegal egg collection and that these sentences may serve as a deterrent in the longer term, they cautioned that this would only be the case if egg collectors are arrested, which would necessitate increased enforcement on the nesting beaches.

In addition to more enforcement presence on nesting beaches, market surveys by RCA (Chacón, 2002b) found evidence of a lack of awareness of marine turtle prohibitions and/or the penalties involved. All the establishments that were found selling Hawksbill articles did so openly. Although 27% of the proprietors appeared completely unaware of its illegality, the remaining 73% knew it was illegal but obviously did not consider the risk of a penalty sufficient to deter them from offering these items for sale. These surveys found an overall lack of knowledge regarding the penalties that applied to marine turtle offences. This extended to government agencies: the Puntarenas Municipality (on the Pacific coast), for example, had issued licences to work with and sell Hawksbill shell, even though it was not within their authority to do so.

ANAI (2003) reports on its efforts to engage the *Ministerio de Salud* in improving controls on the production of cosmetics using turtle oil. An investigation requested by the ministry revealed that only two products on the national market were “correctly” registered with it; another two had registrations that referred to another class of cosmetics; and the remainder did not have any type of registration. The director of the office of Management of Registry and Controls in the ministry stated in her report that, “based on the analysis of the revised legislation, it is perceived that legal impediments exist for the registration and sale of products containing in their composition derivatives of sea turtles; therefore, it is suggested that the registration of such products is eliminated, and that registration of new products not be granted”.

Chacón (2002c) notes on this subject that it is very difficult to determine the true nature of the oils used in making turtle creams. Some creams are synthetic and labelled as such, while others are deceptively labelled. He reports (ANAI, 2003) on contacts made with the US Fish and Wildlife Service Forensics Laboratory to see whether a test could be designed to confirm easily and inexpensively that a product has been made from genuine turtle oil, so that this test could be used to provide evidence in court; these discussions are under way (D. Chacón, *in litt.*, 1 June 2005). The Forensic Laboratory of the *Organismo de Investigación Judicial* is currently working on developing the technical tests to certify Hawksbill shell products (D. Chacón, *in litt.*, 10 May 2005).

Chacón (2002b) reports that egg trafficking in Costa Rica is one of the most open and difficult activities to control in Costa Rica. Although some of the trade derives from the egg collection programme at Ostional, which is regulated and monitored by MINAE and INCOPECA, Chacón (2002a) indicates that this legal egg collection provides only “a small part of the national market” and the rest is provided by eggs that have been collected illegally in Costa Rica or illegally imported from another country. These eggs are sold illegally by vendors who are clearly aware of the illegality of the sale (Chacón, 2002b).



Credit: Scott A. Eckert/WIDECAST

A pilot project successfully developed in Costa Rica has established a certification programme. According to the programme, vendors conforming to national legislation prohibiting the sale of marine turtle products are allowed to display a sign such as the one pictured.



Credit: Scott A. Eckert/WIDECAST

This placard, created and distributed by WIDECAST, can be used by vendors to alert consumers that their business (restaurant, boutique, craft market, etc.) does not carry products made from marine turtles. The placard is bilingual (Spanish one side, English the other).

The marketing of marine turtle eggs, creams and cosmetics and Hawksbill shell products has been documented to involve products that have been illegally imported from, or in some instances exported to, neighbouring countries, thus suggesting a need for more effective controls on this trade.

ANAI (2003) provides details of the certification programme that has been developed in Costa Rica by the National Marine Turtle Conservation Network, in partnership with WIDECAST. This programme involves a contract, or voluntary agreement (“*Convenio de Certificación—Salvemos a las tortugas marinas*”), between an individual vendor and the National Network that is sealed by a public notary. This contract commits the vendor not to sell marine turtle products and to accept unannounced visits by representatives of the National Network to verify their adherence to that commitment. In return, the contract permits the use by the vendor of an emblem that reflects the terms of the contract, i.e. that s/he has committed not to sell turtle products. The emblem may be used on their product labels and in local advertising. In addition, a placard with the emblem is placed in a window of the vendor’s establishment, indicating “CERTIFICADO: *Aquí no se venden productos de tortuga marina*” (CERTIFIED: This store does not sell marine turtle products). In cases where the vendor is found to have breached the contract, the certification is rescinded for a full year (a repeat instance of breach of contract removes the vendor from the certification programme indefinitely). As of 2003, 50% of the sites that had previously been identified as selling Hawksbill shell items had signed these contracts.

Although there have been numerous confiscations of marine turtle products in Costa Rica, no information has yet been provided from in-country as to the existence of a government stockpile and whether and how that may be managed. As indicated above, the surveys by RCA unearthed one stockpile of Hawksbill shell in private hands and there appears to be sufficient basis to suspect that others exist in the country. Although the 2002 turtle law stipulates that possession of marine turtle products for commercial purposes is a punishable offence, it does not stipulate how that commercial intent is to be established, a question that may warrant clarification.

There have been at least two national workshops on illegal trade in marine turtle products in Costa Rica that have involved all the key actors on this issue in the country (Chacón, 2002c).

Marine turtle management

Efforts at marine turtle management have been undertaken in Costa Rica over more than a half-century. These include: legal protection of nesting females and marine turtle nests in 1948; the establishment, in 1983, of a quota system, with obligatory reporting, for the capture of Green Turtles on the Caribbean coast; in 1999, the closure of the Green Turtle fishery, which effectively ended all legal exploitation of marine turtles on the Caribbean coast; and, in 2002, the adoption of a single, overarching marine turtle law, which, *inter alia*, establishes specific penalties for marine turtle offences. Numerous other measures have been taken to enhance the management and conservation of marine turtles in the country, including the protection of nesting beaches and some of the marine areas adjacent to those beaches. RCA, organized to co-ordinate Costa Rica’s participation in WIDECAST, is active in supporting and implementing many of these efforts. A national marine turtle recovery action plan following the standardized format used by WIDECAST, in partnership with the United Nations Caribbean Environment Programme, is currently in the drafting stages (Chacón, 2002a).

Management of exploitation

Since the closure of the commercial Green Turtle fishery in 1999, the only legal exploitation of marine turtles in Costa Rica has been the collection and marketing of Olive Ridley eggs by the community living adjacent to the Ostional National Wildlife Refuge on the Pacific coast. ADIO has worked with MINAE and INCOPECA to develop a management plan that enables the community to collect Olive Ridley eggs for marketing in Costa Rica. The collection of eggs is monitored and controlled. This programme is widely considered to be a model “sustainable use” project, i.e. based on sound biological principles that include a negligible impact on wild populations (most of the nests collected are “doomed” to be excavated by subsequent nesting turtles or lost to erosion or other factors) and accruing benefits to the local community (see, for example, Cornelius *et al.*, 1991; Ballesteros *et al.*, 1998; Hope, 2000; Chacón and Valerín, 2000; Troëng and Drews, 2004; and see ostionalcr.tripod.com/espanol/es_archivo.html#informe). There is, however, concern that it creates complications for the control of eggs from illegal sources. As noted above, the eggs from this programme represent only a portion of the eggs on the national market, with the remainder being from illegal sources. This issue notwithstanding, it is clear that the marine turtle management challenge in Costa Rica arises from illegal rather than legal exploitation.



Credit: WWF-Canon/Carlos Drews

A child helps collecting Olive Ridley eggs during the legal harvest by the Ostional community on the Pacific coast of Costa Rica.

Species research and conservation

Numerous NGOs, as well as universities and other academic institutions, have been involved for decades in marine turtle research and conservation in Costa Rica, including ANAI, WIDECAS, CCC, the *Programa Restauración de Tortugas Marinas* (PRETOMA) and many smaller organizations. In addition to *in situ* monitoring and protection efforts, these activities have involved environmental education and the development of alternative livelihoods (Chacón, 2002a).

Marine turtle research and conservation have been under way at Tortuguero since 1955 and, since 1959, have been conducted by CCC. In addition to surveys of nesting activity (since 1971 along 18 km of beach; as of 1986, along the entire 35.6-km beach between the Tortuguero river mouth and Parismina; and, since 1994, along 29.6 km of beach—Troëng and Rankin, 2005), this work has involved tagging of nesting turtles, biometric data collection, determination of nest survivorship and hatching success, physical data collection, collection of human impact data, and fibropapilloma assessment (CCC, 2000). Since the mid-1980s, the programme has involved eco-tourism activities to provide alternative livelihoods for local villagers who otherwise depend on extractive use of these animals (see www.cccturtle.org). In addition to the many hundreds of Green Turtles tagged at Tortuguero, a total of 328 Hawksbill Turtles had been tagged at Tortuguero during the 44-year period 1955–1998 (Meylan, 1999b) and several turtles have been fitted with satellite transmitters (see www.cccturtle.org).

Three Index beaches, monitored using internationally accepted protocols, have been designated for Leatherbacks along the Caribbean coast. Studies of the coastal rookery began in the 1950s, and regular surveys and tagging began in the early 1990s on beaches from northern Costa Rica to northern Panama (Campbell *et al.*, 1996; Chacón, 1999, cited in Troëng *et al.*, 2004). Track surveys for nesting Leatherbacks began at Tortuguero in 1995 (Troëng *et al.*, 2004); at Pacuare, in 1994 (daily nest counts by the Endangered Wildlife Trust —Troëng *et al.*, 2004); and at Gandoca in 1991 (daily nest counts from February to July—Chacón, 1999, cited in Troëng *et al.*, 2004). In addition to nest counts and recording of other parameters, records of illegal egg collection are made in the context of this survey work.

At Gandoca, where the major focus of research is the Leatherback, which nests there in the highest densities, marine turtle research and conservation efforts have been under way since 1986 through the collaboration of ANAI, MINAE, and the local community, through the *Comité de Manejo de Tortugas Marinas en Gandoca* (Chacón *et al.*, 2003). In addition to the nesting surveys initiated in 1991, these activities include flipper-tagging, protection and translocation of nests (from erosion or poaching) and incubation in a hatchery, and monitoring of nest success. An important component of the project is the participation of volunteers and visitors from outside the area, who assist in the various activities; they stay with local families or in guest houses for a small fee and, in this way, generate income for the families and their community. This has also reduced poaching in the area, where egg collection was a major problem. An estimate has been made that if the local economy were based on the collection and sale of marine turtle eggs, that activity would generate USD13 960 in income for the local community, as compared with USD92 300 generated for the local community in 2003 through their involvement in the conservation project (Anon., 2002b; ANAI, 2003).

Habitat conservation

A process was initiated in Costa Rica in the 1970s to protect important natural sites, including marine turtle nesting beaches (MINAE, 2001). As of 2003, 15 protected areas had been established in Costa Rica, among ca. 150 that form SINAC, with a major objective of protecting marine turtles. On the Caribbean coast, three protected areas incorporate both Index nesting beaches for Green and Hawksbill Turtles and Leatherbacks and offshore waters as marine reserves, thereby providing double protection for marine turtles coming to shore to nest there. Management plans for each protected area include measures to protect habitat and nesting activities and control illegal hunting of marine turtles (MINAE, 2001); artisanal fishing is permitted (Garzón-Ferreira *et al.*, 2002). As characterized by DRGPA (1987) and Duarte Marín (2001), these are:

- Tortuguero National Park, established by *Executive Decree N° 1235* in 1970 and by *Ley N° 5680* (Jiménez and Monge, 2001) in 1975 and expanded in 1980, which covers 52 265 ha of marine area and 19 947 ha of land;
- Cahuita National Park, established in 1970 and expanded in 1978, which covers 22 400 ha of marine area and 1068 ha of land; and
- Gandoca-Manzanillo National Wildlife Refuge, established in 1985, which covers 4436 ha of marine area (including 500 ha of coral reef), 15 km of coast, and 5013 ha of land.

Education and public awareness

Countless education and public awareness efforts have been made on behalf of marine turtles in Costa Rica during the past half-century by government agencies, NGOs and other institutions and individuals. It would be impossible to feature all of these programmes, but of particular relevance to efforts to contain illegal trade in marine turtle products are a number of activities undertaken by ANAI and WIDECAS in recent years (ANAI, 2003), which have included:

- production and distribution of 2000 copies of a brochure *Porque es ilegal vender carey?*
- installation, in conjunction with MINAE, SINAC and several NGOs, of two back-lit displays in the San José airport encouraging tourists not to purchase wildlife or wildlife products, including marine turtle products, in Costa Rica;
- design and distribution of 500 posters on the illegality of trading in marine turtle eggs that are not from an approved programme; and



Credit: D. Chacón-WIDECAS/Asoc. ANAI

A colourful light box in San José's international airport, Costa Rica, cautions arriving passengers in English and Spanish, "Don't buy products from species threatened with extinction. It is both unethical and illegal."

- the above-mentioned certification programme whereby vendors agree to contract conditions, including unannounced inspections, that permit them to display an emblem alerting patrons that they do not sell products of endangered marine turtles; within one year, 50% of the sites that had previously been identified as illegally selling Hawksbill shell items had signed these contracts.

Constraints to marine turtle conservation and management

According to Chacón (2002a), there are several constraints to improved management of marine turtles in Costa Rica, including: inadequate resources and commitment in, and insufficient co-ordination amongst, government agencies as regards law enforcement, including on nesting beaches; inadequate financial resources for broader conservation and monitoring efforts; and insufficient resources to support the National Marine Turtle Conservation Network in supporting and sustaining co-ordination between NGOs, universities and government agencies such as MINAE and INCOPECA. Finally, there is a need for a national recovery strategy to set priorities for all aspects of marine turtle conservation and management. Porras (2002) also notes the need for a “change in attitude” amongst public officials towards more vigorous implementation and enforcement of wildlife laws.

A major constraint to Costa Rica’s efforts to conserve the marine turtles that occur within its national territory is clearly the continued exploitation and inadequate management of these animals in neighbouring countries. The loss of 11 000 large juvenile and adult Green Turtles in the Nicaraguan fishery, for example, may be a major threat to the Tortuguero nesting population, a problem that has implications not only for Costa Rica but also for the status of the species at the global level (cf. Seminoff, 2004).

Summary and recommendations

Costa Rica is far more advanced in its marine turtle management than many countries. Actions taken by both government and the private sector provide numerous examples of approaches that may be easily adapted to similar situations in other countries, including establishment of capture quotas and mandatory reporting of marine turtle landings for the legal Green Turtle fishery that operated in the Caribbean until 1999; the scientifically based egg collection programme at Ostional; community-based eco-tourism models (such as at Gandoca); long-term research and population monitoring programmes; volunteer opportunities and training (such as at Tortuguero); marine turtle rescue and rehabilitation efforts (such as at the Marine Park of Puntarenas); the vendor-certification programme implemented through the National Marine Turtle Conservation Network; and a consolidated and comprehensive regulatory framework, among others.

These exemplary achievements notwithstanding, there are still improvements to be made for marine turtle management both within Costa Rica and in neighbouring countries. The following recommendations aim to address these outstanding issues.

1. First and foremost, every effort should be made to institute and implement a scientifically based management plan for the Green Turtle fishery operating in Nicaragua. In recognition of the global significance of inadequate management of this fishery, the Costa Rican Government should act expeditiously to engage the Governments of Nicaragua and Panama in co-ordinating marine turtle management efforts, including by encouraging Nicaragua to sign and implement the *Acuerdo de Cooperación para la Conservación de las*

Tortugas Marinas en la Costa Caribeña de Costa Rica, Nicaragua y Panamá (Acuerdo Tripartito) (the Co-operative Agreement for the Conservation of Sea Turtles of the Caribbean Coast of Costa Rica, Nicaragua, and Panama). In addition and within that context, the Government of Costa Rica should pursue with the Government of Panama collaborative efforts to enhance protection of their shared nesting population of Leatherbacks.

2. In order to reduce effectively the demand for marine turtle products, eggs in particular, which fuels illegal markets and poaching in and outside Costa Rica, a national socio-economic survey should be conducted that documents not only the importance of this resource within the economy and certain sectors of the population but the cultural attitudes that drive its importance. The likelihood of alternatives meeting this demand should also be incorporated into the survey.

Chacón (2002b) identified a number of areas for improvement in the control of illegal exploitation and trade of marine turtles in Costa Rica. These are summarized below.

3. There is a need for an in-depth investigation of the use, including commercial use, of marine turtle eggs in Costa Rica. A large portion of the eggs on the national market are believed to derive from turtles that have not nested at Ostional and are not Olive Ridentles and therefore to be marketed in direct contravention of national law.
4. There is a need for adequate and sustained training for government agencies and personnel responsible for controlling wildlife trade, namely Customs officials, plant and animal health officials and security forces. In addition to training, concise and standardized materials for identification should be provided. Also, while one of the administrative authorities has headquarters near the airport, MINAE has no personnel stationed along the borders specifically to carry out wildlife controls. These are recurring problems throughout Central America.
5. A particular effort should be directed at training and regular provision of information and technical assistance to the judiciary, including lawyers and judges, as well as to the technical personnel and processes that are essential for the successful prosecution of marine turtle offences.
6. As in other countries, it is crucial that the regulations—including the relevant penalties—regarding marine turtle and other wildlife prohibitions are public knowledge. The large tourism industry in Costa Rica should be a target group for education about the regulations for wildlife protection, because foreign visitors often are a ready source of demand for exotic goods that include protected species and their products. Similarly, penalties for wildlife trade offences should be enforced and widely publicized.
7. With the adoption of the 2002 marine turtle law and the 2005 revised fishery law, there is now an adequate legal framework for penalties for marine turtle offences. However, the effectiveness of these will depend on the level of enforcement effort, in particular the capacity to detect illegal activity and to follow through on the arrests that are made.
8. There is a need for better co-ordination between INCOPECSA and MINAE in managing and promoting the recovery of marine turtles. A clarification of their respective spheres of action as well as improved communication would maximize their individual efforts and improve their overall effectiveness.

9. Increased vigilance and control at well-known smuggling points and subsequent investigations and prosecution of documented cases, such as the widespread sale of Hawksbill shell articles, would also discourage illegal trafficking. Additional support should be provided for the efforts of border control authorities and the police to pursue wildlife offences.

ANAI (2003) in their report on efforts to stem the illegal trade in Hawksbill shell products identified the following needs:

10. More effective communication and co-ordination between the ministries responsible for commerce; foreign affairs; health; environment and energy; and domestic affairs and police, in order to close the gaps that enable illegal trade in marine turtle products, such as licences for production and open sale of prohibited items.
11. Sustained financial resources to produce printed materials that can be distributed in ports of entry, tourist and trade zones, with information on illegal wildlife activities and the penalties involved.

Finally, as recommended by Chacón (*in litt.*, 10 May 2005):

12. A national unit should be established to document, investigate, and pursue illegal use and trade of marine turtle products; and
13. A national recovery strategy for marine turtles should be developed as a collaborative effort of all national stakeholders so as to provide a unified plan of action.

References

- Abadía, G., K. Aparicio, M. Araiza, H. Gómez, M. Hidalgo and R. Menacho. (1998). La Problemática de la Tortuga Verde en Limón. Universidad Nacional. Maestría en Conservación y Manejo de Vida Silvestre. Heredia, Costa Rica. 38 pp.
- ADIO (Asociación de Desarrollo Integral de Ostional). (2001). Plan de manejo para el aprovechamiento de la anidación de *L. olivacea* en Playa Ostional, Santa Cruz, Guanacaste, Costa Rica. mimeografiado. 23 pp.
- ANAI. (2003). Assessment of Illegal Hawksbill Trade-II. Informe de Actividades. Report to the National Fish and Wildlife Foundation (2002-0084-008). Asociación ANAI and WIDECAST (*Red para la conservación de las tortugas marinas en el Gran Caribe*). Unpublished.
- Anon. (1998). Poaching threatens green turtle rookery at Tortuguero, Costa. *CEP News* 13(2). UNEP Caribbean Environment Programme (CEP)/Regional Co-ordinating Unit (RCU), Kingston, Jamaica.
- Anon. (2002a). CITES Document CoP12 Doc. 28. Working document of the 12th meeting of the Conference of the Parties, Santiago (Chile), 3–15 November 2002. Accessible at www.cites.org. Viewed 12 December 2005.
- Anon. (2002b). In the middle of the night: sea turtles renew economy in Gandoca. *Costa Rica Outdoors* 7(4):23. July–August 2002.
- Ballester, J., R.M. Arauz and R. Rojas. (2000). Management, conservation and sustained use of olive ridley sea turtle eggs (*Lepidochelys olivacea*) in the Ostional Wildlife Refuge, Costa Rica: an 11-year review. Pp. 4–5. In: Abreu Grobois, F.A., R. Briseño-Dueñas, R. Márquez, and L. Sarti (Compilers). *Proceedings of the 18th International Sea Turtle Symposium*. NOAA Technical Memorandum NMFS-SEFSC-436. US Department of Commerce. Available at: www.nmfs.noaa.gov/pr/species/turtles/symposia.htm

- Bass, A.L., C.J. Lagueux and B.W. Bowen. (1998). Origin of Green Turtles, *Chelonia mydas*, at “sleeping rocks” off the northeast coast of Nicaragua. *Copeia* 1985(4):1064–1069.
- Berry, F. (1987). Aerial and ground surveys of *Dermochelys coriacea* nesting in Caribbean Costa Rica, 1987. Prepared for the Second Western Atlantic Turtle Symposium, 12–16 October 1987, Mayagüez, Puerto Rico. WATS2 056. 33pp + annexes. Unpublished.
- Bjorndal, K.A., A.B. Bolten and C.J. Lagueux. (1993). Decline of the nesting population of hawksbill turtles at Tortuguero, Costa Rica. *Conservation Biology* 7(4):925–927.
- Bjorndal, K.A., A. Carr, A.B. Meylan, J.A. Mortimer. (1985). Reproductive biology of the hawksbill *Eretmochelys imbricata* at Tortuguero, Costa Rica, with notes on the ecology of the species in the Caribbean. *Biological Conservation* 34:353–368.
- Bjorndal, K.A., J.A. Wetherall, A.B. Bolten and J.A. Mortimer. (1999). Twenty-six years of green turtle nesting at Tortuguero, Costa Rica: an encouraging trend. *Conservation Biology* 13(1):126–134.
- Campbell, C.L. (2003). Population assessment and management needs of a Green Turtle, *Chelonia mydas*, population in the western Caribbean. Ph.D. dissertation, University of Florida. 124 pp. Unpublished.
- Campbell, C.L., C.J. Lagueux and J.A. Mortimer. (1996). Leatherback turtle, *Dermochelys coriacea*, nesting at Tortuguero, Costa Rica, in 1995. *Chelonian Conservation Biology* 2:169–172.
- Carr, A. (1954). The zoogeography and migrations of sea turtles. *Yearbook of the American Philosophical Society*:138–140.
- Carr, A. (1969). Survival outlook of the West-Caribbean Green Turtle colony. Pp. 13–16 In: *Marine Turtles*. IUCN New Publication Series Supplement Paper No. 20.
- Carr, A. (1970). Green sea turtles in peril. *National Parks and Conservation Association Magazine* 44(271):19–24.
- Carr, A.F., H. Hirth and L. Ogren. (1966). The ecology and migrations of sea turtles, 6. The Hawksbill turtle in the Caribbean Sea. *American Museum Novitates* 2248: 1–29.
- Carr, A.F., M.H. Carr and A.B. Meylan. (1978). The ecology and migrations of sea turtles, 7. The west Caribbean Green Turtle colony. *Bulletin of the American Museum of Natural History* 162(1):1–46.
- CCC (Caribbean Conservation Corporation). (2000). Protocol for the CCC Green Turtle program at Tortuguero, June 2000. John H. Phipps Biological Field Station, Tortuguero, Costa Rica. 12 pp. Unpublished.
- Chacón, D. (1999). Anidación de la tortuga *Dermochelys coriacea* (Testudines:Dermochelyidae) en playa Gandoca, Costa Rica (1990 a 1997). *Revista de Biología Tropical* 47:225–236.
- Chacón, D. (2002a). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of the Marine Turtles of the Lesser Antilles, Central America, Colombia and Venezuela. Dated 10 September 2002.
- Chacón, D. (2002b). *Diagnóstico sobre el comercio de las tortugas marinas y sus derivados en el istmo centroamericano*. Red Regional para la Conservación de las Tortugas Marinas en Centroamérica (RCA), San José, Costa Rica. 247 pp.
- Chacón, D. (2002c). Combatiendo el comercio ilegal de productos de tortuga marina en Costa Rica. Informe presentado al NFWF. Asociación ANAI, San José, Costa Rica. Unpublished. 45 pp.
- Chacón, D., J. Machado H., W. Quirós and L. Chaparro. (2003). Proyecto de conservación de tortugas marinas, Talamanca, Caribe Sur, Costa Rica. Anidación de *Dermochelys coriacea* en Playa Gandoca. Informe Temporada 2003. Asociación ANAI, MINAE, WIDECAS. 68 pp. + annexes.
- Chacón, D. and N. Valerín. (2001). Intercambio de experiencias para el manejo de las tortugas marinas en Centroamérica. Caso para estudio Playa Ostional. Red Regional para la Conservación de las Tortugas Marinas en Centroamérica. 17 pp.

- Cornelius, S.E., M. Alvarado, J.C. Castro, M. Mata del Valle and D.G. Robinson. (1991). Management of Olive Ridley sea turtles (*Lepidochelys olivacea*) nesting at Playas Nancite and Ostional, Costa Rica. Pp. 111–135 In: J.G. Robinson and K.H. Redford (Eds). *Neotropical Wildlife Use and Conservation*. University of Chicago Press, Chicago.
- DGRPA (Dirección General de Recursos Pesqueros y Acuicultura, Ministerio de Agricultura y Ganadería). (1987). Situación de las tortugas marinas en el litoral Atlántico de Costa Rica. Informe presentado ante el II Simposio sobre las Tortugas del Atlántico Occidental (WATS II), Mayagüez, Puerto Rico, Octubre 1987. 15 pp. Unpublished.
- Duarte Marín, A. (2001). Costa Rica: Areas protegidas para conocer, salvar, y usar la biodiversidad. Actas de las I Jornadas sobre Reservas Marinas y I Reunión de la Red Iberoamericana de Reservas Marinas (RIRM), Cabo de Gata, Almería, 17–23 de septiembre de 2001. www.mapya.es/rmarinas/index_rirm.htm
- Eckert, S. A. and L. Sarti M. (1997). Distant fisheries implicated in the loss of the world's largest Leatherback nesting population. *Marine Turtle Newsletter* 78:2–7.
- García, F.A. (1987). National Report for Panamá. 12 October 1987. Prepared for the Second Western Atlantic Turtle Symposium, 12–16 October 1987, Mayagüez, Puerto Rico. WATS2 066. 8pp + annexes. Unpublished.
- Garzón-Ferreira, J., J. Cortés, A. Croquer, H. Gúzman, Z. Leao and A. Rodríguez-Ramírez. (2002). Status of coral reefs in southern tropical America in 2000–2002: Brazil, Colombia, Costa Rica, Panama and Venezuela. Pp. 343–356. In: C. Wilkinson (Ed.). *Status of Coral Reefs of the World: 2002*. Global Coral Reef Monitoring Network. Australian Institute of Marine Science, Townsville, Australia.
- Groombridge, B. and R. Luxmoore. (1989). *The Green Turtle and Hawksbill (Reptilia: Cheloniidae): World Status, Exploitation and Trade*. Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Lausanne, Switzerland. 601 pp.
- Hope, R. (2000). Egg harvesting of Olive Ridley marine turtle (*Lepidochelys olivacea*) along the Pacific coast of Costa Rica: an arribada sustainability analysis. MA dissertation thesis, Faculty of Economic and Social Studies, University of Manchester, U.K. Unpublished.
- Jiménez G., G. and K. Monge A. (2001). Protección y conservación de las tortugas marinas a la luz del derecho internacional y nacional ambiental. Análisis de casos en Costa Rica. Tesis de grado para optar por el título de Licenciadas en Derecho, Universidad de Costa Rica, Facultad de Derecho, San José. 315pp. Unpublished. comunidad.derecho.org/aulavirtual/tortugas.html
- Lagueux, C. (1998). The marine turtle fishery of Caribbean Nicaragua: human use patterns and harvest trends. Ph.D dissertation, University of Florida. Unpublished.
- Lefever, H.G. (1992). *Turtle Bogue, Afro-Caribbean Life and Culture in a Costa Rican Village*. Susquehanna University Press, Selinsgrove. 249 pp.
- Mack, D., N. Duplaix and S. Wells. (1979). The Sea Turtle: an Animal of Divisible Parts. International Trade in Sea Turtle Products. TRAFFIC (USA). Prepared for the International Conference on Sea Turtle Conservation, 26–30 November 1979, Washington, DC. 84 pp. Unpublished.
- Meylan, A.B. (1999a). Status of the hawksbill turtle (*Eretmochelys imbricata*) in the Caribbean region. *Chelonian Conservation and Biology* 3(2):177–184.
- Meylan, A.B. (1999b). International movements of immature and adult Hawksbill turtles (*Eretmochelys imbricata*) in the Caribbean region. *Chelonian Conservation and Biology* 3(2):18–194.
- Milliken, T. and H. Tokunaga. (1987). *The Japanese Sea Turtle Trade 1970–1986*. A special report prepared by TRAFFIC (Japan). Center for Environmental Education, Washington, DC. 171 pp.

- MINAE (Ministerio del Ambiente y Energía). (2001). Informe Nacional. Primer Reunión de Diálogo de los Estados de Distribución de la Carey en el Gran Caribe. Preparado por la Autoridad Nacional CITES, Sistema Nacional de Areas de Conservación, Abril 2001. 16 pp. Unpublished.
- Nietschmann, B. (1979). *Caribbean Edge: the Coming of Modern Times to Isolated People and Wildlife*. The Bobbs-Merrill Company, Inc., Indianapolis, Indiana. 280 pp.
- Palmer, P. (1986). *“Wa happen man”: la Historia de la Costa Talamaqueña de Costa Rica, Según sus Protagonistas*. San José, Instituto del Libro. 402 pp.
- Parsons, J. (1962). *The Green Turtle and Man*. University of Florida Press, Gainesville. 121 pp.
- Porras, O. (Asesor Legal, Ministerio del Ambiente y Energía—MINAE). (2002). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of the Marine Turtles of the Lesser Antilles, Central America, Colombia and Venezuela. Dated 9 September 2002.
- PRETOMA (Programa Restauración de Tortugas Marinas). (2005). Costa Rica passes long awaited fisheries law. 16 February 2005 Press release. San José, Costa Rica.
- Pritchard, P.C.H. (1969). Summary of world sea turtle survival situation. Pp. 90–91 In: *Marine Turtles. Proceedings of the Working Meeting of Marine Turtle Specialists organized by IUCN at Morges, Switzerland, 10–13 March 1969*. International Survival Service Commission Marine Turtle Specialist Group. IUCN Supplementary Paper No. 20. IUCN Survival Service Commission, Morges, Switzerland.
- Rebel, T.P. (1974). *Sea Turtles and the Turtle Industry of the West Indies, Florida, and the Gulf of Mexico*, revised edn. University of Miami Press, Coral Gables. 250 pp.
- Seminoff, J.A. (2004). *Red List Assessment of the Green Sea Turtle (Chelonia mydas) using the 2001 Red List Criteria*. IUCN-SSC Marine Turtle Specialist Group. 34 pp. www.iucn-mtsg.org/red_list/cm/MTSG_Chelonia_mydas_Assessment_April-2004.pdf.
- Spotila, J.R., R.D. Reina, A.C. Steyermark, P.T. Plotkin and F.V. Paladino. (2000). Pacific Leatherback turtles face extinction. *Nature* 405:529–530.
- Tressler, D. (1923). *The Marine Products of Commerce*. The Chemical Catalog Company, Inc., New York. 598 pp.
- Troëng, S., D. Chacón and B. Dick. (2002). The Leatherback Turtle *Dermochelys coriacea* Nesting Population of Caribbean Central America, with an Emphasis on Costa Rica. Prepared by the Caribbean Conservation Corporation, Asociación ANAI and Endangered Wildlife Trust for the IUCN Leatherback Task Force. 8 pp. Unpublished.
- Troëng, S., D. Chacón and B. Dick. (2004). Possible decline in leatherback turtle *Dermochelys coriacea* nesting along the coast of Caribbean Central America. *Oryx* 38(4):395–403.
- Troëng, S. and C. Drews. (2004). *Money Talks: Economic Aspects of Marine Turtle Use and Conservation*. WWF-International, Gland, Switzerland. 62 pp. www.panda.org/downloads/species/moneytalks.pdf
- Troëng, S., P.H. Dutton and D. Evans. (2005). Migration of hawksbill turtles *Eretmochelys imbricata* from Tortuguero, Costa Rica. *Ecography* 28(3):394–402.
- Troëng, S. and E. Rankin. (2005). Long-term conservation efforts contribute to positive Green Turtle *Chelonia mydas* nesting trend at Tortuguero, Costa Rica. *Biological Conservation* 121:111–116.
- Wells, S.M. (1979). International Trade in Marine Turtle Products. IUCN unpublished report.
- Wo Ching, E. and R. Castro. (1999). Caza ilegal y furtiva de tortugas marinas en Costa Rica: monitoreo de expedientes penales y administrativos. CEDARENA and AIDA, Costa Rica. 29 pp. Unpublished.

Republic of Guatemala

Introduction

The 148 km Caribbean coastline of Guatemala is composed primarily of the Punta de Manabique, or Manabique Peninsula, and the Amatique Bay. The Peninsula, reaching north-west from the Río Motagua, the border with Honduras, incorporates 150 000 acres of beaches, lagoons, estuaries, marshes, mangrove forests, and tropical rainforests. It is accessible only by boat, with the human population concentrated in seven small waterfront communities. In 1987, in recognition of the area's ecological value for marine turtles, iguanas and crocodiles, all of which lay their eggs on the narrow beach of the outer shore of the Peninsula, national authorities, with support from the *Asociación Española de Cooperación Internacional* (Spanish Association of International Cooperation), established the 12-km San Francisco del Mar Reserve at Jaloa, mid-way along the Peninsula (Katz, 2001).

Marine turtles have been protected to some degree in Guatemala since 1932 and, since 1971, have been completely protected, with the important exception of marine turtle eggs. The first national report on marine turtle conservation in Guatemala (Muccio, 1998) identified collection/poaching of eggs and incidental mortality in commercial fishing operations as by far the most serious threats to the survival of marine turtles in Guatemala and noted that, although no conclusive research had been done on the subject, it was "almost certain" that nearly all eggs laid by marine turtles on Guatemalan shores are collected for human consumption.



Credit: Didier Chacón/ANAI

Marine turtle eggs on sale in Port of San José, Guatemala. Collection of such eggs in Guatemala may affect every marine turtle nest that is laid in the country.

The history of marine turtle conservation in Guatemala is almost entirely based on marine turtle hatcheries—which incubate eggs that are donated by or, in some instances, purchased from egg collectors—and release the hatchlings. Despite this enterprise having been in operation since 1971, there has been little research carried out on marine turtles and only recently has research ventured into investigations of the status of wild populations (Muccio, 1998; C. Muccio, ARCAS—Asociación de Rescate y Conservación de Vida Silvestre, *in litt.*, 5 May 2005).

A National Strategy for the Management and Conservation of Marine Turtles in Guatemala has been developed through the collaboration of several government institutions, including the *Consejo Nacional de Areas Protegidas* (CONAP—the National Protected Areas Council) and *Unidad de Manejo de la Pesca y Acuicultura* (UNIPESCA—the Fishing and Aquaculture Management Unit) of the *Ministerio de Agricultura, Ganadería y Alimentación* (MAGA—the Ministry of Agriculture, Ranching and Food), in consultation with numerous stakeholders (Sánchez Castañeda *et al.*, 2002). A first stage in this process was an assessment of marine turtle management and conservation in the country, which identified numerous problems, including the lack of information on the status of marine turtles and their critical habitats in the country; limited capacity for research, conservation and management; a lack of clear rules governing the use, management and conservation of marine turtles; limited personnel and financial and logistical resources to monitor compliance and enforce those rules; and the lack of studies evaluating the economic value of marine turtles. Regarding the problem of uncontrolled collection of marine turtle eggs, the National Strategy identifies numerous problems with the legal framework and the system of turtle hatcheries in the country, including the lack of integrated management and of feasibility studies for the protection of nesting beaches as an alternative conservation strategy. In addition to an action plan aimed at addressing these shortcomings, the National Strategy proposes a specific law governing the management and conservation of marine turtles (*Reglamento sobre manejo y conservación de tortugas marinas*).

Although the National Strategy focuses most on the collection and sale of marine turtle eggs and on the operation of turtle hatcheries, Chacón's report (2002) on the results of market surveys and other site visits in Guatemala provides evidence of other forms of marine turtle exploitation and use in the country, including the sale of marine turtle eggs and possibly other products from other Central American countries in violation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). These problems, as well as the continued collection and marketing of eggs of Leatherback and Hawksbill Turtles, both classified by IUCN as Critically Endangered, suggest a need for an expanded set of management measures beyond those proposed in the National Strategy.

The National Biodiversity Strategy and Action Plan for Guatemala (CONAMA, 1999) identifies six fundamental problems that place the country's biodiversity at risk, including: weakness in the law and other institutions; gaps in and lack of clarity and/or uncertainty regarding the laws governing property and the use of land and natural resources and in the understanding of these; lack of knowledge and information adequate for biodiversity management; and, finally, heavy pressure on biodiversity resulting from extreme poverty, human population growth and the insecurity of land tenure. Among the many objectives set out in the Plan are building the capacity of artisanal fishers to use aquatic resources sustainably, organize themselves and enhance economic returns, and clarifying, formalizing and strengthening the rules governing the use of biodiversity, including aquatic resources.

Summary of the status of marine turtles in Guatemala

Four marine turtle species occur along the Caribbean coast of Guatemala: the Loggerhead, Green Turtle, Leatherback and Hawksbill Turtle. Carr *et al.* (1982) reported nesting by all four of these species along the 50-km stretch from Punta de Manabique (Cabo de Tres Puntas) to the Río Montagua and considered the Hawksbill Turtle to be the most common nesting species and the Green Turtle the least common. Rosales-Loessener (1987) indicated that a 16 km²-area of *Thalassia* grass, which grows seasonally (from May to December) at the entrance of the Bahía la Graciosa, was a recognized foraging area for Green Turtles and Loggerheads.

Occurrence of marine turtles in Guatemala

English common name	Scientific name	Occurrence
Loggerhead	<i>Caretta caretta</i>	N, F
Green Turtle	<i>Chelonia mydas</i>	N, F
Leatherback	<i>Dermochelys coriacea</i>	N
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	N, F?
Kemp's Ridley	<i>Lepidochelys kempii</i>	A
Olive Ridley	<i>Lepidochelys olivacea</i>	A

Key: N=nesting; F= foraging; A=absent

Rosales-Loessener (1987) reported that marine turtle nesting occurred more or less throughout the year, with Hawksbill Turtles and Loggerheads nesting during the latter half of the year (with the exception of December) and Leatherbacks nesting during the early months of the year (February through March). Based on surveys over an area of 10 km, Rosales-Loessener (1987) extrapolated the annual number of nests over the 50-km stretch of coast at: 380–760 Hawksbill nests (representing ca. 70–150 females), 45–90 Loggerhead and 25–50 Leatherback nests. Ninety Hawksbill nests were reported on the Manabique Peninsula in 2000, in addition to one Leatherback and one Green Turtle nest (Katz, 2000).

Carr *et al.* (1982) reported that at least three Green Turtles tagged at the nesting beach of Tortuguero (Costa Rica) had been recovered in Guatemalan waters. A Green Turtle tagged in Quintana Roo (Mexico) in the mid-1990s nested on the Manabique Peninsula in 2000 (Katz, 2000).



Credit: WWF-Canon/Isaac Vega

The Loggerhead both forages and nests along the coast of Guatemala. The broad head and massive shell are characteristic of the species.

Overview of the legal framework for marine turtle management

Membership in international and regional treaties

Guatemala participates in most international environmental agreements relating to marine turtles, including the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, or Cartagena Convention, and its Protocol Concerning Specially Protected Areas and Wildlife (SPAW Protocol). In addition, Guatemala is party to the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC). Guatemala has also ratified International Labour Organization Convention N° 169 Concerning Indigenous and Tribal Peoples in Independent Countries, which, *inter alia*, protects and regulates the rights of the peoples concerned to use the natural resources in the areas in which they live.

Membership of Guatemala in multilateral agreements relating to marine turtles

Convention	Guatemala
Cartagena Convention	18.12.1989 (R)
Protocol Concerning Specially Protected Areas and Wildlife (SPAW)	18.01.1990 (S)
Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region	18.12.1989 (R)
Protocol Concerning Pollution from Land-based Sources and Activities	No
Convention on Biological Diversity (CBD)	10.07.1995 (R)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	05.02.1980 (E)
Convention on Migratory Species (CMS)	No
Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	15.08.2003 (E)
MARPOL 73/78 (Annex I/II)	03.02.1998 (A)
MARPOL 73/78 (Annex III)	03.02.1998 (A)
MARPOL 73/78 (Annex IV)	03.02.1998 (A)
MARPOL 73/78 (Annex V)	03.02.1998 (A)
Convention on Wetlands of International Importance (Ramsar)	26.10.1990 (E)
UN Convention on Law of the Sea (UNCLOS)	11.02.1997 (Ds)
Western Hemisphere Convention	14/08/1941 (R)
World Heritage Convention	16.01.1979 (R)

Key: Date of: Signature (S); Ratification (R); Accession (A); Declaration of succession (Ds); Entry into force (E)

Laws and regulations relating to marine turtles

The exploitation and use of marine turtles and their products in Guatemala have been regulated through a large number of different types of legal instruments that have been adopted over a period of more than 70 years. This large body of law, fragmented in its evolution, is at once confused and confusing and, not surprisingly, subject to different interpretations (e.g. Herrera de Noack, 1997; Sánchez Castañeda *et al.*, 2002); it also assigns statutory authorities to different government agencies. Although there appears to be consensus that marine turtles are currently protected by law, there appears to be disagreement as to whether marine turtle eggs are protected by law and, thus, whether the pervasive, virtually ubiquitous, collection and marketing of eggs, some of it permitted

through an informal government system that requires a “conservation quota” to be deposited in marine turtle hatcheries, is fundamentally illegal. The national marine turtle strategy (Sánchez Castañeda *et al.*, 2002) is emphatic that marine turtle eggs are not covered by prevailing laws that afford complete protection for marine turtles. Herrera de Noack (1997), however, notes that the *Ley de Caza Decreto 8-70* (which has since been revised) protects the nests of all animals that are not considered dangerous or nuisances, while the protected area legislation would appear to require a permit for any use of marine turtles, in the light of their inclusion on Guatemala’s national *Lista Roja de Fauna* (List of Wild Animal Species Threatened with Extinction).

The general fishing law *Ley de Pesca Decreto Gubernativo N° 1235* of 18 January 1932 set out the first regulations affecting marine turtles in Guatemala (Chacón, 2002). In addition to regulating aquaculture and fishing, the law included various articles pertaining to marine turtles and their derivatives, among which: established size limits and hunting seasons, as well as permissible uses; prohibited stalking and capture at all times of female turtles coming to shore to nest; and a three-year moratorium on the capture, sale and consumption of marine turtle eggs on the Atlantic (Caribbean) coast. Another part of the law included a requirement that municipalities establish in their jurisdictions hatcheries for aquatic wildlife species. This law was repealed by the *Ley General de Pesca y Acuicultura Decreto N° 80-2002* of 17 December 2002 (see www.congreso.gob.gt), which entered into effect on 1 January 2003. This law specifically prohibits the capture or fishing for marine turtles and other species declared as threatened with extinction and establishes penalties for first, second and third violations of this prohibition, which include a monetary fine, confiscation of the catch and equipment and, ultimately, suspension of a fishing licence.

The (unnumbered) *Acuerdo Gubernativo* of 17 February 1981 prohibited the capture, transport, and commercial use of all species of marine turtle that live and reproduce in Guatemala and promoted the establishment of turtle hatcheries in different sites of the country, for the purpose of fostering the reproduction of different marine turtle species (Sánchez Castañeda *et al.*, 2002). Herrera de Noack (1997) raised the question of the applicability of this law in relation to subsistence use of marine turtles.

In addition, marine turtles are protected in Guatemala under the protected areas legislation, *Decreto N° 110-96 Reformas a la Ley de Areas Protegidas* of 1996, which revised the 1989 law *Decreto N° 0004-89 Ley de Areas Protegidas*. This law provides for CONAP to draw up, on an annual basis, a list of native species that are threatened with extinction and establishes various proscriptions in relation to such species, including prohibiting of collection, capture, hunting, fishing, transport, exchange, trade or export of species listed as “endangered”, except for reasons of rescue or safeguarding the species, and forbidding use of products of species listed under the law without CONAP’s authorization. In addition, this law provides for a prison sentence of five to 10 years, a fine of 10–20 000 quetzals (GTQ10–20 000) and confiscation by CONAP of the wildlife products involved in cases of illegal transport, exchange, sale or export of live or dead specimens and parts or derivatives of threatened species listed by it. The CONAP resolutions that determine native wildlife species approved for inclusion in the national Red List assign all marine turtle species that visit the coasts of the country to Category 3, defined as “including those species that are threatened by exploitation or loss of habitats but whose population status permits regulated use and exploitation, and regional endemics. Their use is restricted to scientific use, regulated trade, controlled hunting, and commercial breeding to the second-generation” (CONAP, 2001d). This category is indicated by CONAP as corresponding to the IUCN Categories Vulnerable, Rare and Commercially Threatened (which have been superseded by the IUCN Red List Categories and Criteria adopted by IUCN in 1994 and revised in 2000, under which all Caribbean marine turtle species are listed as Critically Endangered or Endangered).

The protected areas law provides for the development of a national system of protected areas (*Sistema Guatemalteco de Áreas Protegidas*—SIGAP) to comprise areas designated to be protected by the State through legal measures that regulate the use of the land and the resources in the area. These may be government lands to be dedicated preferentially to conservation or private property (CONAMA, 1999).

Finally, the *Acuerdo Ministerial N° 039-96* of MAGA requires the use of turtle excluder devices (TEDs) by all boats licensed to trawl for shrimps, with penalties including fines and confiscation of the catch, gear and boat. CONAP *Resolución N° ALC/048-2000 Regulaciones para al Aprovechamiento de Especies Cinegéticas* prohibits the hunting of marine turtles. CONAP *Resolución N° ALC/001-2001* formalizes the operational basis for the *Grupo Asesor de Tortugas Marinas* (GATM—the Marine Turtle Advisory Group of Guatemala).

The Guatemalan Congress ratified CITES by means of *Decreto N° 63-79*, which was gazetted on 14 March 1980. In accordance with the country's legal system, international treaties enjoy the same legal standing as domestic law, at least with respect to environmental issues and apply automatically, requiring only the issuance of certain regulations to enforce their provisions. The provisions of CITES are, thus, immediately applicable. The CITES National Legislation Project assessed Guatemala's legislation as "believed generally to meet the requirements for implementation of CITES" (Anon., 2002). A two-year project undertaken by the *Instituto de Derecho Ambiental y Desarrollo Sustentable* (Institute of Environmental Law and Sustainable Development) in 1999–2001, with funding through the *Programa Ambiental Regional para Centroamérica* (Regional Environment Programme for Central America), completed a number of activities aimed at strengthening CITES implementation in Guatemala. These included revision of several regulations relating to the control of wildlife trade, capacity-building of Customs and other agencies responsible for controlling wildlife trade, and reprinting of the *Manual para la Protección de Especies CITES de Flora y Fauna Silvestre de Guatemala* (Manual for the Protection of Guatemalan CITES Species of Flora and Fauna) (Melini *et al.*, 2000; Vásquez Paz, 2001).

Responsible authorities

The *Dirección Técnica de Pesca y Acuicultura* (DITEPESCA—the Technical Directorate of Fishing and Aquaculture) of MAGA has historically been the government agency responsible for marine turtles and was so when Rosales-Loessener conducted his research (Rosales-Loessener, 1987). With the adoption of the protected areas law in 1989, CONAP was created with links to the *Ministerio de Ambiente y Recursos Naturales* (MARN—the Ministry of Environment and Natural Resources) and designated as the government agency responsible for the management of wildlife inside and outside protected areas. This intensified existing institutional and jurisdictional overlap with respect to marine turtles and caused duplication in both responsibility and conservation effort. This situation persisted until 2001, when a co-ordinated effort between CONAP, UNIPESCA (successor to DITEPESCA) and several other agencies integrated and improved implementation of the law. CONAP and UNIPESCA currently share statutory authority for marine turtles. Surveillance and enforcement are the responsibility of these two bodies, as well as that of the *Basa Naval del Pacífico* (BANAPAC—the Pacific Naval Base), the *Basa Naval del Atlántico* (BANATLAN—the Atlantic Naval Base), the *Policía Nacional Civil* (PNC—the national civil police) and the *Servicio de Protección a la Naturaleza* (SEPRONA—the nature protection service) (Sánchez Castañeda *et al.*, 2002).

CONAP (through its *Departamento de Vida Silvestre* (DVS)) serves as CITES Management Authority and is authorized to establish CITES Scientific Authorities and mechanisms to improve the functioning of the treaty.

The CITES Scientific Authorities were designated by *CONAP Resolución N° 61-96*, which created the national CITES Commission of Guatemala.

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective (Caribbean sector only)

Carr *et al.* (1982) reported a subsistence fishery for marine turtles operating along the Caribbean coast and that eggs were collected and sold in Puerto Barrios and Guatemala City. Rosales-Loessener (1984 and 1987) confirmed this information, indicating that the artisanal marine turtle fishery operated in marine turtle foraging areas, that the turtles were for the consumption of a small segment of the population and that this consumption existed at the local level, almost exclusively in Livingston, where turtle meat served as a substitute for beef, meat and pork, which were higher in price. After 1981, when the marine turtle fishery was closed by law, exploitation of marine turtles along the Caribbean coast of Guatemala was limited to the consumption of eggs; meat was consumed only on a very occasional basis by some coastal families and not favoured; and the shell was never used in handicrafts.

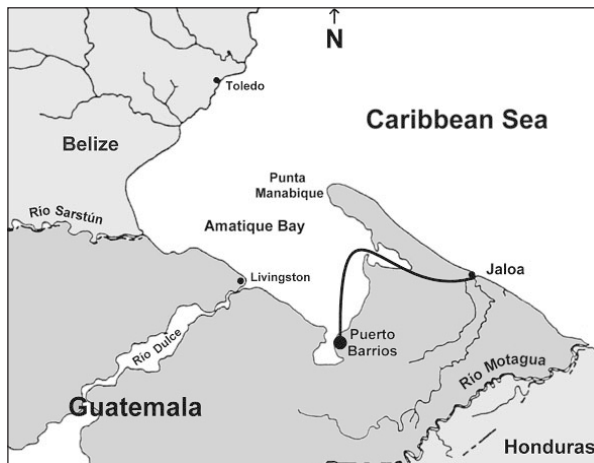
Rosales-Loessener (1984 and 1987) reported that almost all marine turtle eggs laid along the Caribbean coast were collected and estimated, based on the number of nests and eggs laid per nest, that ca. 60 000–118 000 eggs were collected in a given year. Although he recorded no trade in any other marine turtle products, he reported that marine turtle eggs were sold throughout the country.

Carr *et al.* (1982) reported incidental take of marine turtles along the Caribbean coasts and indicated that Loggerheads were the species principally affected. Rosales-Loessener (1987) reported the occasional stranding of Hawksbill Turtles, which he presumed had been drowned in fishing gear, but he did not consider the number of strandings to be high as, “fortunately”, there was no shrimp trawl fleet operating off the nesting beaches.

Recent (since 1992) exploitation

The most widespread form of exploitation of marine turtles in Guatemala continues to be widespread collection and commercial use of marine turtle eggs, which are generally consumed raw, mixed with orange juice, as a revitalizing drink in the morning, and sold for 2–3 US dollars (USD2–3) per glass by street vendors (Chacón, 2002). Muccio (1998) reported that although no conclusive research had been done on the subject, it was “almost certain” that nearly all eggs laid by marine turtles on Guatemalan shores were collected for human consumption and that “the entire Caribbean coast is virtually free of any governmental control over the collection and commercialization of sea turtle eggs”. It is in this light that his report and other efforts to address marine turtle exploitation in Guatemala have focused largely on implementation of the government-sanctioned marine turtle hatchery system (see below).

Katz (2001) reported that on the Caribbean coast, marine turtle meat is available but is not traded openly, while eggs, on the other hand, are advertised and sold in bars and restaurants and by street vendors in Puerto



Map showing the Caribbean coast of Guatemala

Barrios/Santo Tomas de Castillo. Income derived from the eggs only marginally fulfills economic needs and is available during only part of the year; nevertheless, “the thorough collection of eggs for commercial sale, breaking the reproductive cycle, is the greatest immediate threat to sea turtle survival on Guatemala’s Caribbean coast”. Rivas (in press) reports, based on information provided by locals in Punta de Manabique, that 3847 turtle eggs—1486 from Hawksbill Turtles, 349 from Green Turtles and 2012 from unidentified species—were collected in 2004, most of which were sold in Puerto Barrios.

Detailed information on use and trade of marine turtles and turtle products in Guatemala is available from market surveys and site visits undertaken by the *Red Regional para la Conservación de las Tortugas Marinas en Centroamérica* (RCA—Central American Marine Turtle Conservation Network) in partnership with the Wider Caribbean Sea Turtle Conservation Network (WIDECAST) in five cities in the country, two of which, Livingston and Puerto Barrios, are on the Caribbean coast (Chacón, 2002). These surveys collected little information on the details of the trade in marine turtle eggs in Guatemala because of a general unwillingness on the part of locals to co-operate with the individuals conducting the surveys. However, they did document use and trade of other marine turtle products and surveys confirmed earlier findings that Hawksbill shell products are not a traditional item for sale in Guatemalan markets. Nevertheless, they did find some Hawksbill shell items for sale—in Guatemala City, including at two establishments located at the airport; in Antigua Guatemala (where foreigners were reported to be the major purchasers of these products); and, in a greater concentration, in the Livingston area on the northern Caribbean coast. Information gathered there from Garifuna residents in the city was that Hawksbill scutes came from Belize via Punta Gorda and then were fashioned by local artisans. At one shop in Livingston where a large number of items was found, the saleswoman indicated that these items sold frequently and were purchased primarily by foreigners. One fisher interviewed in Livingston was selling the scutes from a Hawksbill Turtle caught a few days before at USD40/kg.



Credit: Didier Chacón/ANAI

Olive Ridley oil for sale in the Port of San José, Guatemala. The oil is not commercially produced and is sold in re-used bottles.

Another reported that when turtles were caught accidentally, which was most common, the meat was taken from the turtle and the carapace thrown back into the ocean to avoid problems, as it is known that it is illegal to kill them.

In addition, the RCA surveys found products made from turtle oil and fat. In the Port of San José on the Pacific coast, three shops were located that sold shark and Olive Ridley oil; although the vendors did not indicate that they knew the product was illegal, the turtle products were sold in a concealed way and were only offered when the buyer asked. Although purchased by both locals and foreigners, it was locals who purchased more. The oil-based preparations are home-made and sold in recycled bottles without commercial labels; sometimes those who produce it are also those who have bought the turtle, sometimes there are middlemen involved. Finally, site visits by RCA in Livingston collected information on a marine turtle fishery operating there. In addition to observations of people fishing for turtles using nets with logs as floaters, interviews with fishers indicated that they caught three species—Green Turtles, Hawksbill Turtles and Loggerheads—between Punta de Manabique and Punta Cocolí, year-round (suggesting that these are feeding grounds for both juvenile and adult turtles), although the number of turtles depended on the season, with the peak period being December to April. From interviews with fishers, it was clear that they were aware of the illegality of capturing and selling turtles.

The turtle hatchery system

As summarized in the National Strategy for marine turtles (Sánchez Castañeda *et al.*, 2002), the system of marine turtle hatcheries in Guatemala was first initiated in 1971. The first marine turtle hatchery was established by the *Dirección General de Bosques y Vida Silvestre* (DIGEBOS—the National Forestry Directorate) of MAGA in the village of Hawaii on the Pacific coast. This was followed by other hatcheries along the Pacific coast and one on the Caribbean coast near the village of San Francisco del Mar. Over the years, the number of active hatcheries has varied as a function of the resources and sponsors available and reached at one time as many as 28 from both coasts; at the time of writing of the National Strategy, 19 were in operation. Because of government budget cuts, most of the hatcheries in Guatemala have been abandoned by government agencies and are now operated by a variety of non-governmental entities, including conservation NGOs, high schools, private companies and individuals (Muccio, 1998; Sánchez Castañeda *et al.*, 2002; C. Muccio, *in litt.*, 4 May 2005).

These turtle hatcheries have developed with the objective of mitigating the negative impact of the collection of most of the marine turtle eggs laid in the country. The hatcheries incubate eggs that are donated to them as a “conservation quota” (a proportion of each nest) by egg collectors, under a system that is sanctioned by CONAP, and release the hatchlings. Once the donation is made, CONAP issues a receipt that legalizes the remaining eggs for consumption and sale. The “conservation quota” has until recently been set at 12%, or 12 eggs based on an average of 100 eggs per Olive Ridley nest. A proposal to increase it to 20% has proven controversial and has not taken effect in practice (C. Muccio, *in litt.*, 4 May 2005). According to ARCAS (2002), although “very weak”, this system, which operates primarily on the Pacific coast, affords the marine turtle “the only degree of protection it gets in Guatemala”. It is described in detail by Muccio (1998) and reviewed in the National Strategy (Sánchez Castañeda *et al.*, 2002).

It was not until recently that an effort was made by CONAP to synthesize data from the hatcheries operating in the country. The Aquatic Resources Section of the Wildlife Department of CONAP collected information from the country’s turtle hatcheries on the number of eggs donated during the 1999–2000 and 2000–2001 seasons.

These are presented in the table below. As the number of eggs donated in a given season should represent 12% of all eggs in nests collected by collectors (CONAP, 2001a, cited in Sánchez Castañeda *et al.*, 2002), ca. 441 000 eggs were probably collected in total, from ca. 4400 nests (given an average of 100 eggs per Olive Ridley nest), in the 1999/2000 season. On the same basis, ca. 699 000 eggs were probably collected, from ca. 7000 nests, the following season. Successful hatchling releases amounted to ca. 10% of all eggs collected in both seasons (see table). The species composition of the eggs collected in these two seasons was: 97% Olive Ridleys and 3% Leatherbacks in the 1999–2000 season and 91.86% Olive Ridleys, 5.31% Hawksbill Turtles, 2.7% Leatherbacks and 0.13% Green Turtles in the 2000–2001 season.

Summary of turtle hatchery results for the 1999–2000 and 2000–2001 seasons

Season	Eggs donated/incubated	Eggs collected	Hatchlings released	% released of...	
				..eggs donated	..eggs collected
1999–2000	52 879	440 658	47 645	90.10	10.82
2000–2001	83 910	699 250	65 593	82.67	9.38
Total	136 789	1 139 908	113 238		

Source: CONAP, 2001a, cited in Sánchez Castañeda *et al.*, 2002, with additional calculations by the authors.

CONAP estimated that the total economic value of the marine turtle eggs sold during the 1999–2001 period was USD214 835.

CONAP (2001a, cited in Sánchez Castañeda *et al.*, 2002) cautions that, since not all egg collectors make the required donations, the numbers that they have compiled should be considered minimum values. Muccio (1998) also noted that there were many collectors and traders who did not comply with this system; based on observations by ARCAS in the Hawaii area (Pacific coast), which is relatively well monitored and enforced, he estimated that only ca. 50% of egg collectors abide by the system. Based on this percentage, ca. 900 000 marine turtle eggs could have been collected during the period 1999–2000 and ca. 1.4 million in the period 2000–2001. This would mean that ca. 5.5% and under 5%, respectively for each period, of the total number of marine turtle eggs laid, actually survived to be released as a hatchling.

International trade

Historical perspective

There is little evidence of international trade in marine turtles involving Guatemala. CITES trade statistics derived from the UNEP-WCMC CITES Trade Database record no trade in marine turtles to or from Guatemala during the period 1975–1979. All exports from Guatemala reported to CITES during the period 1980–1992, inclusive, were imports into the USA. Of the 22 shipments recorded, 12 involved relatively small quantities of marine turtle eggs (the largest containing 112 eggs), several of which were recorded as seized on entry. The remainder included shipments of a single carving, a single body, one or two carapaces, a pair of shoes, and 28 undescribed Hawksbill Turtle specimens.

There are no records in Japanese Customs statistics of imports of Hawksbill shell from Guatemala into Japan during the 20 years prior to the closing of the Japanese import market for Hawksbill shell in January 1993

(Milliken and Tokunaga, 1987; H. Kiyono, TRAFFIC East Asia-Japan Office, *in litt.* to TRAFFIC International, 29 July 2002).

Recent (since 1992) international trade

CITES trade statistics for the period 1993–2004, inclusive, document very little trade in marine turtles from Guatemala. The only records are of imports into the USA. Other than a Hawksbill body and five kilogrammes of meat, all shipments prior to 2001 were of eggs, in relatively small quantities (the largest containing 113 eggs). Most were recorded as seized on entry, although all are presumed to have entered the country in contravention of the US *Endangered Species Act*. Although relatively few in number, these records suggest a continued illegal trade in marine turtle eggs to the USA, an unknown proportion of which undoubtedly escapes detection by the US authorities. CITES-recorded trade post 2000 has been limited to exports to the USA reported by Guatemala (but not by the USA) of specimens for scientific purposes.

ARCAS (2002) reports, based on personal observations, on the existence of a “fairly heavy” trade in Olive Ridley eggs from Nicaragua, Mexico and El Salvador in the principal markets in Guatemala City, which they presume extends to other large cities. This trade continues openly at the time of writing (C. Muccio, *in litt.*, 4 May 2005). Katz (2001) describes law enforcement as “minimal” and notes that eggs from “both coasts and from neighbouring countries are openly sold in many parts of Guatemala”. Chacón (2002) reports from interviews in Livingston on the north-east Caribbean coast that one fisher indicated that the majority of Hawksbill Turtles landed there were caught in Belize.

Enforcement issues

The National Strategy for marine turtle management and conservation (Sánchez Castañeda *et al.*, 2002) identifies numerous enforcement problems in relation to the widespread collection of marine turtle eggs in Guatemala and insufficient compliance with the egg donation system. Among these are the lack of a sustained enforcement presence on all nesting beaches and problems with administering the conservation quota and the CONAP receipts that legalize the eggs that are not donated to hatcheries. The National Strategy cites a widespread problem in the country of minimal compliance with the law. The information presented by Muccio (1998; ARCAS, 2002 and *in litt.*, 4 May 2005) and Chacón (2002) provides additional evidence of the need for a far more vigorous effort to enforce marine turtle legislation, including in relation to the illegal capture of marine turtles on the Caribbean coast, the marketing of marine turtle products in the country, and the import and sale of marine turtle eggs from other Central American countries in violation of CITES.

According to Chacón (2002), the investigations undertaken by RCA uncovered no records of penalties having been levied for marine turtle infractions in Guatemala: although a certain number of claims had been heard in the courts, they had not been successful in securing any penalties.

Muccio (*in litt.*, 4 May 2005) notes that UNIPESCA, in conjunction with the Naval Base and the shrimp fishery association, is undertaking annual inspections of the shrimp fleet operating in the Pacific coast to ensure proper deployment of TEDs, but current monitoring and enforcement on land on the Pacific coast are limited to that undertaken by three CONAP employees, far short of the capacity that is necessary to ensure a high level of compliance with the egg donation system and other proscriptions relating to marine turtles.

Marine turtle management

The National Strategy for the Management and Conservation of Marine Turtles in Guatemala (Sánchez Castañeda *et al.*, 2002) identifies numerous shortcomings in the framework for and operation of marine turtle management in Guatemala and notes that, despite a large body of legislation protecting marine turtles, threats persist and are increasing. These include depredation of eggs, commercial capture (for meat, leather and shell), incidental capture in industrial fisheries, and increasing contamination of marine and coastal habitats, in part as a result of beach construction that has not taken account of environmental impact assessment. In addition, the National Strategy identifies a number of issues to address in improving the egg donation system and operation of the country's turtle hatcheries. To address these many problems the National Strategy includes an Action Plan organized around the following objectives: 1) increasing knowledge of marine turtle populations as a basic tool for adequate management; 2) ensuring an adequate legal and institutional basis in line with national reality for the protection, use, management and conservation of marine turtles in the country; 3) fostering a change in attitude, behaviour and awareness in Guatemalan society with respect to the protection, use, management and conservation of marine turtles; 4) optimizing the management of marine turtle hatcheries, promoting the protection of natural nests and other mechanisms of conservation and management; and 5) strengthening capacity to manage and execute initiatives and programmes and projects relating to use, management, and conservation of marine turtles.

It should be noted that many institutions have been involved in informational and training workshops and other activities relating to the management and conservation of marine turtles in Guatemala and, most recently, in the development of the National Strategy. In recent years, GATM, the Guatemalan Marine Turtle Advisory Group, has served as the structure for co-ordinating and unifying these efforts. The role of this group was formalized by the Executive Secretary of CONAP in 2000 (*Resolución No. ALC-018/2000*) and, at the time of writing, brought together 16 government agencies, NGOs, private entities, community groups, and academic institutions. Through the group, there has been a consolidation of efforts to unify and standardize conservation methods, such as updating and standardizing official documents for the control of trade in marine turtle eggs; to increase support for the delivery of conservation quotas to hatcheries; and to revise the conservation quota from 12% to 20% of the total eggs laid per nest. GATM has also facilitated co-ordination in control and enforcement efforts by SEPRONA, UNIPESCA, BANAPAC and CONAP; prepared and published the *Manual de lineamientos técnicos para el manejo de tortugarios en Guatemala* (CONAP, 2001b, cited in Sánchez Castañeda *et al.*, 2002); and established management and conservation measures (*Medidas Transitorias*) to be implemented during the development of the National Strategy (CONAP, 2001c, cited in Sánchez Castañeda *et al.*, 2002).

Rivas (in press) reports that the NGO *Fundación Mario Dary* (FUNDARY) is working to develop a conservation plan for marine turtles of the Punta de Manabique Wildlife Refuge on the Caribbean coast.

Management of exploitation

Management of marine turtles in Guatemala focuses exclusively on the egg donation system and operation of marine turtle hatcheries as an effort to control the widespread collection of marine turtle eggs, which are not considered by CONAP to be protected by law. Among the many shortcomings in the donation system identified in the National Strategy for marine turtles, several are particularly pertinent to the question of whether the management regime is consistent with the principle of sustainability. These are discussed below.

1. The egg donation system is not operating adequately to ensure that a proportion of all nests collected are deposited in turtle hatcheries for incubation and subsequent release of hatchlings; for example, the system functions only in those areas where there are hatcheries, thus creating an illegal market where there are no hatcheries.
2. There is a great deal of confusion and contradiction as regards the issuance of the receipts (*recibos de cuota*) for eggs that have been deposited with hatcheries; the procedures need to be revised and clarified so as to enable a better and more organized control of the quota system and the marketing of eggs.
3. There is a need for a rational basis for establishing the “conservation quota”, the percentage of eggs per nest that are required to be contributed to conservation efforts. This has recently been increased to 20%, but because it has not been accepted by the egg collectors, it has not taken effect in practice. The National Strategy notes that the egg collectors claim that 20% is too high, while the conservationists claim it is too low. While the National Strategy focuses on the need for efforts to make the 20% “more acceptable”, it should be noted that **no scientific** assessment has been undertaken either to validate the 20% quota or to derive a quota that would be likely to be consistent with standards of best practice for marine turtle management.

Several additional points should be noted in relation to the current management regime:

4. There has until recently been little monitoring of the collection of eggs in Guatemala, such that the total number of eggs—or nests—collected is unknown. CONAP has initiated the compilation of national reports on the eggs donated to and managed by marine turtle hatcheries, with the aim of synthesizing, standardizing and systematizing the information compiled by the different hatchery administrators and generating a database that can serve as a baseline for comparing between different nesting seasons and, finally, for analysing the impact of the conservation activities that have been undertaken during these nesting seasons (CONAP, 2001a, cited in Sánchez Castañeda *et al.*, 2002). While this is a good first step, it should be noted that these data and the results of their analysis will only be as good as the data that are generated by the turtle hatcheries. Other than Muccio’s (1998) estimate of a 50% compliance level with the egg donation system, there does not appear to be any quantitative assessment of the actual proportion of nests and eggs laid that are documented through this system.
5. That there have been few population surveys and no regular monitoring of marine turtle nesting populations and that overall nesting trends are unknown should be considered as shortcomings in management, particularly in the light of the heavy exploitation of eggs, including within the egg donation system. Although any positive results in population trends from implementation of the egg donation system could not credibly be derived for several decades, there is no basis to assume that trends are increasing.
6. The efficacy of the “all eggs in one basket” management approach for marine turtles in Guatemala must be assessed on the basis of current scientific understanding of the sensitivities of the incubation period, for example, that slight fluctuations in average sand temperature can alter the sex ratio of hatchlings. Katz (2001) cites other concerns, including increased vulnerability to contamination, depredation, and natural events such as storms or flooding; damage done to eggs during transport; and “the need to relocate nests close to homes, where little suitable beach is available”. Based on the analysis provided here, it is possible that no more than 5% of the marine turtle eggs laid in the country actually produce a marine turtle hatchling that is released to

the sea. Even in those instances, such as with the one turtle hatchery on the Caribbean coast at San Francisco del Mar, in the village of Jaloa, which in 2000 and 2001 received entire nests collected by villagers hired to patrol for them (W. Katz, Coastal Wildlife Club, *in litt.*, 13 May 2005), there is still a need to ensure that the circumstances of their incubation and (subsequent hatchling) release to the sea meet standards of best practice.

7. A final point should be noted in relation to the operation of the marine turtle hatcheries. Most of these hatcheries are not operated by government agencies but, rather, by NGOs, local communities, universities and private enterprises, often with the assistance of volunteers, and each administers the hatchery differently (Sánchez Castañeda *et al.*, 2002). Although the information collected by CONAP (2001a, cited in Sánchez Castañeda *et al.*, 2002) suggests a very good success rate in their incubation of marine turtle eggs, sustaining this rate and ensuring that it is met by all hatcheries necessitates technical support and training, as well as adequate equipment for proper incubation, at the right temperatures (to ensure a balanced sex ratio), and that the release of hatchlings follows standards for best practice.

On this subject, Muccio (1998) reported that the Center of Conservation Studies (CECON) of the University of San Carlos and the Peace Corps conducted a study to determine the optimal conditions for hatcheries in Guatemala to ensure a high hatchling success rate and a favourable temperature for the production of a 50/50 sex ratio in hatchlings. This study resulted in the *Manual de lineamientos técnicos para el manejo de tortugarios en Guatemala* (CONAP, 2001b), which is the principal technical resource in the country for operating the marine turtle hatcheries. However, the extent to which the hatcheries adhere to these and other guidelines would appear to warrant regular review by CONAP.

Species research and conservation

Although the history of marine turtle conservation in Guatemala dates back at least 25 years (Muccio, 1998), there has not been a great deal of research undertaken on the status of marine turtles or their habitats and little *in situ* conservation effort. Most active marine turtle conservation effort has been directed towards turtle hatcheries as a means of mitigating the impact of collection of most of the marine turtle eggs that are laid in the country and on enhancing the performance of the hatcheries to ensure that it meets best-practice standards. The NGO ARCAS, for example, has been working for a number of years to provide guidance on the operation of the turtle hatcheries and, in recent years, in collaboration with the UK-based Ambios Ltd., has been researching nest temperatures and humidity of natural Olive Ridley turtle nests on the Pacific coast so as to derive clear guidance for the maintenance of optimum conditions in hatchery nests (Ballesterio *et al.*, 2005; www.ambios.net/seaturtles).

Investigations of marine turtles on the Caribbean coast began with the surveys of Carr *et al.* (1982) and the marine turtle project conducted by DITEPESCA in 1982, that was originally aimed at the preparation of the national report submitted to the First Western Atlantic Sea Turtle Symposium (Rosales-Loessener, 1984). This programme included interviews, field surveys, experimental fishing in foraging areas, and marking and recording of morphometric data. It was continued by DITEPESCA, so as to collect additional data for the Second Western Atlantic Turtle Symposium, and included night-time nesting surveys, marking and recording of data, collection and translocation of eggs for incubation and release of hatchlings (Rosales-Loessener, 1987).

As of 1998, no marine turtle population monitoring had been undertaken on the Caribbean coast since the work undertaken and reported to the Second Western Atlantic Turtle Symposium by Rosales-Loessener (1987).

ARCAS prepared the first national report on marine turtles in the country since the report by Rosales-Loessener (1987) to the Second Western Atlantic Turtle Symposium (Muccio, 1998) and has conducted marine turtle crawl counts since 1997 at sites on the Pacific coast, as well as other marine turtle (and other wildlife) conservation activities, but their focus is primarily the Pacific sector of the country.

A pilot project, *Proyecto Tortugas Mar Caribe*, was undertaken in 2000 and 2001 as a community-based marine turtle research and conservation project of the Rotary Club of Puerto Barrios in collaboration with WIDECAS and the Caribbean Conservation Corporation. This project employed a 13-member team of experienced egg collectors, representing 85% of the families from the coastal community of Jaloa, who conducted nightly patrols during the nesting season (from 19 June to 10 September) over a 10-km section of beach adjacent to their homes and relocated all marine turtle nests to a protected area within the community. The project, endorsed by CONAP, also collected anecdotal data on marine turtle strandings, as well as nesting outside the study region, and “established a foundation of teamwork” as the basis for further research and conservation activities (Katz, 2001). Although it was hoped that this project would expand after the initial pilot phase, it did not, such that the only marine turtle conservation activities that are being undertaken on the Caribbean coast are through the NGO FUNDARY.

FUNDARY has been working with marine turtles on the Caribbean coast since 2001. Since 2003, they have been working with personnel from CONAP and volunteers to patrol the beaches of San Francisco del Mar in Punta de Manabique and operate a hatchery. Although in 2003, only one nest was incubated and few turtles (35 of 120 eggs) released, in 2004, seven nests—all Hawksbill Turtles—were incubated in the hatchery and 545 hatchlings (of a total of 652 eggs) were released (A.B. Rivas, FUNDARY, *in litt.*, 21 April 2005).

Habitat conservation

The national system of protected areas (SIGAP) was established in Guatemala in 1989 and, as of 2003, included over 120 protected areas (51 of them private nature reserves) covering 3 192 997 ha and 29.3% of the country’s land area (CONAP, 2003). On the Caribbean coast, Punta de Manabique was declared an “area of special protection” in 1989 and designated as Guatemala’s fourth Ramsar site on 28 January 2000. On 17 March 2005, with the official publication of *Decreto N° 23-2005*, it was formally declared the Punta de Manabique Wildlife Refuge. This site covers 132 900 ha, including 66 000 ha of coastal waters, and is one of three marine protected areas along Guatemala’s Caribbean coast (Burke and Maidens, 2004). The site incorporates marine turtle habitat and is managed by FUNDARY. Under the protected areas law, hunting or collection within protected areas specified by SIGAP and in designated buffer zones is prohibited unless the management plan provides for it and licences have been duly issued.

Education and public awareness

Over a two-year period, *Proyecto Tortugas Mar Caribe* built a team of volunteers and introduced a number of projects to the communities of the Punta de Manabique, including teacher training and a series of environmental lessons into 17 village schools. The project also promoted environmental education at a national scale, targeting the general public, hotel and hospitality sectors, policy-makers, and the media (Katz, 2001). Some of these activities have been taken forward by FUNDARY, which has been giving presentations on marine turtle conservation in the coastal schools of Punta de Manabique since 2003 and, in 2004, initiated a specific project in San

Franciso del Mar that involves both teachers and students in lessons in marine turtle biology and conservation and site visits to the nesting beaches and the local turtle hatchery, where they participate in the care of the incubating nests and release of hatchling turtles (Rivas, in press).

Those efforts notwithstanding, there appear to have been few concerted efforts aimed at heightening awareness of marine turtle conservation in Guatemala. The National Strategy for marine turtles notes that marine turtle conservation is a controversial subject in Guatemala, in large part owing to lack of awareness and dissemination of information on the importance of marine turtle use and management.

Constraints to marine turtle conservation and management

The National Strategy for marine turtles (Sánchez Castañeda *et al.*, 2002) identifies financial resources as the key constraint to improving marine turtle management in Guatemala, along with strategic alliances to fully implement the actions that the Strategy proposes. In addition, the Strategy notes the following constraints:

- inadequate integration of sectoral efforts at the national level;
- the lack of information and systematization of information on the status and exploitation of marine turtles;
- outdated and inadequate technical basis for management, including the information base;
- inadequate implementation of legal measures providing for the protection, management and conservation of marine turtles;
- absence of programmes of information dissemination or formal or informal education or extension work in relation to the conservation of marine turtles;
- inadequate capacity—technical, logistical and financial—for management and conservation of marine turtles; and
- insufficient appreciation for the economic importance of marine turtles and lack of economic valuation studies to demonstrate the importance of marine turtle management.

ARCAS (2002) identifies several additional constraints: limited public and political support; inadequate government capacity, and poverty.

Summary and recommendations

Although marine turtles have been legally protected in Guatemala for decades, exploitation has persisted, most pervasively through collection of marine turtle eggs, which may affect every nest that is laid in the country. Marine turtle management in the country has, as a consequence, been almost exclusively focused on the development of marine turtle hatcheries and implementation of an egg donation system aimed at ensuring that a proportion of the nests laid produce hatchlings that are released to the sea. There has been little in the way of sustained *in situ* management and conservation effort, including protection of nests and nesting beaches, enforcement of the egg donation system, population monitoring, and outreach and education on behalf of marine turtles. A National Strategy for the conservation and management of marine turtles has been developed through a participatory process and includes an Action Plan to address a range of shortcomings in marine turtle management (Sánchez Castañeda *et al.*, 2002). Although a very positive development for marine turtles in Guatemala, the Strategy and Action Plan focus primarily on the egg donation/hatchery system and less on *in situ* conservation and management efforts.

An overarching recommendation of this analysis is that there be a concerted effort to redress the imbalance between *ex situ* and *in situ* management and conservation efforts on behalf of marine turtles in Guatemala, with a major emphasis of that re-orientation focused on establishing a defensible, scientific basis for marine turtle management in the country. Along these lines, the following actions are proposed:

1. The legal basis for marine turtle management, currently fragmented and confusing, should be brought together in a single document specifying the prohibitions and restrictions that apply, the statutory bodies responsible for implementing and enforcing that legislation, and the penalties that apply. These should specifically address the killing of turtles at sea and on nesting beaches; excavation of nests and collection of eggs; and marketing of eggs and other marine turtle products. The proposed marine turtle regulations, *Reglamento sobre manejo y conservación de tortugas marinas* (Sánchez Castañeda *et al.*, 2002), should be revised to take into account the full range of issues affecting marine turtles in the country. A summary of these rules should be widely disseminated throughout the country through a range of media as well as dedicated outreach and extension work with local coastal communities.
2. In the context of a rationalization of the legal rules that apply to marine turtles, a specific prohibition should be established on the collection at all times of Leatherback and Hawksbill eggs in the light of these species' Critically Endangered (cf. IUCN) status.
3. An independent scientific review should be undertaken of the marine turtle hatchery system in Guatemala. This should include the egg donation system and the "conservation quota", as well as operation of the hatcheries and a feasibility study of various options to bring egg collection to levels that might be sustainable, drawing on other examples from the region, including the Ostional project in Costa Rica. Such a review should aim at providing viable management measures to improve management of marine turtles in the country.
4. In addition to establishing a scientific basis for a "conservation quota", the egg donation system should be revised to ensure that adequate and appropriate control can be exercised so as to be certain that the programme does not continue to serve as a loophole for widespread, unsustainable collection and marketing of marine turtle eggs.
5. *In situ* management and conservation efforts should be initiated to: identify critical nesting and foraging sites for marine turtles; establish Index beaches for long-term monitoring; nest protection programmes and beach patrols; population monitoring; and enforcement and implementation of the egg donation system.
6. Concerted efforts should be made to mitigate causal factors underlying the ubiquitous collection of marine turtle eggs, including involving local communities more widely in conservation efforts, such that the need for hatcheries is reduced as social conditions improve to permit the successful *in situ* incubation of eggs.
7. A major communications effort should be developed and implemented in relation to marine turtles aimed at fundamental changes in awareness and appreciation for marine turtle conservation, in particular the consumption of marine turtle eggs.

8. Drawing on the CITES capacity-building efforts of recent years, a sustained programme should be established to provide regular training and materials for law enforcement personnel, including Customs, police, the nature protection services, and naval stations to support marine turtle enforcement.
9. Greatly increased financial, political and logistical support should be provided to CONAP, UNIPESCA and other relevant agencies and to the national marine turtle advisory group—GATM, NGOs, communities, and other stakeholders to enable them to enhance their capacities and undertake the wide range of marine turtle conservation and management activities recommended in the National Strategy and this analysis.

References

- Anon. (2002). CITES Document CoP12 Doc. 28. Working document of the 12th meeting of the Conference of the Parties, Santiago (Chile), 3–15 November 2002. Accessible at www.cites.org. Viewed 12 December 2005.
- ARCAS (Asociación de Rescate y Conservación de Vida Silvestre/Wildlife Rescue and Conservation Association). (2002). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of the Marine Turtles of the Lesser Antilles, Central America, Colombia and Venezuela. Completed by Colum Muccio, Director of Administration and Development. Dated 25 September 2002.
- Ballestero, D., C. Jackson, C. Muccio, R. Nunny. (2005). Olive Ridley nest temperatures related to natural population dynamics and conservation strategy. Poster presentation to the 25th Annual Symposium on Sea Turtle Biology and Conservation, 18–21 January 2005, Savannah, Georgia, USA.
- Burke, L. and J. Maidens (2004). *Reefs at Risk in the Caribbean*. World Resources Institute. 80 pp. reefsatrisk.wri.org
- Carr, A., A. Meylan, J. Mortimer, K. Bjorndal and T. Carr. (1982). *Surveys of sea turtle populations and habitats in the Western Atlantic*. NOAA Technical Memorandum NMFS-SEFC-91. US Department of Commerce.
- Chacón, D. (2002). *Diagnóstico sobre el comercio de las tortugas marinas y sus derivados en el istmo centroamericano*. Red Regional para la Conservación de las Tortugas Marinas en Centroamérica (RCA), San José, Costa Rica. 247 pp.
- CONAMA (Comisión Nacional del Medio Ambiente). (1999). Estrategía Nacional para la conservación y uso sostenible de la Biodiversidad y Plan de Acción Guatemala. 115 pp.
- CONAP. (2001a). Informes nacionales temporadas de anidación de tortugas marinas. Guatemala. 45 pp.
- CONAP. (2001b). Manual de lineamientos técnicos para el manejo de tortugarios en Guatemala.
- CONAP. (2001c). Aprobación de las medidas transitorias para manejo y conservación de tortugas marinas. Resolución de Secretaría Ejecutiva de CONAP No. ALC/002-2001.
- CONAP. (2001d). Listado de especies de fauna silvestre amenazadas de extinción (Lista Roja de Fauna). Resolución No. ALC/032-99 del Consejo Nacional de Areas Protegidas y sus reformas (Enmiendas y Adiciones) Resolución ALC/039-99 del Consejo Nacional de Areas Protegidas. Departamento de Vida Silvestre, Secretaría Ejecutiva, Consejo Nacional de Areas Protegidas (CONAP).
- CONAP. (2003). Informe Areas Protegidas. Consejo Nacional de Areas Protegidas—CONAP. www.biodiv.org/world/reports
- Herrera de Noack, J. (1997). Legislación nacional e internacional que afecta a las tortugas marinas en Centroamérica. Caso Guatemala. Instituto de Derecho Ambiental y de Desarrollo Sustentable—IDEADS, Guatemala. 29 pp. Unpublished.
- Katz, W. (2000). Proyecto Tortugas, Mar Caribe: Report 2000. Prepared for the Wider Caribbean Sea Turtle Conservation Network (WIDECAS). 4 pp. Unpublished.

- Katz, W. (2001). Proyecto Tortugas Mar Caribe: Report 2001. Prepared for the Wider Caribbean Sea Turtle Conservation Network (WIDECAST). 15 pp. Unpublished.
- Melini, Y.G., G. García, L. Girón. (2000). Fortalecimiento de la implementación del Convenio CITES en Guatemala: su Operativización. Proyecto ejecutado de junio 1999 a Julio 2000. Instituto de Derecho Ambiental y Desarrollo Sustentable—IDEADS. 18 pp. Unpublished.
- Meylan, A.B. (1999). International movements of immature and adult hawksbill turtles (*Eretmochelys imbricata*) in the Caribbean Region. *Chelonian Conservation and Biology* 3(2):18–194.
- Milliken, T. and H. Tokunaga. (1987). *The Japanese Sea Turtle Trade 1970–1986*. A special report prepared by TRAFFIC (Japan). Center for Environmental Education, Washington, DC. 171 pp.
- Muccio, C. (1998). Informe nacional sobre el estado de la conservación de tortugas marinas en Guatemala. (National sea turtle conservation report for Guatemala). Asociación Rescate y Conservación de Visa Silvestre (ARCAS), Guatemala. 30 pp. Unpublished.
- Rivas Chacón, A.B. (In press.) School project about sea turtles, Official Rural School, San Francisco del Mar, Specially Protected Area Punta de Manabique, Izabal, Guatemala. *Proceedings of the 25th Annual Symposium on Sea Turtle Biology and Conservation, Savannah, Georgia, USA, 18–22 January 2005*. NMFS Technical Memorandum.
- Rosales-Loessener, F. (1984). Western Atlantic Turtle Symposium National Report for Guatemala, Submitted December 1982. Pp. 201–208. In: Peter Bacon *et al.* (Eds). *Proceedings of the Western Atlantic Turtle Symposium, 17–22 July 1983, San José, Costa Rica*, III, Appendix 7. University of Miami Press, Florida.
- Rosales-Loessener, F. (1987). The National Report for Guatemala. Presented to the Second Western Atlantic Turtle Symposium, Mayagüez, Puerto Rico, October 1987. WATS2 048. 10 pp. + annexes. Unpublished.
- Sánchez Castañeda, R., M.R. Jolon Morales, C. González Lorenzana, J.C. Villagrán Colón, J.L. Boix Morán and H. Dieseldorff Monzón. (2002). *Estrategia nacional de manejo y conservación de tortugas marinas: Guatemala*. Consejo Nacional de Areas Protegidas-CONAP/FONACON/CBM/EPQ/UNIPESCA. 112 pp.
- Vásquez Paz, E.E. (2001). Fortalecimiento de la implementación del Convenio CITES en Guatemala: su Operativización. Fase 2. Proyecto ejecutado de junio 1999 a Julio 2000. Instituto de Derecho Ambiental y Desarrollo Sustentable—IDEADS, Guatemala. 14 pp. Unpublished.

Honduras

Introduction

Honduras is the second-largest country in Central America and the most mountainous, the only flat areas being the narrow coastal plains along the Caribbean Sea, the Gulf of Fonseca on the Pacific coast and a few interior valleys. The easternmost section of the Caribbean coast, collectively known as the Mosquitia or Misquito Coast, harbours the richest biodiversity in the country and has a long history of indigenous civilization. The Río Plátano Biosphere Reserve was established in this region in 1980 to conserve both the area's natural resources and the several ethnic groups living there. The country's Caribbean coast extends for 671 km and forms part of the Meso-American Barrier Reef System, which includes the Bay Islands, comprising the three major islands of Utila, Roatán and Guanaja, several smaller islands (e.g. Barbareta, Morat, Santa Elena, Swan Islands/Islas del Cisne), and numerous cays in between; the archipelago of Cayos Cochinos; and the Cayos Zapotillos.

Marine turtles have been a source of food for centuries along both coasts of Honduras and continue to be so. Although the exploitation of marine turtles has been regulated since 1959 through the country's fisheries law, and marine turtles are currently considered fully protected through international mandates established through the accession of Honduras to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC), an important exemption exists for their use by indigenous groups. This use is regulated but is controlled only in some areas through community-based projects run by NGOs with the support of the national fisheries agency. There is no monitoring of the levels and nature of exploitation.

There is little quantitative or qualitative information available on the status and exploitation of marine turtles in Honduras and few and fragmented research and conservation efforts. Cruz and Espinal (1987) reported to the Second Western Atlantic Turtle Symposium on heavy exploitation of marine turtles in the country, in particular Green and Hawksbill Turtles captured by Misquitos working on the shrimp and lobster fleets operating out of the Bay Islands; they indicated that their investigations had led them to conclude that the legal protections in place in Honduras represented no guarantee for the future survival of marine turtles in the Atlantic of Honduras. More recent findings from market surveys and site visits conducted from 2000 to 2002 by the *Red Regional para la Conservación de las Tortugas Marinas en Centroamérica* (RCA—Central American Marine Turtle Conservation Network) indicate that exploitation and marketing of marine turtles and turtle products, in particular eggs and Hawksbill shell products, are intensive and widespread in the country and, for the most part, conducted openly. Their findings suggest an urgent need for much more vigorous and sustained education and enforcement efforts on behalf of marine turtles, based on a rationalization and clarification of the legal norms that apply.

In addition to a dearth of information on the status of marine turtles in Honduras, there is also a lack of planning for marine turtle management. There is no national or sub-national marine turtle management strategy or plan and the most recent analysis of the legal and institutional framework for marine turtle management in the country is an unpublished report prepared in 1997 (Galindo, 1997). Although significant advances have been made in the country in recent decades to enhance the institutional framework for biodiversity conservation and implement it, as in the case of the creation of a national protected areas system and publication of a National Biodiversity Strategy and Action Plan for Honduras (SERNA, 2001), these efforts have yet to benefit marine turtles, particularly in the light of the sectoral division that exists in the country between the management of wildlife,

understood to be terrestrial species, and marine species, understood to be fisheries resources, the latter of which are regulated through the 1959 fisheries law that is widely recognized as obsolete.

The ratification by Honduras of IAC holds a great deal of promise that these many gaps in marine turtle management will be addressed. However, the success of those efforts will no doubt rely on external funding and technical assistance, such as may be available through regional programmes and institutions, such as the Central American Commission for Environment and Development (CCAD) and the Central American Regional Environment Programme (PROARCA—*Programa Ambiental Regional para Centroamérica*) and RCA.

Summary of the status of marine turtles in Honduras

Four species of marine turtle occur along the Caribbean coast of Honduras. Cruz and Espinal (1987) reported the Hawksbill Turtle to be the most frequently observed in, and reported from, the coral reef regions of the Bay Islands, Cayos Cochinos and Misquito cays and that it had been recorded as nesting in all of these same areas. They further reported that the Loggerhead was the second-most frequently observed in the reef areas, followed by the Green Turtle. They reported that the Green Turtle was the species most frequently recorded nesting on the beaches and cays, although it was reported not to be very frequent on the Misquito coast. The Leatherback was infrequently recorded at sea and recorded as nesting on the beaches of the Misquito coast; it had never been recorded as nesting on the beaches of the Bay Islands or cays.

Occurrence of marine turtles in Honduras

English common name	Scientific name	Occurrence
Loggerhead	<i>Caretta caretta</i>	N, F
Green Turtle	<i>Chelonia mydas</i>	F
Leatherback	<i>Dermochelys coriacea</i>	N
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	N, F
Kemp's Ridley	<i>Lepidochelys kempii</i>	A
Olive Ridley	<i>Lepidochelys olivacea</i>	A

Key: N=nesting; F= foraging; A=absent

More recently, Molinero (2002), reports that the principal foraging and nesting areas for each species on the Caribbean coast of Honduras are as follows:

- **Loggerhead:** foraging—fishing banks to the north of Carataska, Bay Islands; nesting— Plaplaya, Trujillo, Cocobila, Ibans, Kury, Mukabila
- **Green Turtle:** foraging—Sangrelaya, Roatán, Islas del Cisne (Swan Islands); nesting—unknown
- **Hawksbill Turtle:** foraging—Punta Sal, Cayos Cochinos, Islas del Cisne, fishing banks to the north of Carastaska; nesting—Cayos Cochinos, Utila, Islas del Cisne, Punta Sal, fishing banks to the north of Carataska
- **Leatherback:** nesting—Plaplaya, Trujillo, Cocobila, Ibans, Kury, Mukabila

Carr *et al.* (1982) reported that good developmental habitats for Green Turtles, Loggerheads, and Hawksbill Turtles occurred around all the Bay Islands but that the whole area was “badly depleted”. Along the remainder of the Honduran coast, there is little reef development, but from the Bay Islands to Cabo Gracias a Dios, extensive

grass flats existed, where Green Turtles, Loggerheads and Hawksbill Turtles were frequently observed and Leatherback sightings were “fairly common”.



Credit: Scott A. Eckert/WIDECAST

Nesting Loggerhead

Meylan (1999a) reported that no estimate of Hawksbill nesting was available for Honduras but cited Cruz and Espinal (1987) in reporting that aerial and ground surveys on the mainland and offshore islands between 1982 and 1987 had revealed only sparse nesting. Carr *et al.* (1982) had reported numbers of nesting Loggerheads, Green and Hawksbill Turtles to be “greatly diminished” on the mainland and badly depleted in the Bay Islands, while Cruz and Espinal (1987) reported that the general opinion in Utila was that Green and Hawksbill populations had declined in the preceding 10–15 years as a result of over-exploitation.

Carr *et al.* (1982) reported that, by the time of their writing, there had been 27 tag returns from Honduran waters, mostly from the eastern part of the coast, of females tagged at the Tortuguero nesting beach in Costa Rica. Meylan (1999b) cited Bjorndal (1993, pers. comm.) in reporting that a female Hawksbill Turtle, tagged at Tortuguero in 1977, was recaptured at Cay Gorda Bank, Honduras, in 1979, and another, tagged in 1983, was recorded as recaptured at Isla Guanaja, Honduras, in 1987.

Overview of the legal framework for marine turtle management

Membership in international and regional treaties

Although Honduras is not party to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, or Cartagena Convention, nor its protocols, it has been a party to CITES since 1985 and the Ramsar Convention on Wetlands since 1993. Honduras has also acceded to IAC and to the International Labour Organization (ILO) Convention N° 169 Concerning Indigenous and Tribal Peoples in Independent Countries, which, *inter alia*, protects and regulates the rights of the peoples concerned to use the natural resources in the areas in which they live (SERNA, 2001). See table overleaf.

Laws and regulations relating to marine turtles

Based on the information reviewed for this study, there appears to be some confusion as to the legal status of marine turtles in Honduras. As is the case elsewhere in the region, legal provisions affecting the exploitation of marine turtles derive from general laws and very specific laws that have been adopted over a relatively long period of time, apparently with little reference to each other, and revised with other pieces of legislation that vary in type and legal weight, such that it is unclear as to what piece of legislation takes precedence over another. In

Membership of Honduras in multilateral agreements relating to marine turtles

Convention	Honduras
Cartagena Convention	24.03.1983 (S)
Protocol Concerning Specially Protected Areas and Wildlife (SPAW)	No
Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region	24.03.1983 (S)
Protocol Concerning Pollution from Land-based Sources and Activities	No
Convention on Biological Diversity (CBD)	31.07.1995 (R)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	13.06.1985 (E)
Convention on Migratory Species (CMS)	No
Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	01.02.2001 (R)
MARPOL 73/78 (Annex I/II)	21.11.2001 (A)
MARPOL 73/78 (Annex III)	No
MARPOL 73/78 (Annex IV)	No
MARPOL 73/78 (Annex V)	21.11.2001 (A)
Convention on Wetlands of International Importance (Ramsar)	23.10.1993 (E)
UN Convention on Law of the Sea (UNCLOS)	05.10.1993 (R)
Western Hemisphere Convention	No
World Heritage Convention	08.06.1979 (R)

Key: Date of: Signature (S); Ratification (R); Accession (A); Entry into force (E)

addition, there is confusion regarding the relationship between the fisheries legislation, which specifically refers to turtles (*quelonios*), and the country's wildlife legislation, which appears to apply only to terrestrial species, and how either of those fits within the more recent environmental law. Also creating confusion is the fact that CITES, based on the legal system in Honduras, automatically applies in the country and would, thus, appear to provide complete protection of marine turtles and their products (as opposed to solely a prohibition on international trade). Ratification of IAC by Honduras would also appear to provide complete protection of marine turtles with the exception of use by indigenous groups, a position that would converge with the country's membership in ILO Convention N° 169.

According to Chacón (2002), the first regulations affecting marine turtles in Honduras were instituted in 1959 through the *Ley de Pesca* (General Fishing Law) N° 154, which, *inter alia*, provides for the conservation and use of the fauna and flora of rivers, lakes and marine areas of the country. This law establishes the duration and location for bans on turtle exploitation and requires that the closed seasons be announced publicly 15 days prior to their implementation. In addition, it stipulates that anyone who destroys or collects turtle eggs or hatchlings for commercial purposes is guilty of an infraction, as is anyone who takes a turtle of weight or size smaller than the regulation allows. Galindo (1997) cites Article 7 of this law in allowing the capture of turtles only for scientific purposes, although the preceding sub-paragraph stipulates establishment of closed seasons for the same. In addition, he indicates that the *Secretaría de Agricultura y Ganadería* (SAG—the Ministry of Agriculture and Ranching), which oversees fisheries, has every year issued closed seasons during which the collection, commercial use and possession of marine turtle eggs is prohibited; he cites, for example, *Resolución N° 004-97*, which established a closed season for the collection, commercial use and possession of marine turtle eggs from 15 April to 15 June of 1997. Finally, Galindo (1997) indicates that SAG has issued resolutions fully protecting marine turtles, but he provides no specific number or date for those resolutions.

Groombridge and Luxmoore (1989) refer to regulations dated 7 March 1978 and presumed to have been promulgated under the *Ley de Pesca* of 1959, prohibiting the capture, industrialization and trade of the Hawksbill Turtle for an indefinite period of time.

CITES was ratified in Honduras by *Decreto Ley N° 771* of 1979, which prohibits all commercial trade and export of wildlife, except for a few species that may be traded under quotas. Because CITES obligations form part of national law, marine turtles are considered completely protected under this law (Galindo, 1997).

Acuerdo Ejecutivo N° 001-90 of 1990 prohibited the capture and commercial use of all wildlife in the country; however, it would appear to be generally understood that “wildlife” in this instance is defined as terrestrial rather than marine species.

The *Ley General Del Ambiente Decreto N° 104-93* of 8 June 1993 is a framework law that, *inter alia*, provides for the creation of a *Secretaría de Estado en el Despacho del Ambiente* and mechanisms to bring together different authorities and agencies to provide for environmental management and protection. It prohibits exploitation, hunting, capture and commercialization of species identified as protected or threatened with extinction but does not specify how these should be designated. In making separate provisions for regulating hunting (Article 41) and the management of marine and coastal resources (Articles 55-58), the law perpetuates the sectoral divide between marine and terrestrial species. This law establishes the basis for the creation of the national protected areas system, the *Sistema Nacional de Áreas Protegidas de Honduras* (SINAPH).

Resoluciones N° 015-93, N° 030-95 and N° 003-96 provide for the use of turtle excluder devices (TEDs) in shrimp trawl nets (Galindo, 1997).

Cruz and Espinal (1987) reported that the annual updates to the fisheries law were of limited effect and that, in practice, implementation of the law and its penalties was very limited on both coasts and in the principal cities of the country. In addition, the National Biodiversity Strategy and Action Plan (SERNA, 2001) identifies the need for elaboration and adoption of a revised fisheries law, as well as an overarching biodiversity law. Finally, the *Acuerdo Ejecutivo* of 1990 and its implementing regulations are recognized by the government as having provided a disservice to wildlife conservation and management in the country and to be in urgent need of revision (http://cohdefor.hn/areas_protegidas, viewed 26 April 2005).

Following the enactment of the *Reglamento de Procedimientos para la Aplicación de la Convención del Comercio Internacional de Especies Amenazadas de Fauna y Flora Silvestres Acuerdo N° 966-03*, in 2003, the CITES National Legislation Project assessed CITES-implementing legislation in Honduras as “believed generally to meet the requirements for implementation of CITES” (Anon., 2005; M. Rodriguez, Co-ordinador, Oficina Nacional CITES, *in litt.*, 24 June 2005).

Responsible authorities

On the Atlantic Coast of Honduras, the *Dirección General de Pesca y Acuicultura* (DIGEPESCA—the Fishing and Aquaculture Directorate) of SAG has management authority over marine turtles and all other aquatic (marine, riverine and lacustrine) resources. On the Pacific Coast, operational authority for marine turtle management has been mandated to the *Comisión de Verificación y Control Ambiental del Golfo de Fonseca* (CVC-GOLF—the

Comission for Verification and Environmental Control of the Gulf of Fonseca), with DIGEPESCA responsible for implementation and enforcement of the regulatory regime (M. Rodriguez, *in litt.*, 24 June 2005). The *Departamento de Áreas Protegidas y de Vida Silvestre* (DAPVS—the Department for Protected Areas and Wildlife) of the *Administración Forestal del Estado, Corporación Hondureña de Desarrollo Forestal* (AFE-COHDEFOR—State Forestry Administration, Honduran Corporation for Forestry Development) is responsible for regulating and managing terrestrial wildlife resources, including those in protected areas. Other governmental agencies have responsibility for implementing mandates established through the membership of Honduras in various multilateral environmental agreements. For example, the *Dirección General de Biodiversidad* (DiBio—the Biodiversity Directorate) of the *Secretaría de Recursos Naturales y Ambiente* (SERNA—the Secretariat for Natural Resources and the Environment), established in 1997, is responsible for implementing the Convention on Biological Diversity (CBD) and other international agreements affecting marine turtles and natural resources in general.

The designated management authority for CITES is SAG. CITES Scientific Authority responsibilities are shared between DiBio; DIGEPESCA; DAPVS; the biology department of the *Universidad Nacional Autónoma de Honduras* (UNAH—the National Autonomous University of Honduras); the *Escuela Nacional de Ciencias Forestales* (the National School of Forestry Science) and the *Escuela Agrícola Panamericana de El Zamorano* (the Pan-American Agricultural School of Zamorano) (S. Midence, DiBio, *in litt.*, 24 May 2005).

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective

Exploitation of marine turtles in Honduras dates back centuries to well before the arrival of Columbus. Carr *et al.* (1982) reported that, although some Hawksbill Turtles were killed for their shell, by far the heaviest pressure on turtles in Honduras was from incidental catch in shrimp trawls; all shrimpers that they interviewed reported catching Green Turtles, Loggerheads and Hawksbill Turtles with “some regularity”, and although no figures were available, turtles appeared to be taken “wherever they [were] found”. Cruz and Espinal (1987) described in detail the organization and operation of the shrimp and lobster fleets based in the Bay Islands, which caught large numbers of marine turtles. Green Turtles were most frequently captured in the shrimp trawls and, because the meat was valuable, were frozen or kept alive until return to port, when the captain and crew would share the meat, either for sale or their families’ consumption. After the Green Turtle, the Loggerhead was most frequently taken in the shrimp trawls but, because its meat was not of any value, these turtles were returned to the sea either alive or dead.

Cruz and Espinal (1987) interviewed, in 1986 and 1987, the Misquito divers employed by the lobster fleet to capture lobsters (using snorkel or, more recently, scuba gear). The divers also caught Hawksbill Turtles. They said that some boat captains bought the Hawksbill shell from the divers and offloaded it prior to arriving in port so as to avoid the authorities who sometimes inspected the boats; however, the divers took most of it back to their communities after a return to port, sometimes along with frozen Hawksbill meat, which they shared with family and friends. Based on these interviews, Cruz and Espinal recorded that each lobster trip came back with a minimum of one and maximum of 10 Hawksbill Turtles, captured between 20–25 divers per boat. Extrapolating

from these figures and an estimated 70 boats at that time, one Hawksbill Turtle caught per trip would be 840 per year, while five per trip would lead to 4200 being caught. They estimated that ca. 5000 Hawksbill Turtles were taken in the lobster fleet of 70 boats in the period 1986–1987 and that the lobster fleet was possibly responsible for 95% or more of the total captures of Hawksbill Turtles in Honduras.

Cruz and Espinal (1987) reported that, in the Bay Islands, only Green Turtle meat was in demand on the local market, as it sold for less than beef, chicken and pork imported from La Ceiba. In addition, however, the other organs were consumed, including the heart and intestines. Hawksbill meat was consumed only at the subsistence level and there was no consumption of Loggerheads; turtle eggs were consumed at the subsistence level, but there was no marketing of them.

Cruz and Espinal (1987) noted that the trade in Hawksbill shell in the Bay Islands had a long history and that the captains of the fishing boats were the primary intermediaries through buying it directly from the Misquito divers. They identified the centres of trafficking in Hawksbill shell to be the coastal communities of Mosquitia, Guanaja, Roatán and La Ceiba. Because Guanaja was an important stop-over site for the shrimp and lobster fleets, they estimated that half of the trade in Hawksbill shell was concentrated there. The commercial use of Hawksbill shell also occurred in Utila but on a smaller scale than at any other site on the three main islands, possibly because there were fewer tourists there; however, in 1986 there were several buyers of Hawksbill shell.

In Utila and Guanaja, Cruz and Espinal (1987) encountered three to five fishers deploying turtle nets in bays and estuaries where the turtles came to forage. They estimated catching a turtle a day from June to August. In Roatán, they estimated that ca. 10 individuals were involved in the same activity, along with the Garifuna, along the coast. They estimated that, amongst all these fishers, 250 Green Turtles were captured from June to August, during the period 1984–1987.

On the island of Roatán, Hawksbill Turtles were also captured by subsistence fishers taking lobsters, conches and other reef animals and the trade in Hawksbill scutes was active. In addition, although most of the hotels warned their guests not to fish with spear guns on the reef or destroy live animals, they permitted the exhibition and sale in their hotels of articles made by local craftspeople out of Hawksbill shell. They indicated that the number of craftspeople working with Hawksbill shell varied with demand, but they estimated that it was no more than 15 individuals who were involved regularly in this activity. They further reported that the people involved were increasingly cautious owing to the fact that the local police had not only confiscated Hawksbill shell and products but had also imposed fines that were arbitrarily set.

Cruz and Espinal (1987) reported that the trade in Hawksbill shell in the Bay Islands appeared to have diminished in the previous two years and moved towards the Misquito Coast as a result of the inspectors and police operating in the ports of Guanaja.

Cruz and Espinal (1987) also reported that the meat of Loggerheads was consumed in some Garifuna communities and that the eggs of all marine turtles were consumed year-round in all regions, including the Mosquitia. They noted that during the preceding five years, during the nesting season, female turtles had been observed killed on the beach for the purpose of extracting their eggs and that the Misquito divers and crew on the shrimp boats excavated nests to consume the eggs locally. The only product from the Leatherback that was used was the eggs, which were consumed locally and sold. Finally, Green Turtle meat was eaten and turtle soup advertised in local eateries and restaurants in cities along the coast.

Recent (since 1992) exploitation

According to Molinero (2002), legal consumption of marine turtles, particularly Green Turtles, has continued along the Caribbean coast of Honduras on the basis of the indigenous take exemption that was formalized through ratification by Honduras of ILO Convention N° 169. Misquitos take Green and Hawksbill Turtles during lobster fishing in the Caribbean and the Garifuna in Sangreleya (Colón) fish for Green Turtles for consumption in their community. There is no control on this exploitation by the government and no records of the numbers of marine turtles that are killed or consumed.

Chacón (2002) reported on the results of market surveys and site visits undertaken by RCA in partnership with the Wider Caribbean Sea Turtle Conservation Network (WIDECAS) during the period 2000–2002. These surveys found widespread marketing of marine turtle products in the country, as discussed below.

Eggs. The collection of marine turtle eggs for human consumption is intense on the Caribbean and Pacific coasts of Honduras. Turtle eggs are a basic food item of the Mestizo, Garifuna and Misquito communities along the Caribbean coast and, as in other Central American countries, they are more widely consumed by the general population primarily because they are considered to have aphrodisiac properties. The market surveys by RCA and site visits found marine turtle eggs being sold in bars (*cantinas*), seafood restaurants, markets and soccer stadiums, where they are prepared in a mix of chilli, salsa, onion and other condiments; they were always found in businesses selling seafood. In Tegucigalpa, marine turtle eggs were sold at the stadium during National League soccer games. Chacón notes that this profile of egg consumption coincides with that reported by Groombridge and Luxmoore (1989) and, thus, provides evidence that efforts to dissuade egg consumption have had little effect over the course of nearly two decades.

Hawksbill shell. Of the 31 establishments that were found selling marine turtle products in the five towns that RCA surveyed, 29 were dedicated solely to the sale of Hawksbill articles and 27 sold these products openly; the other two shops sold commercially produced turtle cream and pure turtle oil. One shop that no longer sold Hawksbill products is located at the Golosón airport and has not sold Hawksbill products since the Environmental Prosecutor of La Ceiba confiscated Hawksbill products worth 800 US dollars (USD800) from it in 1998; a second shop that still sold Hawksbill shell products also reported having had items confiscated from it in the past. Shopkeepers selling Hawksbill shell products named a number of different towns along the Caribbean coast as the source of these products, including Tela and La Ceiba. Chacón (2002) further reports that vendors selling Hawksbill shell products and belonging to the *Asociación Nacional de Artesanos Hondureños* (ANAH—National Association of Honduran Handcrafters) are authorized by the Association to sell this type of product.



Credit: Didier Chacón/ANAI

Moisturizing lotion containing turtle oil, found on sale in Honduras.

Meat. Chacón (2002) reports that, in addition to Green Turtle meat for human consumption, marine turtle meat is occasionally used as bait in fishery operations along both the Caribbean and Pacific coasts: bodies and entrails are used as bait in lobster baskets. In addition, he reported that the systematic use of the Green Turtle is gaining importance, especially in the foraging areas in the north-east of the country, where some fishers specialize only in taking Green Turtles. Surveys were undertaken in four coastal communities along a 40-km stretch of coast in the Municipality of Iruya, Department of Colón. The men taking Green Turtles are members of the Garífuna community, some of them quite experienced fishers and most working seasonally on the fishing fleets operating out of the Bay Islands, while others are farmers or vendors of basic products. They set nets for turtles from March to September, with a slump in July when the fishers leave to work on the shrimp boats. According to interviews with the fishers and other locals, turtles are used primarily for their meat; however, some communities use the whole turtle. The meat is sold throughout the communities from the moment that the turtle is butchered, and one turtle can yield 30–55 kg of usable products, primarily meat, viscera and, in some cases, the lower plastron (calipee), which is salted or smoked over the hearth to be consumed in soup about two to three months later. In interviews, the Garífuna women indicated that Green Turtle meat was consumed by everyone except those with anaemia, as popular belief is that it is not healthy in such circumstances; this contradicts practices elsewhere in Central America, where the meat is considered particularly nourishing for people with ailments, including anaemia.

International trade

Historical perspective

CITES trade statistics derived from the UNEP-WCMC CITES Trade Database record very little international trade in marine turtles from Honduras during the first 15 years of the treaty’s operation. There was no CITES-reported trade in marine turtles from Honduras during the period 1975–1979 and, with the possible exception of 235 unspecified items and 61 Hawksbill Turtle carvings recorded in 1980, very little such trade from 1980 until 1993. All the reported trade was to the USA and most items were recorded as seized on entry.

Groombridge and Luxmoore (1989) characterized CITES-reported exports as “trivial” in comparison with the volume of exports of Hawksbill shell recorded in Japanese Customs statistics as imported from Honduras during the 1980s. These increased dramatically in 1980 and then dropped to nil in 1986, following the accession of Honduras to CITES in 1985, and remained at nil in subsequent years up to the closing of Japan’s import market for Hawksbill shell in January 1993.

Japanese imports (kg) of Hawksbill Turtle shell, 1970–1992, from Honduras, as recorded in Japanese Customs statistics

Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
	0	0	0	316	0	38	0	71	9	9	1132	481
Year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Total
	636	1886	2463	2217	0	0	0	0	0	0	0	9258

Sources: Milliken and Tokunaga, 1987; H. Kiyono, TRAFFIC East Asia-Japan Office, *in litt.* to TRAFFIC International, 29 July 2002.

Groombridge and Luxmoore (1989) noted that the sharp increase in Japanese imports from Honduras coincided with a decrease in declared exports from neighbouring Nicaragua. They noted, however, that some of the substantial catch of marine turtles by Honduran fishers suggested in these statistics may also have taken place in Nicaraguan waters. Cruz and Espinal (1987) suggested the same, noting that the divers and boat captains working on the lobster boats admitted that the resource had diminished virtually completely in Honduran waters and that after 1980–81 the majority of the boats left to fish in international waters and those of neighbouring countries, such as Nicaragua or Colombia, with or without authorization. Cruz and Espinal (1987) also reported that various boat captains complained about incursions by boats from the Cayman Islands in Honduran waters capturing turtles from May to January.

Cruz and Espinal (1987) reported that articles made of Hawksbill shell from El Salvador and Nicaragua were on sale in souvenir shops in Honduras and that unworked Hawksbill scutes were traded as contraband to the Cayman Islands from the Bay Islands and La Ceiba.

Recent (since 1992) international trade

Although prior to 1992, most of the marine turtle items recorded in CITES statistics as originating in Honduras were carvings (in small numbers), much of the recorded trade for the period 1993–2004, inclusive, was in marine turtle eggs and meat, in small quantities. All this trade was reported solely by the USA, as the importing country, and most of the items, including one Green Turtle carapace in 2003, were recorded as having been seized on entry. Particularly noteworthy exceptions are the recorded import by the USA of eight Hawksbill carapaces and 44 kg of Cheloniidae meat in 1997. These records suggest a continued trade in marine turtle products from Honduras, no doubt by Hondurans living in or visiting the USA, an unknown proportion of which undoubtedly escapes detection by the US authorities.

Chacón (2002) reported, based on the interviews by RCA with Honduran shopkeepers selling Hawksbill shell products, that foreigners were, along with nationals, purchasers of these products and that Nicaragua was mentioned by several as the source of the Hawksbill shell items on sale. Further, a shopkeeper in San Pedro de Sula, who was selling the largest quantity of Hawksbill products of all the shops surveyed (87 pieces in total) reported buying the surplus from a factory that exports Hawksbill shell products to the Cayman Islands. A vendor at another shop indicated that sales increased at the end of the year, as Hondurans visiting from the USA for the Christmas holidays liked to take back Hawksbill products with them. One vendor, however, mentioned that some tourists refused to buy Hawksbill articles because they respected animal rights.

Enforcement issues

Cruz and Espinal (1987) concluded from their investigations that the legal protections in place for marine turtles at the time of their writing represented no guarantee for the future survival of marine turtles in the Atlantic of Honduras. The findings presented by Chacón (2002) would appear to echo these concerns, as marine turtle exploitation and trade, the latter presumably illegal, are intensive and widespread in the country.

Chacón (2002) reported that the RCA project did not unearth any examples of judicial procedures regarding marine turtle infractions in Honduras and that only confiscations had occurred. Whether this is a result of inadequacies in the penalties established in the fisheries law and its implementing instruments or in the operation of the judiciary is not clear from the information that has been reviewed for this study.

Marine turtle management

Management of exploitation

There has been no stock assessment in the usual sense for any species of marine turtle in Honduras and little basis to determine the contemporary status or trend of marine turtle populations in the country. Although exploitation of marine turtles is regulated by law and these species are, for the most part, considered protected, the exemption for indigenous take appears to be regulated only in relation to a closed season. That the indigenous fishery is unrestricted with regard to marine turtle size, leaving large juvenile and adult turtles (the most important age classes to protect in order to maintain population numbers) vulnerable and the illegal take of turtles and eggs persists at unknown levels suggests that the current regime fails to achieve management and is inconsistent with the principles and practice of sustainable use.

Other than a project in the Gulf of Fonseca on the Pacific Coast and another in the Mosquitia on the Caribbean coast, where DIGEPESCA is actively involved in patrols and other nest protection efforts, there does not appear to be much monitoring or control of either legal or illegal activity. The fact that no records exist of the nature and levels of exploitation of marine turtles other than through these few projects, and that extensive exploitation and trade in marine turtle products are known to occur throughout the country, leads one to conclude that there is, in practice, little marine turtle management in the country. The legal framework for marine turtle management remains confused and fragmented and no national marine turtle strategy or plan exists, suggesting the need for a major concerted effort to develop a viable management programme for marine turtles.

Species research and conservation

Carr *et al.* (1982) reported that no research was being undertaken on marine turtles and particularly regretted that there was no information from the Mosquitia, which they noted was “unsurveyed and badly needs attention”. Cruz and Espinal (1987) reported on the survey work that had been undertaken in Honduras during the 1980s in an effort to assess marine turtle nesting and identify the most important nesting beaches. These surveys employed different methods, including aerial surveys, land surveys (including by foot and by boat) and other site visits. In April 1987, these efforts benefited from the assistance of students and professors from the Biology Department at UNAH and volunteers. In addition, Cruz and Espinal (1987) reported on the results of an extensive series of first-time interviews that they conducted with the crews of the shrimp boats and Misquito divers on the lobster boats in an effort to estimate the extent of incidental capture of turtles in the fleet in the Bay Islands and on interviews conducted in communities along the coast of the Mosquitia. With the exception of the market surveys by RCA in 2000 and 2001, there does not appear to have been very much field investigation in relation to marine turtles since this and Espinal’s earlier (1984) reports to the Western Atlantic Sea Turtle Symposia. Galindo (1997) reports that UNAH has undertaken investigations of nesting and at one time undertook a tagging programme for turtles in the Mosquitia, which was discontinued owing to a lack of funds. The only systematic marine turtle nesting data along the Honduran coast appear to relate to Leatherback nesting in the Mosquitia, where RCA reports ca. 40 nests (ca. 10 females) are laid, principally between Iriona and Plaplaya, between March and June (RCA, 2001).

In addition to the UNAH, various local groups have been involved in marine turtle research and conservation, including the *Comité para la Defensa y Desarrollo de la Flora y Fauna del Golfo de Fonseca*

(CODDEFAGOLF); staff of the Cayos Cochinos Biological Reserve; Bay Islands Conservation Association (BICA); the *Fundación Capiro, Calentura, Guaimoreto* (FUCAGUA); and the NGO MOPAWI, dedicated to development of the Mosquitia region (RCA, 2001). The longest-running and most prominent of the projects on the Caribbean coast has been conducted by MOPAWI since 1992, with the support of DIGEPESCA. Its primary focus has been engaging local indigenous communities in the protection of marine turtles and turtle nests during the nesting season as an alternative to the consumption of marine turtles and turtle eggs, which are part of the traditional diet of the indigenous communities living in the area. In addition to increasing awareness of marine turtle conservation, MOPAWI is involving communities in surveillance and protection of nests, including the transfer of nests to an enclosure where they can be protected until hatching. Specifically, MOPAWI supports more than 100 inhabitants of Plaplaya in a protection programme that involves the patrol of 12 km of beach, along with nest protection and monitoring responsibilities (www.tve.org/ho/doc.cfm?aid=1299, viewed 22 December 2005).

As the focal point for WIDECAS in Honduras, MOPAWI co-ordinates a national marine turtle conservation network to facilitate and promote information exchange, adoption of best practices, and integrated conservation action.

Habitat conservation

Cruz and Espinal (1987) identified a number of habitat impacts on marine turtles in Honduras, including the destruction and degradation of reefs from extraction of coral for construction and sedimentation, destruction of mangroves, occupation of nesting beaches, waste water and solid waste on reefs, and fishing fleet traffic. More recently, Arrivillaga and García (2004) report that coral reefs in the Bay Islands are threatened by rapid development of the coastal areas, which is causing sedimentation and other watershed management problems, and that poorly installed and maintained septic systems are polluting groundwater and leaching nutrients into the reef areas; an additional problem is physical damage from inexperienced divers and boat anchors resulting from the very high level of diving activity around the Bay Islands. With the rapid tourism development in the Bay Islands, loss of nesting habitat through construction and artificial lighting is presumed also to be a problem for marine turtles.

Honduras has an extensive system of protected areas in different management categories with different legal statuses (SERNA, 2001). According to DiBio, this system includes 72 legally established protected areas and an additional 40 that have been proposed but have not yet been formally approved (www.serna.gob.hn, viewed 26 April 2005). Of these, 12 are marine protected areas along the Caribbean coast (Burke and Maidens, 2004). These include the Bay Islands National Park, established in 1997, which is the only national marine park on the Caribbean coast, and the Cayos Cochinos Archipelago, designated in 1993 and 1994 but without a management category, which covers 489 km², including the cays and the surrounding area to five nautical miles and is among the important reef zones of the southern Meso-American Barrier Reef System (Arrivillaga and García, 2004). The Cayos Misquitos, Cayos Zapotillos and Caratasca (covering 120 000 ha and known to harbour marine turtles and manatees *Trichechus manatus*) have been proposed as biological reserves and an additional eight marine reserves have been proposed in the Bay Islands: Barbareta, Guanaja, Isla de Utila, Islas del Cisne/Swan Islands, Ragged Key, Sandy Bay West End, Teca and Turtle Harbour (www.serna.gob.hn, viewed 26 April 2005).

In addition, at least one marine turtle nesting beach, Plaplaya, occurs within the Rio Plátano Biosphere Reserve, which encompasses one of the largest protected areas in Central America (the website of SERNA records it as

815 000 ha) and was established as a United Nations World Heritage Site in 1982. It includes prime examples of lowland tropical rainforest, coastal lagoons, undisturbed beaches, mangroves, grasslands and patches of pine savannah. It is the home of members of the Misquito and Pech, as well as Garifuna, ethnic groups, who live in small communities on the coast and along the major rivers.

The Janet Kawas National Park in Atlántida province near the city of Puerto de Tela was established in 1994 and 1995 and designated as a Ramsar site in 1995. It covers 78 150 ha and supports 374 species of marine plants and animals, including marine turtles. The Hawksbill Turtle has been recorded nesting on beaches within the park (www.ramsar.org). The Ramsar site description notes a number of threats to the area from human activities, including over-fishing of several marine species, poaching and commercial hunting, which, in addition to habitat disturbance, had led to the extirpation of several large mammal species from the park.

The Punta Izopo Wildlife Refuge, also in Atlántida, east of Puerto de Tela, was designated as a Ramsar site in 1996. It is currently under review as a wildlife refuge (www.serna.gob.hn, viewed 26 April 2005). The current Ramsar site description indicates that this area covers 11 200 ha and that, in addition to remnants of original humid tropical forest and other terrestrial habitats, it incorporates coastal (ca. 14 km of coastline) and marine environments of importance for marine turtles (www.ramsar.org); all four Caribbean marine turtle species have been reported to occur there.

Education and public awareness

Cruz and Espinal (1987) reported that there was no environmental education focusing on the protection of marine turtles along the Atlantic coast. They undertook the first experimental workshop on environmental education with primary school teachers in Utila in the Bay Islands focusing on marine turtles. Also along the Misquito coast, project participants organized lectures in primary schools in various communities and participated in a number of radio programmes focusing on marine turtles. Education and outreach activities are being conducted by MOPAWI and BICA.

Constraints to marine turtle conservation and management

Molinero (2002) notes a number of constraints to effective management of marine turtles in Honduras, namely:

- inadequacies in the legal framework: the *Ley General de Pesca*, which dates from 1959, for example, is obsolete and inadequate in addressing current marine turtle management issues;
- lack of knowledge of marine turtles, including in fishing communities where there is little information on, and no training in, marine turtle management;
- limited human resources: there are few biologists working on marine turtles in the country, and there is only a small number (ca. 25 according to Molinero) of *guarda recursos* in Honduras who have been trained in Honduras and Costa Rica in marine turtle management;
- lack of other trained personnel;
- inadequate funding for field studies and conservation projects: the sources of funding are oriented towards more general or integrated projects rather than specifically marine turtles; and
- lack of public and political support: there is no permanent programme to enforce marine turtle protections other than surveillance regarding the use of TEDs by the shrimp fleet.

Galindo (1997) also cites the inadequate legal framework for managing marine turtles in Honduras and suggests the adoption of a specific law for marine turtles that covers all the relevant issues; in doing so, he notes a suggestion made by a staffperson with DIGEPESCA that a total ban on the exploitation of marine turtles would provide for more and better control and protection, particularly in the light of insufficient staffing for monitoring and inspection.

Summary and recommendations

Marine turtles are protected in Honduras through various pieces of legislation, but an important exemption for exploitation by indigenous peoples that is essentially uncontrolled and unmanaged, in addition to extensive trade in Hawksbill shell products and marine turtle eggs, raises the question as to whether there is, in practical terms, any management of marine turtles in the country. There are no quantitative data on marine turtle exploitation, no population monitoring programmes, no information on population status or trends. Exploitation and commercial use of marine turtle products are widespread throughout the country. Although DIGEPESCA, the primary statutory management authority, is taking certain steps, both administrative and operational in some areas, and there have been confiscations of marine turtle products in various places in the country, the investment of human and other resources in management at the field level, in monitoring and enforcement at all levels, and in education and awareness to promote compliance with prevailing law, are clearly seriously inadequate in relation to the task at hand. Although there are some innovative projects, led by NGOs and involving community groups (notably MOPAWI), aimed at redressing the impact of exploitation pressure, these are localized in nature and, thus, do not address the management issues at the fundamental level.

In accordance with the FAO Code of Conduct for Responsible Fisheries (FAO 1995), an explicitly precautionary code, which states that “the right to fish carries with it the obligation to do so in a responsible manner so as to ensure effective conservation and management of the living aquatic resources”, the management of marine turtles in Honduras should seek to maintain the availability of the resource “in sufficient quantities for present and future generations in the context of food security, poverty alleviation and sustainable development”. Management measures should, *inter alia*, prevent over-fishing, rehabilitate depleted populations, incorporate the best scientific evidence (taking into account traditional knowledge, as well as relevant environmental, economic and social factors), assign priority to research and data collection (including at international scales), and promote environmentally safe fishing gear and practices in order to protect both the target resource and the ecosystems upon which it depends.

Among the fundamental components of any regime aimed at management of wild populations are: restrictions on exploitation that are consistent with the species’ biological requirements; a monitoring programme—systematic, ongoing, and rigorous collection and review of data—either on the specifics of exploitation or of wild populations so as to discern trends that can inform management; mechanisms to identify, monitor and address other threats to the species being exploited, so that these threats can be factored with exploitation to assess what level of overall mortality the species might sustain; and a high level of compliance (sometimes achievable only through vigorous enforcement) with the restrictions put in place to ensure that management goals are achieved.

1. A National Strategy and Action Plan for the Recovery of Marine Turtles in Honduras, drawing on expertise and input from all stakeholders including regional networks (e.g. WIDECAS and RCA), should be developed as a first step in clarifying the conservation status of marine turtles in Honduras and the threats that

they face, identifying gaps in essential knowledge and policy for conservation and management, and agreeing on priority actions for addressing these gaps and promoting the conservation and recovery of these animals.

2. In support of the development of a national marine turtle strategy and scientifically based management, a comprehensive frame survey should be undertaken to quantify and characterize exploitation and use of marine turtles in the Caribbean sector of Honduras. The survey should document the full range of extractive uses of marine turtles, including:
 - the collection of eggs, hunting on nesting beaches, and take of turtles at sea;
 - numbers of individuals (fishers or others) actively involved in taking turtles or collecting eggs, including the types of gears involved, and the extent to which marine turtle landings result from incidental or opportunistic take in other fishing operations for from a targeted fishery; and
 - exchange, processing and marketing of turtles, eggs, and turtle products.

The investigation should include the take of marine turtles by the lobster and conch fleets operating out of the Bay Islands and assess the extent to which this take occurs in waters outside the jurisdiction of Honduras and in the waters of other countries (e.g. Belize, San Andrés Archipelago, Colombia, Nicaragua).

Finally, the investigation should also assess:

- the importance of the marine turtle resource for the livelihoods of individuals and communities, i.e. as a source of protein and cash income; and
- the extent to which marine turtle exploitation relies on the indigenous-take exemption in prevailing law, and the extent of illegal exploitation.

It should be noted that this information is essential to the development of an effective marine turtle management strategy but also that such a project will also provide an opportunity to engage fishers and fishing and other coastal communities in discussions about the conservation and management needs of marine turtles.

3. A thorough, participatory review of the legal situation of marine turtles in Honduras should be undertaken to include all pieces of legislation, including departmental and ministerial resolutions, with the purpose of developing a single document that clarifies the legal status of marine turtles, including relevant prohibitions and the penalties that apply for infractions for such prohibitions. This review should clarify the authorities responsible for different aspects of marine turtle management. The fundamental rules and authorities, including those applying to the marketing of marine turtle eggs and Hawksbill shell products in particular, should be widely circulated within government and to all sectors, through various media, so as to educate consumers and promote compliance with the law.
4. The legal exemption for subsistence exploitation should be reviewed in consultation with indigenous groups, municipalities and others who share management responsibility, in the context of an effort to develop a management plan for marine turtles that balances the recovery of marine turtle populations with cultural traditions and socio-economic realities. Essential to that process should be implementation of a system to record the levels and nature of marine turtle exploitation as a fundamental component of any management programme.

5. Legal exploitation of marine turtles should be restricted in reflection of their biological parameters, take into account their depleted status and aim, at a minimum, to prevent any further population declines. Any exploitation regime promoting population recovery and maintenance should be established on sound management principles and practice, which should include the following:

A. Bringing exploitation in line with biological principles, including:

- complete protection of nesting females at all times;
- complete protection of all species during the primary nesting season, 1 March to 30 November;
- complete protection of the Leatherback, which occurs in the country only as an adult, and typically an egg-bearing female;
- maximum size limits, based on length (which is easier to undertake in the field) rather than weight, so as to safeguard large juveniles and adults;
- a conservative limit on the numbers of animals that may be exploited, such as through quotas and/or licences for taking turtles, or eggs that may be collected; and
- a requirement that capture or collection limits be based, if not on a stock assessment, on data derived from national processes and research activities, and that, as far as practicable, these data be collected in such a way as to be compatible with the goal of assessing stocks throughout their full geographic ranges;

B. Managing legal exploitation through an enforceable, high-compliance monitoring programme aimed at establishing trends and monitoring these over time. A national programme to monitor marine turtle exploitation should document comprehensively and systematically, and in a manner allowing such records to be analysed and compared over time, the following:

- the number of individuals taking marine turtles or collecting marine turtle eggs, and by what means;
- the number, size and species distribution of the marine turtles landed and the locality where the animals were taken;
- the number of eggs/nests collected and the sites of collection;
- catch-per-unit-effort; and
- the disposition of the marine turtles landed or eggs collected, including value of the animal and/or products if sold or traded.

In further support of reliable monitoring of the fishery, the following should be considered as requirements for participation:

- that ownership identification tags be installed on approved gear (e.g. nets);
- that turtles be landed alive or intact; prohibiting, for example, the use of spear guns and extended net sets that can result in drowning and providing for reliable recording and verification of turtle landings; and
- that the licensing process include as a criterion full participation in the monitoring programme.

C. Establishing a systematic marine turtle monitoring program that will:

- document distribution and abundance of local populations;
- identify major nesting grounds and foraging areas;
- designate Index nesting beaches and Index foraging grounds, and document the numbers of marine

- turtles occurring in these over time;
- manage data records such that statistically significant trends in abundance can be identified and inform management; and
 - identify and monitor threats and other factors influencing marine turtle survival.
6. Efforts should be made to quantify and reduce, as necessary, levels of incidental catch of marine turtles in fishing operations.
 7. The capacity of DIGEPESCA and other agencies, such as DAPVS, the police and Customs, to participate in nesting beach patrols, wildlife trade controls, and other marine turtle management and wildlife trade control efforts should be strengthened, not only through additional personnel, but through the regular provision of training opportunities and technical materials to support their efforts.
 8. A major marine turtle enforcement campaign should be implemented, to include a nation-wide market survey, following on from that of RCA reported by Chacón (2002), to inventory all establishments marketing marine turtle products and, subsequently, to confiscate all marine turtle products. Follow-up visits should be made to all establishments over an extended period of time to ensure compliance with the law. Communications materials, such as those developed in Costa Rica, should be produced and widely disseminated in order that the need for marine turtle conservation and broader wildlife conservation penetrate the consciousness of the many communities in the country.
 9. The efficacy of existing protected areas in providing for the full range of habitat management needs for marine turtles should be reviewed, along with the need for additional habitat management measures in areas currently not falling within protected areas, such as important nesting beaches or foraging areas that are or may be subject to development or other pressures.
 10. Increased resources should be made available to community-level initiatives seeking to enhance the livelihoods of coastal peoples while safeguarding the marine turtle resource and preventing the further decline of local and regional stocks.
 11. Financial, logistical and political support and encouragement is recommended to assist in the development and implementation of a modern, scientifically based conservation and management regime, including for the revision of the legal framework, scientific studies, monitoring programmes, enforcement capacity, and institutional strengthening of government agencies whose mandate includes marine turtles and their habitats. Both private and public foreign investment in the fisheries and tourism sectors in Honduras should take account of the increased responsibilities—and costs—to DIGEPESCA, DAPVS and other government agencies in managing for sustainability the resources affected and the broader biodiversity impacts that may ensue.
 12. Financial, logistical and political support and encouragement should also be extended to active NGO and community-based research and monitoring efforts. Building on the success of existing, pioneer initiatives is encouraged.

References

- Anon. (2005). CITES Document SC53 Doc. 31. Working document of the 53rd meeting of the CITES Standing Committee. Accessible at www.cites.org. Viewed 12 December 2005.
- Arrivillaga, A. and M.A. García. (2004). Status of coral reefs of the Mesoamerican Barrier Reef Systems Project region and reefs of El Salvador, Nicaragua and the Pacific coasts of Mesoamerica. Pp. 473–491. In: C. Wilkinson, (Ed.). *Status of Coral Reefs of the World: 2004*, II. Australian Institute of Marine Science. www.aims.gov.au/pages/research/coral-bleaching/scr2004.
- Burke, L. and J. Maidens (2004). *Reefs at Risk in the Caribbean*. World Resources Institute. 80 pp. reefsatrisk.wri.org
- Carr, A., A. Meylan, J. Mortimer, K. Bjorndal and T. Carr. (1982). *Surveys of sea turtle populations and habitats in the Western Atlantic*. NOAA Technical Memorandum NMFS-SEFC-91. US Department of Commerce.
- Chacón, D. (2002). *Diagnóstico sobre el comercio de las tortugas marinas y sus derivados en el istmo centroamericano*. Red Regional para la Conservación de las Tortugas Marinas en Centroamérica (RCA), San José, Costa Rica. 247 pp.
- Cruz, G.A. and M. Espinal. (1987). National Report for Honduras. 11 October 1987. Prepared for the Second Western Atlantic Turtle Symposium, 12-16 October 1987, Mayagüez, Puerto Rico. WATS2 047. 39 pp. + annexes. Unpublished.
- Espinal, M. (1984). National Report for Honduras. Submitted 29 December 1982. Pp. 221-224. In: P. Bacon *et al.* (Eds). *Proceedings of the Western Atlantic Turtle Symposium, 17-22 July 1983, San José, Costa Rica*, III. Appendix 7. University of Miami Press, Florida.
- Galindo, M.G. (1997). Legislación nacional e internacional que afecta a las tortugas marinas en Centro América. Centro de Derecho Ambiental de Honduras (CENDA), Tegucigalpa. 12 pp.
- Groombridge, B. and R. Luxmoore. (1989). *The Green Turtle and Hawksbill (Reptilia: Cheloniidae): World Status, Exploitation and Trade*. Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Lausanne, Switzerland. 601 pp.
- Meylan, A.B. (1999a). Status of the Hawksbill turtle (*Eretmochelys imbricata*) in the Caribbean region. *Chelonian Conservation and Biology* 3(2):177–184.
- Meylan, A.B. (1999b). International movements of immature and adult Hawksbill turtles (*Eretmochelys imbricata*) in the Caribbean region. *Chelonian Conservation and Biology* 3(2):18–194.
- Milliken, T. and H. Tokunaga. (1987). *The Japanese Sea Turtle Trade 1970–1986*. A special report prepared by TRAFFIC (Japan). Center for Environmental Education, Washington, DC. 171 pp.
- Molinero, C. (2002). *Red Nacional para la conservación de las tortugas marinas en Honduras*. Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of the Marine Turtles of the Lesser Antilles, Central America, Colombia and Venezuela. Dated 7 October 2002.
- RCA (Red Regional para la Conservación de las Tortugas Marinas en Centroamérica). (2001). *Diagnóstico regional y planeamiento estratégico para la conservación de las tortugas marinas en el istmo centroamericano*. 134 pp.
- SERNA. (2001). *Estrategia Nacional de Biodiversidad y Plan de Acción*. Dirección General de Biodiversidad, Secretaría de Estado en los Despachos de Recursos Naturales y Ambiente (SERNA). 70 pp.

Nicaragua

Introduction

Situated in the middle of the isthmus, Nicaragua is the largest country in Central America. It enjoys two coasts, bordering the Pacific Ocean on the west and the Caribbean Sea on the east, that extend over 923 km and harbour an extraordinary richness of coastal marine biodiversity. The 550-km Caribbean coast includes large lagoons, abundant wetlands, coral reefs and mangroves and, lying off the coast, numerous cays and an extensive continental shelf, including the Miskito Bank. These areas are important as marine turtle nesting sites and foraging areas and have been reported to be the largest foraging ground in the entire Atlantic system for Green Turtles (Carr *et al.*, 1978). The nesting population of Hawksbill Turtles in the Pearl Cays is one of the largest remaining in the central-western Caribbean (Lagueux *et al.*, 2003).

Complementing the rich diversity of species and ecosystems found along the Caribbean coast of Nicaragua is a rich cultural diversity, which includes six ethnic groups—including the indigenous Miskitu, Sumu and Rama and ethnic Creole and Garifuna—who have for centuries depended on this biodiversity, and marine turtles in particular, for their sustenance and livelihoods. The Caribbean coastal lowlands are administered as two autonomous regions, the *Región Autónoma Atlántico Norte* (RAAN) and the *Región Autónoma Atlántico Sur* (RAAS), which together comprise ca. 50% of national territory. These were established by law in 1987 in recognition of the desire of the coastal inhabitants to exercise their rights to the land and natural resources in the region and to preserve their cultural identities and traditions. A small portion of the south-east Caribbean coast is administered as part of the Departamento Río San Juan.

Nicaragua has a long and well-documented history of exploitation of marine turtles for both subsistence and commercial purposes. Nietschmann (1979a) characterized the Miskitu inhabiting the coast of Nicaragua and adjacent Honduras as the foremost Amerindian turtling society in the Caribbean; as such, they are, or have been, effectively culturally dependent on Green Turtles. The Miskitu have also been involved in commercial fisheries for Green Turtles, including to international markets, since as early as 1633 (Parsons, 1962). This trade took on an industrial aspect in Nicaragua in the late 1960s, when turtle-processing plants were established to provide turtle meat, calipee, skin and oil to export markets. Exploitation of Hawksbill Turtles has always been driven more by commercial than subsistence factors (Nietschmann, 1981), but it, too, dates back to at least the end of the 17th century.

Groombridge and Luxmoore (1989) cited a range of threats to marine turtles in Nicaragua, the principal “undoubtedly” being exploitation of turtles and their eggs and incidental take, primarily by shrimp trawlers. Although some legal measures have been adopted over recent decades to protect marine turtles and reduce exploitation and incidental take, they have not been sufficient in managing a significant, economically important artisanal Green Turtle fishery that operates along the Caribbean coast of Nicaragua. This fishery, which subsided during the 1980s as a result of the large military presence, battles fought near communities (Lagueux, 1998), and emigration from the coast during the country’s civil war, resurged in the 1990s with migration back to the coast and the need of the inhabitants to function in a cash economy (Campbell, 2003). The only restriction on the fishery has, until February 2005, been a four-month closed season, and only in recent years has this been effective in prohibiting the landing of Green Turtles in the four major population centres on the coast; Green Turtles continue to be landed during the closed season in the coastal communities. There has been no effort by government management authorities to assess its impact on marine turtle populations.

Investigations of marine turtle exploitation along Nicaragua's Caribbean coast, including monitoring of the Green Turtle fishery, have been conducted since 1993 by Dr Cynthia Lagueux of the Wildlife Conservation Society (WCS) and colleagues as part of a marine turtle conservation programme implemented in collaboration with the *Ministerio del Ambiente y Recursos Naturales* (MARENA—the Ministry of Environment and Natural Resources). These efforts have documented the annual take of over 11 000 Green Turtles in this fishery (Lagueux, 1998), a level that had not been recorded since the 1970s (Nietschmann, 1973). Although the fishery probably affects Green Turtle populations originating from several nesting grounds in the Caribbean, the majority of turtles in the foraging aggregation in Nicaragua are produced at the Tortuguero (Costa Rica) rookery (Bass *et al.*, 1998), and it is the principal foraging site for Tortuguero adult females (Carr *et al.*, 1978; Lagueux, 1998; Campbell, 2003). This fishery thus poses a potentially significant management problem for the Tortuguero Green Turtle nesting population, one of the two largest in the world.

A new fisheries law and implementing regulations entered into force in Nicaragua in 2005 and incorporate a number of measures on behalf of marine turtles, including restricting the Caribbean Green Turtle fishery to subsistence use only. If enforced, these laws could significantly reduce the level of exploitation of these animals. However, jurisdictional questions arising from the autonomous status of the Caribbean sector of Nicaragua, the fact that federal authorities have little political influence in the region (Lagueux, 1998), and the fundamental importance of the artisanal fishery for the coastal inhabitants call into question whether this subsistence-use-only restriction can be effective as a management tool. The fact that marine turtles have long been a major source of protein and income for the ethnic communities inhabiting the Caribbean coast of the country is one of the most important aspects of the challenge of marine turtle conservation in Nicaragua (MARENA, 2001), one of the most complex wildlife management challenges in the Western Atlantic basin.

In addition to legal exploitation of Green Turtles, there is illegal exploitation of marine turtles along the Caribbean coast of Nicaragua, including of Hawksbill Turtles and egg clutches and Loggerheads and Green Turtles taken during the closed season. Most of the Green Turtle meat is sold in local communities and cities along the coast and Hawksbill products can be found throughout villages and cities along the coast, at the international and regional airports, in tourist and local markets in Managua, and in towns along the Pacific coast (C. Lagueux, WCS, pers. comm., 2005). According to Chacón (2002), Hawksbill products are traded to vendors in Honduras, El Salvador, Costa Rica and possibly other countries. Finally, incidental take in the shrimp and lobster fisheries and in gill-netting operations continues to be a problem for marine turtles in the Caribbean region of the country (Lagueux, 1998; Lagueux and Campbell, 2005).

A management plan for the conservation of marine turtles of the Nicaraguan Caribbean is currently being developed by WCS, in collaboration with MARENA, local and regional government agencies, local fishing communities and other civil society groups. Particularly noteworthy components of this plan are measures to improve management of the legal fishery for Green Turtles and eradicate illegal exploitation and trade of Hawksbill Turtles and their products (CITES-Nicaragua, 2002).

Summary of the status of marine turtles in Nicaragua

Four marine turtle species forage and nest along the Caribbean coast of Nicaragua. According to Lagueux and Campbell (2002a), Green Turtles occur along almost the entire coast wherever seagrass is present, “in very general terms, in the vicinity of Miskito, Man O' War, Tyra, Seal, Kings and Pearl Cays” and along the entire

coast when migrating to their nesting beach in Costa Rica. Hawksbill Turtles also occur over most of the Caribbean coast, wherever there are reefs and in largely the same areas as Green Turtles. Little is known of Loggerhead distribution; however, Loggerheads are captured in the Green Turtle fishery and are assumed to forage and migrate along Nicaragua's coastal waters (Lagueux, 1998; C. Lagueux, pers. comm., 2005). The Leatherback occurs only seasonally to nest.

Occurrence of marine turtles in Nicaragua

English common name	Scientific name	Occurrence
Loggerhead	<i>Caretta caretta</i>	F
Green Turtle	<i>Chelonia mydas</i>	N, F
Leatherback	<i>Dermochelys coriacea</i>	N
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	N, F
Kemp's Ridley	<i>Lepidochelys kempii</i>	A
Olive Ridley	<i>Lepidochelys olivacea</i>	A

Key: N=nesting; F= foraging; A=absent

The Hawksbill Turtle is the most important nesting species along the Caribbean coast of Nicaragua, with the most important nesting sites being in the Pearl Cays, located off the central coast, and at El Cocal beach on the south-east mainland coast of the country in the Departamento of Río San Juan (Lagueux *et al.*, 2003; Lagueux and Campbell, 2005). Lagueux *et al.* (2003) estimated the Pearl Cays Hawksbill nesting population to number between 85 and 165 females. El Cocal is also a nesting site for Leatherbacks and Green Turtles (the latter's nesting described as "very sparse" (Lagueux and Campbell, 2002a and 2005), while Loggerhead nesting has not been confirmed there (Lagueux and Campbell, 2005). Hawksbill nesting on the Caribbean coast occurs from April to November, with the peak nesting period between July and August (Lagueux *et al.*, 2003). Although Green Turtles are abundant as foragers, there is currently very little nesting by Green Turtles, and it occurs only in the south-east of the country, from late-May to the end of October (Lagueux and Campbell, 2005). Three major causes of marine turtle mortality have been documented by Lagueux and Campbell (2005) on the south-east coast: exploitation of nesting females and eggs, of Hawksbill and Green Turtles primarily; industrial shrimp trawling; and artisanal lobster and gill net fisheries.

In the absence of population data on marine turtles in Nicaragua, which have only begun to be systematically collected in recent years, catch data have been used to infer population trends. Lagueux (1998) found a 92% decline in the number of Hawksbill Turtles captured between the late 1960s to early 1970s and the mid-1990s, with all evidence pointing to a decline in populations rather than any reduction in fishing effort.

There are numerous published and unpublished reports of extra-territorial movements of marine turtles from Nicaragua. Carr *et al.* (1978) tabulated international tag returns from Green Turtles tagged at Tortuguero, Costa Rica, during 1956–1977, which indicated that the waters of Nicaragua, in particular the Miskito Bank area, are the principal feeding grounds for the Tortuguero nesting colony. Carr *et al.* (1982) reported that the recovery in Nicaragua of two tags that had been put on Green Turtles at Aves Island (Isla de Aves, Venezuela) was the first

evidence that the Miskito Bank may be a feeding habitat for two different major breeding populations of Green Turtles.

According to Lagueux (1998), Green Turtles caught off Nicaragua had been tagged in the Bahamas, Bermuda, Brazil, Cuba, USA (Florida), Grand Cayman, Mexico (Yucatán), Panama, and Venezuela; and two Loggerheads taken in Nicaragua had been tagged in Panama and Portugal (in the Azores). Nietschmann (1981) reported that a male Hawksbill Turtle tagged at Little Sandy Bay, Nicaragua, in 1972 was recaptured in 1974 at Almirante Bay, Panama, and a female Hawksbill tagged in the Miskito Cays, Nicaragua, in 1972 was recaptured five months later at Pedro Cays, Jamaica. Meylan (1999) cites several other sources (e.g. BJORNDAL *et al.*, 1985; 1993) in reporting that eight female Hawksbill Turtles tagged at Tortuguero, Costa Rica, between 1956 and 1988 were recaptured at various points (e.g. Miskito Cays, Rio Grande Bar, Tasbapune) in Nicaragua and that a female Hawksbill Turtle tagged at Buck Island, Saint Croix (in the US Virgin Islands), in 1990 was recaptured at Witties Cay, Miskito Cays, Nicaragua, in 1991. Finally, she reported that an immature Hawksbill Turtle tagged at Las Coloradas, Yucatán, Mexico, in 1990 was recaptured in the Miskito Cays, Nicaragua, in 1996. There have been additional captures in Nicaragua in recent years of Hawksbill Turtles tagged elsewhere in the region (C. Lagueux, WCS, *in litt.*, 13 June 2005).

Overview of the legal framework for marine turtle management

Membership in international and regional treaties

Nicaragua is not yet party to several of the most important international agreements relating to marine turtles, such as the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean

Membership of Nicaragua in multilateral agreements relating to marine turtles

Convention	Nicaragua
Cartagena Convention	24.03.1983 (S)
Protocol Concerning Specially Protected Areas and Wildlife (SPA)	No
Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region	24.03.1983 (S)
Protocol Concerning Pollution from Land-based Sources and Activities	No
Convention on Biological Diversity (CBD)	20.11.1995 (R)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	04.11.1977 (E)
Convention on Migratory Species (CMS)	No
Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	04.03.1997 (S)
MARPOL 73/78 (Annex I/II)	01.05.2001 (A)
MARPOL 73/78 (Annex III)	01.05.2001 (A)
MARPOL 73/78 (Annex IV)	01.05.2001 (A)
MARPOL 73/78 (Annex V)	01.05.2001 (A)
Convention on Wetlands of International Importance (Ramsar)	30.11.1997 (E)
UN Convention on Law of the Sea (UNCLOS)	03.05.2000 (Ds)
Western Hemisphere Convention	22.05.1946 (R)
World Heritage Convention	17.12.1979 (Ac)

Key: Date of: Signature (S); Ratification (R); Accession (A); Declaration (Ds); Entry into force (E); Acceptance

Region, or Cartagena Convention, and its Protocol Concerning Specially Protected Areas and Wildlife (SPAW Protocol); the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC); and the Convention on Migratory Species (CMS). Moreover, Nicaragua has not yet ratified the 1998 *Acuerdo de Cooperación para la Conservación de las Tortugas Marinas en la Costa Caribeña de Costa Rica, Nicaragua y Panamá (Acuerdo Tripartito)* (the agreement between Costa Rica, Nicaragua and Panama to co-operate in conserving marine turtles of their Caribbean coasts) (MARENA, 2001). Nicaragua is also not party to International Labour Organization Convention N° 169 Concerning Indigenous and Tribal Peoples in Independent Countries.

Laws and regulations relating to marine turtles

Nicaragua's constitution serves as the fundamental legal basis for natural resource protection and management. It also sets the stage for the dichotomy in marine turtle management that bedevils the country today. Article 60 of the Constitution obliges the State to preserve, conserve and restore the environment and natural resources and to establish the appropriate structures and measures to fulfill this mandate. Article 89 of the Constitution recognizes the rights of the Caribbean coastal communities to preserve and develop their cultural identity within the context of the national identity, including their own forms of social and local political organization in accordance with their traditions; finally, it recognizes their rights to use the country's natural resources (MARENA, 2001). From this foundation has arisen a large body of legal provisions that pertain specifically or generally to marine turtles in Nicaragua. These laws have taken many forms and differ in the weight that they carry and are dispersed in time, applicability (e.g. some apply to the Pacific, some to the Atlantic coast), and implementation. Complicating their implementation is the autonomous status of the Caribbean coastal regions, the RAAN and the RAAS.

In recognition of the need to establish a simple, coherent legal framework to address the full breadth of marine turtle conservation and management in Nicaragua and in support of the development of a marine turtle management plan, analyses of relevant laws, resolutions, and other legal instruments have been undertaken, with the objective of strengthening existing laws, adopting new laws, and providing for revocation of laws that have proved ineffective (CITES-Nicaragua, 2002; Lagueux *et al.*, 2002; C. Lagueux, *in litt.*, 13 June 2005).

A major advance in modernizing the legal framework for the extraction of marine and aquatic resources was realized with the adoption of the *Ley de Pesca y Acuicultura N° 489*, gazetted on 27 December 2004, and its implementing regulation *Decreto N° 9-2005 Reglamento de la Ley N° 489*, gazetted on 25 February 2005. This legislation reaffirms previous legal provisions in relation to marine turtles, such as requiring the use of turtle excluder devices (TEDs) in the shrimp fishery, expands on many of these and includes the establishment of specific penalties for infractions. Based on this law and several previous laws, three of the four marine turtle species that occur on the Caribbean coast are fully protected, the exception being the Green Turtle, which is, with these new laws, permitted to be taken for subsistence purposes only during an open season. The closed season is regulated by MARENA and extends from 1 March to 30 June (CITES-Nicaragua, 2002).

Particularly noteworthy amongst the provisions in the *Ley de Pesca y Acuicultura N° 489* are the following:

- “Subsistence fishing” is defined as that conducted without commercial purpose but with the aim of subsistence or improving the family diet;

- As regards the exploitation of marine resources of the Caribbean Sea, there must be a respect for the rights established for the Autonomous Regions in the Constitution, Statute of Autonomy of the Atlantic Coast Regions, and other regulations (Art. 4);
- It is prohibited to market (purchase, sell, process, or transport with the purpose of providing to national or international markets) (Art. 49):
 - fisheries products, the legal provenance of which precludes their being marketed;
 - species subject to prohibition in Nicaragua or in other Central American countries, with the exception of inventories held up to three days after the beginning of a closed season;
 - species subject to prohibition in international treaties to which the country is party;
 - species under established size limits or subject to prohibitions by the competent authority as a result of being threatened with extinction.
- The capture, killing or use of marine turtles of any species (excepting subsistence provisions, see below), as well as the use of any of their products is prohibited, with the exception of use for scientific research and subject to the specific regulations promulgated by MARENA in accordance with the Convention on Trade in Endangered Species of Wild Fauna and Flora (CITES) (Art. 77);
- Subsistence fishers must comply with closed seasons and other prohibitions (Art. 94); and
- Subsistence fishing for marine turtles is permitted on the Atlantic coast of the country (Art. 96).

In addition, the new law outlines different types of infractions and the penalties that apply to those infractions. Among these are: fishing with the intent to commercialize the product (for which a licence is required) under the guise of subsistence fishing; failure to deploy TEDs; capture, possession or commercial use of aquatic resources during closed seasons or those that have been declared as threatened species (minimum fine of 1000 US dollars [USD1000], two to four years of imprisonment); processing and commercial use of aquatic resources subject to prohibition (minimum fine of USD5000, two to four years of imprisonment).

The implementing regulations for the new fisheries law include the following provisions:

- Subsistence fishing is conducted with the sole purpose of obtaining sustenance and direct food for the fisher and his or her family (Art. 104); and
- In the case of fishing for marine turtles on the Atlantic coast, including when that is considered subsistence fishing under the law, there shall be implemented, as appropriate, restrictions arising from the need to ensure the sustainability of the resource, for the benefit of the community. Such restrictions will be established by MARENA, in co-ordination with the regional authorities, through Ministerial Resolution (Art. 106).

The following excerpts from the two-volume compendium of Nicaraguan wildlife law by Hernández Munguía (2002a and 2002b, cited in Lagueux and Campbell, 2002a) highlight some of the major legal provisions that have been adopted for marine turtles over several decades; others are noted by the CITES Management Authority (CITES-Nicaragua, 2002):

- *Ley de Caza, N° 206* of 1956 regulates hunting throughout the national territory, including by resolutions establishing closed seasons, hunting exclusion zones and permissible trade in products derived from hunting activities.

- *Reglamento de Explotación y Prohibición de la Destrucción de las Tortugas, N° 14* of 29 August 1958 regulates exploitation and prohibits destruction of marine turtles. It requires issuance of a permit for the collection of turtle eggs on the Pacific coast but does not authorize activities aimed at industrial exploitation of turtle eggs. Further, the regulation prohibits transport, trade and exploitation of turtle eggs and destruction of turtle nests during closed seasons.
- *Decreto Ejecutivo Relativo a la Veda de Tortugas en el Océano Atlántico N° 204-DRN* of 12 July 1972, gazetted on 15 July 1972, established an annual four-month closed season for the capture of marine turtles from 1 April to 31 July, during which time it was also illegal to buy, sell, display for sale, process, transport, or possess turtles or turtle products. This law also provided for the imposition of a monetary fine for infractions against these prohibitions.
- *Decreto de Prohibición de Aprehensión y Caza de Toda Clase de Animales Silvestres y Exportación de Huevos de Tortugas, N° 625* of 1977 “indefinitely prohibits” the capture, hunting, and export (including of sub-products) of “all classes of wildlife” for commercial purposes; it also prohibited the export of turtle eggs for a period of 10 years and provided for the collection of eggs for personal consumption or internal trade to be regulated by the *Ministerio de Agricultura y Ganadería* (C. Lagueux, *in litt.*, 26 June 2005). Although this law has been interpreted in some instances as having conferred protection on all marine turtles from commercial exploitation, it has clearly not been interpreted in this way by the regulatory authorities, at least in so far as the Caribbean Green Turtle fishery is concerned.
- *Acuerdo N° 2* of 18 April 1983 prohibits hunting of Loggerheads and Hawksbill Turtles.
- *Ley General del Medio Ambiente y los Recursos Naturales, N° 217* of 1996 specifies the mandate of MARENA as the principal authority responsible for controlling the use, exploitation and protection of natural resources (see below).
- *Ley de Normalización Técnica y Calidad, N° 219* of 1996 obliges MARENA to prepare and propose technical standards for the protection and use of marine turtles to the National Commission of Technical Standardization and Quality for their approval.
- *Resolución Ministerial que Establece el Sistema de Vedas de Especies Silvestres Nicaraguenses, N° 007-99* of 1999 establishes a system for prohibiting the take of specific wildlife species, including procedures for listing species under prohibition and for either temporary or indefinite closed seasons. The list of species under temporary or indefinite prohibition is reviewed and published annually by MARENA. This list includes an indefinite ban on the hunting of all Caribbean marine turtles, except for the Green Turtle. Take of wild specimens of species listed under this law is prohibited except where authorized for scientific purposes, rearing in captivity, or for artificial reproduction and only when such specific projects have been approved by the General Directorate of Biodiversity and Sustainable Use of Natural Resources of MARENA. This resolution and *MARENA Resolución Ministerial N° 023-99* of 1999 establish a permanent closed season for the killing of Hawksbill Turtles and the collection of their eggs (Lagueux *et al.*, 2003).
- *Acuerdo Ministerial para el Uso de los Aparatos Excluyentes de Tortugas, N° 002* of 1998 requires all national and foreign shrimp boats operating in Nicaraguan waters to use TEDs. This law is implemented and enforced

by the *Ministerio de Fomento, Industria y Comercio* (MIFIC). Penalties for violations of this law include the confiscation of the product and fines of up to USD5000, as well as revocation of the boat captain's operating and fishing licences for repeat offenders.

Other laws that protect marine turtles include:

- *Decreto N° 43* of 1991 designated the Miskito Cays and immediate coast as a marine biological reserve, thereby conferring protection on an area of great importance for marine biodiversity that includes extensive seagrass beds and coral reefs, important habitats for Green and Hawksbill Turtles (CITES-Nicaragua, 2002). This reserve (and others declared along the Atlantic coast) are not closed to subsistence use of marine turtles (Ruiz and Jarquín, 1997). As provided by the new fisheries law, trawling is prohibited in protected areas, as are other activities specified in the protected areas law.
- *Decreto Ejecutivo N° 527* of 17 April 1990 established the Gran Reserva Biológica Indo-Maiz, the coast of which was once an important nesting area for Hawksbill Turtles (Nietschmann, 1973).
- *Decreto N° 8* of 1998 establishes the standards and procedures for the import and export of wildlife in Nicaragua and implements the provisions of CITES, including the prohibitions on trade provided through the listing of individual species, such as marine turtles, in Appendix I (CITES-Nicaragua, 2002).
- *Resolución RAAS N° 192-02-04-00*, adopted by the Regional Council (the supreme governing body) of the RAAS, authorizes the President of the Regional Council's Commission for the Environment and Natural Resources to join efforts with MARENA to protect the Hawksbill Turtle and its nesting sites (CITES-Nicaragua, 2002) and gives "unconditional" support to WCS's Hawksbill Conservation Programme.

Chacón (*in litt.* 26 September 2002) reports the existence of an agreement from 1996 between MARENA and the government of the RAAN regarding exploitation of the Green Turtle on the Caribbean Coast.

The CITES National Legislation Project assessed Nicaragua's legislation as "believed generally to meet the requirements for implementation of CITES" (Anon., 2002).

Responsible authorities

According to *Ley N° 217, Ley General del Medio Ambiente y los Recursos Naturales*, of May 1996 and its implementing regulations, MARENA is the government agency responsible for developing and promulgating regulations for conservation, protection, improvement and restoration of the environment and natural resources and integrating these objectives with rational and sustainable use in accordance with the country's constitution. Amongst MARENA's many responsibilities are determining the list of endangered, threatened and protected species that should be the subject of rigorous control and *in situ* and *ex situ* protection measures, in order to comply with special laws and regional and international conventions; implementing a system of closed seasons and other restrictions on the take and export of wild species; initiating conservation programmes; managing protected areas, and law enforcement. These responsibilities are often shared and co-ordinated with other government agencies, such as the police, Navy and the environment commissions of the regional councils (including the RAAS and the RAAN) and mayoralties (Hernández Munguía, 2000b, cited in Lagueux and

Campbell, 2002a; MARENA, 2001). According to Lagueux and Campbell (2002a), MARENA has authority for all aspects of marine turtle management, except the enforcement of TEDs, which is the responsibility of MIFIC, the competent authority for the country's fishing laws, through the *Administración Nacional de Pesca y Acuicultura* (AdPesca) and the *Dirección General de Recursos Naturales* (the General Directorate of Natural Resources).

The new *Ley de Pesca y Acuicultura N° 489* provides for the following:

- Monitoring, surveillance and control of fishing activities are the responsibility of MIFIC, through AdPesca in co-ordination with MARENA; the Autonomous Regional Councils are required to develop a system of inspection with the assistance of the Navy, national police, Customs, municipalities and other government agencies as may be necessary (Art. 10);
- MARENA has primary authority to regulate fishing in protected areas; however, it must consult with AdPesca in the development of management plans (Art. 9); and
- MARENA is the primary authority for establishing prohibitions through Ministerial Resolutions for aquatic resources, based on technical advice from AdPesca and prior consultation with the *Comisión Nacional de Pesca y Acuicultura* (CONAPESCA—the National Fishing and Aquaculture Commission).

A Statute of Autonomy in 1987 conferred, incompletely, natural resource ownership and extraction rights to the inhabitants of the Caribbean coastal regions through the establishment of the RAAS and the RAAN. Hence, the governing authorities of these two autonomous regions, as indicated above, share management responsibilities for marine turtles as well as other species occurring in the region.

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective

The centuries-old history of marine turtle exploitation and its role in the culture of the indigenous Miskitu have been extensively documented in numerous publications by Dr Bernard Nietschmann (e.g. 1973, 1974, 1975, 1979a, 1979b and 1981) and are summarized in Groombridge and Luxmoore (1989). This exploitation, primarily focused on Green Turtles, included subsistence use and capture for commercial export by the Miskitu (the latter as far back as 1633—Parsons, 1962) and, until the 1960s, by turtlers from the Cayman Islands and, in the late 1960s and 1970s, for export by companies having established operations in Nicaragua (see next section). Data on levels of exploitation are available from various authors for different periods. Nietschmann (1979a) reported that 10 000 Green Turtles were estimated to have been killed annually in Nicaragua from 1969 to 1975 when three processing plants operated on the east coast. These were shut down in 1977 with the closure of the export market, but hunting for local use and sale continued. Arostegui (1984) reported a take in 1982 of 720 Green Turtles from the Caribbean coast for subsistence purposes and local sale; if accurate, this would indicate a 90% decrease in the number of turtles estimated to have been taken annually in the early 1970s.

Nietschmann (1979b, cited in Groombridge and Luxmoore, 1989) observed a dramatic decrease in catch-per-unit effort in the Green Turtle fishery that suggested a depletion of the population: in 1971, an average of two man-days were required to take one Green Turtle, but by 1975 this had increased to six man-days.

Unlike the fishery for Green Turtles, Arostegui (1984) indicated that there was no officially recorded exploitation of Hawksbill Turtles in Nicaragua (although some official statistics exist for exports—see next section). However, Carr *et al.* (1982) reported that Hawksbill Turtles were hunted “constantly” for their shell, and their eggs were taken “whenever...found”. Nietschmann (1981) estimated that ca. 1000—2000 Hawksbill Turtles were killed per year through “year-round, almost continuous, exploitation”.

Recent (since 1992) exploitation

Since at least 1999, the only legal exploitation of marine turtles along the Caribbean coast has been the capture of Green Turtles. However, other marine turtle species have continued to be taken. Hawksbill Turtles are captured by lobster divers and are always landed; the majority of Loggerheads captured incidentally in nets set for Green Turtles are clubbed over the head and released (most of them unconscious), but they are sometimes landed and the meat consumed or used for bait (see below). Hawksbill, Leatherback and Green Turtle eggs are also collected (Lagueux, 1998; Lagueux and Campbell, 2002a and 2005).

There are no government statistics for marine turtle landings in recent decades in Nicaragua (CITES-Nicaragua, 2002). However, data are available through WCS’s turtle conservation programme, which operates on the Caribbean coast. This programme has been monitoring the Green Turtle fishery since 1993. With the support of



Credit: C.J. Lagueux

Miskitu turtle fishers unloading live Green Turtles from a sailing boat in Puerto Cabezas (Bilwi), Nicaragua.

the local fishing communities and MARENA, WCS has collected data in the principal turtling communities and at the principal Caribbean landing sites (Lagueux, 1998). These data indicate the direct take each year of more than 11 000 Green Turtles and the capture of an estimated 450 Loggerheads in nets set for Green Turtles on Nicaragua’s Caribbean coast (Lagueux, 1998; Lagueux and Campbell, 2002a). As reported by Lagueux and Campbell (2002a), ca. 300–500 fishers are involved in this Green Turtle fishery and the fishery is a major source of income for them. Today, Green Turtles are used primarily as a source of income for the coastal communities along the Caribbean coast and are an important source of protein. Green Turtle meat is sold in the coastal communities and in coastal towns, such as Bluefields, Corn Island, and Pearl Lagoon in the RAAS, and Puerto Cabezas (Bilwi) in the RAAN, as well as consumed by the fishers and exchanged amongst family and friends. In addition, Green Turtle meat may also be transported to Managua and other Pacific towns and the mines (Bonanza, Rosita and Siuna), for personal consumption, but also sold in restaurants and during cultural events (C. Lagueux, pers. comm., 2005).

Nearly 50% of the Green Turtles taken in the Caribbean fishery are sold in towns along the coast and most of the remaining 50% of Green Turtles are sold in and among the ethnic communities (Lagueux, 1998). The CITES

Management Authority (CITES-Nicaragua, 2002) reports that meat from illegally taken Green Turtles is sold by fishers at the market or to the abattoir or small neighbourhood restaurants.

Implementation of the new *Ley de Pesca y Acuicultura N° 489*, which restricts Green Turtle exploitation to subsistence use only, may significantly reduce exploitation levels in what is a largely commercial fishery. However, it is too early to assess the impact of this legislation.

After the Green Turtle, the Hawksbill Turtle is the most sought-after species, primarily for its shell for handicrafts and secondarily for meat and eggs. It is the focus of pervasive illegal exploitation involving both local commerce and regional trade. More than 100 Hawksbill Turtles (Lagueux, 1998; Lagueux and Campbell, 2002a)—possibly 200–300 based on recent observations (Lagueux *et al.*, 2003)—are estimated to be killed annually along the Caribbean coast. The minimum estimate represents at least a 90% decrease from the more than 1000 Hawksbill Turtles estimated by

Nietschmann (1981) to have been taken per year in the 1970s; as mentioned above, available evidence attributes this relatively low take to a decline in Hawksbill population numbers. In addition to the capture at sea, there is extensive poaching of Hawksbill nests: nearly 100% of Hawksbill egg clutches are poached at El Cocal, along with an estimated 5% of Leatherback egg clutches (Lagueux and Campbell, 2002a and 2005). Prior to 2000, nearly 100% of Hawksbill egg clutches in the Pearl Cays were poached, but the Hawksbill conservation programme implemented in the area by WCS has reduced the proportion to ca. 30% (Lagueux *et al.*, 2003) and more recently to ca. 15% (Lagueux and Campbell, unpubl. data).



Credit: C.J. Lagueux

Live Green Turtles on sale in Nicaragua at the dock in Puerto Cabezas (Bilwi), after capture in their feeding grounds in the Miskito Cays (Nicaragua), by Miskitu turtle fishers.



Credit: C.L. Campbell/WCS

Turtle fishers in Rio Grande Bar, Nicaragua, unloading a Green Turtle captured at sea in a turtle net, 2003. Usually the Green Turtles are sold to an intermediary, who butchers them and sells the meat locally.

In addition to the efforts of WCS, other activities have been undertaken in Nicaragua with the aim of documenting marine turtle exploitation, specifically the marketing and trade of marine turtle products in the country—Hawksbill products in particular. The CITES Management Authority (CITES-Nicaragua, 2002) reports that a national inventory undertaken by MARENA identified 41 merchants across the country, principally in the departments of Masaya and Managua, that sold Hawksbill shell products. These products were believed to be fashioned by artisans in the country from animals taken illegally along the coast. Although all of these merchants were Nicaraguan, the principal demand for the products is understood to be from foreign tourists. For many of these merchants, the sale of Hawksbill shell products was indicated to be an important source of income.

Information on the use and trade of marine turtle products in Nicaragua is also available from market surveys and site visits undertaken in Nicaragua from August to December 2001 by the *Red Regional para la Conservación de las Tortugas Marinas en Centroamérica* (RCA—Central American Marine Turtle Conservation Network) in partnership with the Wider Caribbean Sea Turtle Conservation Network (WIDECAST). This information, from Chacón (2002), is summarized below.



Credit: C.J. Lagueux/WCS

Jewellery made from Hawksbill Turtle shell being sold openly at the Puerto Cabezas (Bilwi) airport in Nicaragua.

- **Hawksbill shell.** Articles from Hawksbill shell were found for sale in the major markets across the country and in areas visited frequently by tourists, either national or foreign. They were also found in the Puerto Cabezas airport. (They have also been observed in Bluefields airport, the secure area of the international airport in Managua and in a shop in a mall in Managua—C. Lagueux, pers. obs.) Investigators from RCA documented 21 permanent establishments and three travelling merchants selling Hawksbill shell products and counted 597 pieces at the 11 sites where they were able to undertake an inventory. A subsequent visit to three of these sites counted a total of 4085 articles made from

Hawksbill shell. One of the travelling merchants indicated that some of the Hawksbill shell is sent for resale in Managua. Most commonly, the establishments selling Hawksbill shell products were those that sold handicrafts. The majority of merchants identified Hawksbill shell articles as important sales items, a major source of income, and the product that sold most. Further, the vast majority of merchants interviewed indicated that the shell came from the Caribbean coast of the country.

- **Products from turtle oil,** such as hand cream and body lotion, were found for sale in only one shop but were reported to be popular and in demand.
- **Eggs.** Although the collection of Hawksbill eggs is very common along the Caribbean coast, it is primarily for personal consumption (C. Lagueux, pers. comm. to D. Chacón, 2002). The trade in turtle eggs through established networks occurs more commonly on the Pacific coast, where there is some regulated (and much illegal—C. Lagueux, *in litt.*, 23 June 2005) collection of Olive Ridley eggs.

Lagueux (1998) and Lagueux and Campbell (2005) provide information on incidental capture of marine turtles by the industrial shrimp trawl fleet (required by law to deploy TEDs) and in the artisanal lobster and gill net fisheries operating in the Caribbean waters of Nicaragua. This by-catch includes primarily Green and Hawksbill Turtles that are landed for consumption or, along with Loggerheads (the meat of which is not much in demand), more recently landed for use as bait in the shark and lobster fisheries. It also includes stranded turtles that have drowned in shrimp trawl nets. On the south-east coast, Green Turtles were found by Lagueux and Campbell (2005) to be the most frequently stranded species and all the stranded Green and Hawksbill Turtles and Loggerheads were large juveniles or adults, age classes that marine turtle populations can least afford to lose.

International trade

Historical perspective

Groombridge and Luxmoore (1989) summarized information on the history of marine turtle trade from Nicaragua as documented by several authors (e.g. Nietschmann and Parsons). This trade, in Green Turtles for meat and other products and in Hawksbill Turtles for tortoiseshell, dates back to the 17th century and involved a number of export points, as either final destination markets or intermediary countries (Parsons, 1962). Particularly prominent in this trade were turtlers from the Cayman Islands, who took turtles off the Miskito Bank to supply markets for Green Turtle meat, primarily, and for tortoiseshell in Belize and Jamaica. Parsons (1962) reported that, at the time of his writing, 10–12 Cayman Island vessels (a lower number than in earlier years) were taking 2000–3000 Green Turtles each year in the Miskito Cays, the majority of which were carried live to Grand Cayman. The Nicaraguan Government closed the turtle grounds to Cayman Islanders in the 1960s (Nietschmann, 1979a).

As reported by Nietschmann (e.g. 1979a), the commercial Green Turtle industry in Nicaragua developed at the end of the 1960s when the first of three processing plants began purchasing Green Turtles for the export of turtle meat, calipee, skin and oil. During the period 1969–1976, 5000–10 000 Green Turtles were exported from the country each year; from 1972 to 1975, over 70 000 kg of turtle products (presumed by Groombridge and Luxmoore, 1989 to have been all or principally derived from Green Turtles) were exported per year from Nicaragua to the USA alone. Rebel (1974) reported that Hawksbill shell and Green Turtle steaks, fillets and flippers were exported to the USA.

The export and import of marine turtle products for all but scientific purposes were prohibited in Nicaragua in 1977 and this led to the closing of the processing plants on the Caribbean coast (Nietschmann, 1979a). However, exports of marine turtle products continued. CITES trade statistics derived from the UNEP-WCMC CITES Trade Database document exports, reported by Nicaragua, of 21 523 kg of Green Turtle calipee to the Federal Republic of Germany and of 300 live Green Turtles to the Cayman Islands in 1980. Virtually all of the trade recorded by CITES after that year until 1993 comprised shipments recorded by the USA; most of these involved relatively small quantities (e.g. one carving, one skull, 50 eggs) and were seized on entry.

Japanese Customs statistics on imports of Hawksbill shell into Japan prior to the closure of that import market in January 1993 have been reviewed by several authors, including Milliken and Tokunaga (1987) and Groombridge and Luxmoore (1989). For the years 1970 to 1992, imports of Hawksbill shell into Japan from Nicaragua totalled 14 519 kg, peaking in 1974 and gradually declining to nil for the years 1986–1992. Groombridge and Luxmoore

(1989) note that, for the years 1980–1982, these figures accord almost exactly with the Hawksbill export figures presented by Arostegui (1984).

Japanese imports (kg) of Hawksbill Turtle shell, 1970–1992, from Nicaragua, as recorded in Japanese Customs statistics

Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
	798	1060	1316	994	2646	1632	1446	1573	1014	949	7	475
Year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Total
	417	0	0	192	0	0	0	0	0	0	0	14 519

Sources: Milliken and Tokunaga, 1987; H. Kiyono, TRAFFIC East Asia-Japan Office, *in litt.* to TRAFFIC International, 29 July 2002.

Recent (since 1992) international trade

CITES trade statistics for the years 1993–2004, inclusive—with one exception, all imports into the USA—document exports from Nicaragua of scientific specimens and, for the most part, relatively small quantities of items (e.g. one kilogramme of eggs, 144 eggs, one carapace), most of which were seized on entry. In several instances, shipments involved relatively large numbers of eggs (e.g. 773, 332) or were recorded as being for commercial purposes (three of five shipments thus recorded—all of eggs—were seized on entry). Other than the scientific specimens, eggs and meat were the most commonly reported commodity in trade during this period.

There are no estimates of the volume of illegal trade in marine turtles or turtle products from Nicaragua. However, from CITES statistics and other sources (e.g. Chacón, 2002), it is known to exist on a small scale, when tourists leave the country with articles made of Hawksbill shell or with turtle eggs, and on larger scales, involving unknown quantities of Green Turtle meat transported to the islands of San Andrés and Old Providence in the San Andrés Archipelago (Colombia), which lies off the coast of Nicaragua (Lagueux and Campbell, 2002a; J.M. Mow, CORALINA, pers. comm., 2002); of Hawksbill shell and shell products traded from Nicaragua to other Central American countries; and marine turtle eggs exported to other Central American countries and the USA, for both commercial and personal purposes. The CITES Management Authority (CITES-Nicaragua, 2002) reports that illegal trade in marine turtle products is suspected to occur across the extensive border with Costa Rica, which is known to be a corridor for illegal trade in live wildlife and wildlife products and where there are few border patrols and insufficient resources to address the problem. Based on the market surveys conducted by RCA throughout Central America, Chacón (2002) reports a major change from the situation reported by Groombridge and Luxmoore (1989): the volume of Hawksbill shell products being moved from the Caribbean coast of Nicaragua to the centre of the country and from there to at least Honduras, El Salvador and Costa Rica indicates increased rather than decreased incentives to trade.

Enforcement issues

There is abundant evidence of illegal exploitation and trade of marine turtles in Nicaragua and of a lack of implementation and enforcement of wildlife legislation (Lagueux and Campbell, 2002a; Chacón, 2002). The

most prominent enforcement problems appear to be the continued exploitation of completely protected Hawksbill Turtles and the Green Turtle fishery on the Caribbean coast, which is primarily commercial but, as of 2005, has been restricted by law to be for subsistence purposes only. Although illegal exploitation and trade are recognized by the government as a problem for the management of marine turtles, limited human and financial resources preclude systematic and efficient efforts to bring it under control (CITES-Nicaragua, 2002). Inadequate enforcement effort appears to have had the result that individuals are not deterred from engaging in illegal exploitation of marine turtles, as suggested by the openness with which Hawksbill Turtles are captured and Hawksbill shell products are sold throughout the country. For example, these have been observed at regional airports and in at least three shops catering only to ticketed passengers (C. Campbell, WCS, pers. obs.; Lagueux and Campbell, 2002a). Inadequate enforcement and monitoring of TED requirements in the shrimp trawl fishery is also a problem (Lagueux and Campbell, 2005).

Although technically, Hawksbill Turtles, Loggerheads and Leatherbacks are protected by law year-round, these species continue to be exploited at high levels (Lagueux and Campbell, 2002a). As documented here, illegal exploitation takes many forms, including capture at sea of these three species and of Green Turtles during the four-month closed season; killing of nesting females; collection of eggs (of all species); and the marketing of marine turtle products, especially Hawksbill products and Green Turtle meat but also other products, in violation of the closed season. In addition to illegal take and trade of marine turtles within the country, there is evidence that marine turtle products, Hawksbill handicrafts in particular, are traded to other Central American countries and that this trade is increasing (Chacón, 2002).

It should be noted that measures have been taken by MARENA in an effort to stem the illegal trade in Hawksbill shell products. According to the CITES Management Authority (CITES-Nicaragua, 2002), these measures include: development of a national action plan for the control of trade in Hawksbill shell products; a national inventory of all retail and other establishments selling Hawksbill shell products as a basis for taking action to control illegal Hawksbill trade; co-ordination with the mayoralty of Managua in controlling the sale of Hawksbill products, particularly in markets; and production of posters and other materials to heighten public awareness of the problem. More recently, MARENA, through their local delegate, have confiscated Hawksbill products from the regional airport and a retail store in Bluefields (Anon., 2005). In addition, the recent adoption of the new fisheries law (*Ley de Pesca y Acuicultura N° 489*) and its implementing regulation should assist MARENA and other government efforts to restrict this trade.

Lagueux and Campbell (2002a) report that the regulatory agencies often allow continued take and sale of Green Turtles during the closed season and that the closed season is not respected by local communities, thus suggesting that it is ineffective in restricting the fishery. These observations raise similar concerns regarding the effectiveness of the new fisheries law in reducing the number of turtles taken in the legal fishery. The socio-economic realities of the Green Turtle fishery, compounded by difficulties with enforcement, suggest that there may be little real change in the operation of this fishery.

Lagueux and Campbell (2002a) report that stockpiles of Green Turtle calipee are held legally by private owners but are not regulated in any way. The individuals holding these stockpiles are doing so in the hope that the government will lift the export ban and they will be able to sell the calipee on the international market.

Lagueux *et al.* (2003) report that the pattern documented by Nietschmann (1971) of collection of 90–95% of Hawksbill nests laid in their study area in the Pearl Cays appears to have persisted through 1999, when nearly 100% of eggs were poached from the Pearl Cays. However, they report results of their Hawksbill conservation project “exceeding [their] expectations” in terms of the degree of local participation and co-operation in the project and the beneficial effect on nest protection. From 2000 to 2002, only five nesting females, “to the best of [their] knowledge”, were killed on the nesting beaches in the Pearl Cays, and, along with a decline in poaching on the beaches regularly surveyed, poaching declined on those beaches that were not surveyed daily. At the same time, however, they noted a number of difficulties encountered by the project and additional threats to nesting habitat resulting from the absence of the authorities in the area.

Marine turtle management

Although the legal framework in Nicaragua provides for the protection of marine turtles as threatened species and restricts exploitation of Green Turtles on the Caribbean coast, there are numerous shortcomings in that framework and its implementation, with the result that there has been little effective management of marine turtle exploitation on the Caribbean coast of Nicaragua and the domestic and international trade arising from that exploitation. There have, nevertheless, been active efforts under way in the country to improve the management of these species and improve the legal and regulatory framework, most notably through the recent enactment of the fisheries law (*Ley de Pesca y Acuicultura N° 489*) and its implementing regulation. The major focus of government efforts has been the Olive Ridley *arribadas* on the Pacific coast (MARENA, 2001). On the Caribbean coast, the main actor on behalf of marine turtles is WCS, which, with the support of local communities, MARENA and regional government authorities, has been leading research, conservation and management efforts in relation to the four marine turtle species that occur there. These efforts include the development of a Management Strategy for Sea Turtle Conservation on the Caribbean Coast of Nicaragua (Lagueux *et al.*, 2002), currently being finalized and translated into the three principal languages used on the coast, as a first step in the development of a management plan for the conservation of marine turtles nesting and foraging along the Caribbean coast. These efforts have been undertaken in collaboration with local stakeholders, including MARENA, the mayoralties of Bilwi, Bluefields, Pearl Lagoon and the Corn Islands, the regional councils and universities of the RAAN and the RAAS, and local fishing communities (Lagueux and Campbell, 2002a; MARENA, 2001). Finally, MARENA (2001) is pursuing a range of activities aimed at addressing the illegal Hawksbill trade.

Management of exploitation

As mentioned above, exploitation of marine turtles in the Caribbean sector of Nicaragua is currently restricted to the take of Green Turtles during an annual eight-month (1 July–28 February) open season (CITES-Nicaragua, 2002). The other three marine turtle species in Nicaragua are legally protected from exploitation. That the legal fishery is not restricted through maximum size limits and, thus, does not protect the large juveniles and reproductively active adults that are the most important age classes in guaranteeing population maintenance and recovery should be considered a major shortcoming. Lagueux’s (1998) findings on the extent and level of exploitation in the Green Turtle fishery, the lack of compliance with the closed season (Lagueux and Campbell, 2002a), and analyses by Campbell (2003) and Campbell and Lagueux (2005) provide evidence of a serious management problem that has both regional and global implications.

Based on a constructed population matrix model, Campbell (2003) concluded that the renewal in the mid-1990s of this essentially uncontrolled commercial fishery in Nicaragua of more than 11 000 large juvenile and adult Green Turtles per year is probably depleting recruitment into the Green Turtle population that nests at Tortuguero (Costa Rica), as most of this nesting population is known to forage in Nicaragua. She noted that, because of the several decades (up to 36 years—Frazer and Ladner, 1986) required for Caribbean Green Turtles to reach sexual maturity, the effects of the fishery on the population may not be visible from the nesting beach for many years. Although based on current information, the impact of the Nicaraguan fishery on the Tortuguero Green Turtle population is unclear, Campbell (2003) suggests that the population as a whole may be facing a serious threat from the fishery in spite of protective measures in place in Costa Rica.

There is wide recognition of the need for improved management of the fishery for Green Turtles along the Caribbean coast of Nicaragua (e.g. by Lagueux, 1998; Campbell, 2003 and Campbell and Lagueux, 2005; Lagueux and Campbell, 2002a; MARENA, 2001 and CITES-Nicaragua, 2002). The new fisheries law (*Ley de Pesca y Acuicultura N° 489*) and its implementing regulations, which entered into effect in February 2005, clearly aim at improved management, through restricting the Green Turtle fishery to subsistence use only and providing for specific penalties for violations of this and other provisions, such as on the sale and trade of marine turtles and marine turtle products. Based on the information reviewed for this study and presented here, there is little question that compliance with the subsistence-use-only provision will be very difficult for the coastal communities of the Caribbean for whom the fishery is a major source of livelihood and, thus, that vigorous enforcement may be necessary to ensure that the measure is adhered to. More important than actual compliance, however, is the question of whether a subsistence-use-only provision will actually achieve sustainability in adjusting exploitation so that it does not deplete the Green Turtle population.

The work being led by WCS aims to establish a scientific basis for evaluating the impact of sustainable exploitation on the Tortuguero rookery. It also aims to engage the support of communities that will need to be active participants in the management and regulation of use and that will be most affected by a scientifically based revised management regime, which will inevitably entail a considerable reduction in the number of turtles that can be taken, as well as other restrictions (Campbell, 2003; Lagueux and Campbell, 2002b). In addition to the need to establish a scientific basis for a continued fishery, the management planning process recognizes the need to address issues of feasibility (in terms of achieving a high level of acceptance/compliance), particularly in the light of the socio-economic circumstances of the coastal communities and the constraints faced by MARENA and other management agencies, and to include specific mechanisms to generate alternative incomes in the light of the heavy dependence on the marine turtle resource. In addition, there is recognition of the need to incorporate—and expand on, as appropriate—the monitoring regime currently implemented by WCS in recording the numbers of marine turtles taken, the biometrics of the catch and catch-per-unit effort.



Credit: WCS

Dr Cathi Campbell of WCS meeting with community leaders in Nicaragua, to discuss marine a turtle management strategy.

The other major marine turtle management challenge in Nicaragua arises from the extensive illegal trade in marine turtle products, Hawksbill shell products in particular, which, as suggested below, requires a major, multi-faceted effort if it is to be brought effectively under control. Incidental take is also a problem that needs to be assessed and addressed.

Species research and conservation

Marine turtle research and conservation along the Caribbean coast of Nicaragua began in the 1970s through the Hawksbill tagging efforts of Dr Bernard Nietschmann and Green Turtle feeding ecology research undertaken by Dr Jeanne Mortimer (Mortimer, 1976; 1981). Such efforts have, however, been sporadic and systematic documentation of the biology and ecology of these species in the country has only been initiated quite recently. Since 1993, most marine turtle research and conservation along the Caribbean coast has been undertaken by Drs Cynthia Lagueux and Cathi Campbell of WCS, in collaboration with numerous partners, including local coastal communities and their governing bodies, the Bluefields Indian and Caribbean University, the *Universidad de las Regiones Autónomas de la Costa Caribe Nicaragüense*, municipal and regional governments of the RAAS and RAAN, MARENA, and the national police force, as well as members of the Caribbean region's marine turtle scientific network and WIDECAS. In addition to scientific research that includes conducting population assessments, studying population demography and nesting ecology, conducting genetic stock assessments and tracking movements and migration patterns, the programme has, since 1998, involved conservation activities, such as:

- investigation and monitoring of nesting activity and fishing effort;
- environmental education;
- training and capacity-building;
- community participation; and
- nest protection.

As mentioned above, these efforts also involve facilitating the development of a management plan for the long-term conservation of marine turtles on the Caribbean coast of Nicaragua and alternative sources of income for local turtle fishers.

WCS research and conservation efforts on behalf of Hawksbill Turtles nesting in the Pearl Cays commenced in 1998 and a conservation project involving the collaboration of several local communities was initiated in 2000, aimed at protecting nesting Hawksbill Turtles and eggs. Nocturnal beach patrols were also undertaken to study the nesting ecology. Nesting beach surveys conducted since 2000 are the first systematic and continuous nesting beach surveys carried out throughout the principal nesting season for Hawksbill Turtles in the Pearl Cays of Nicaragua. WCS has also expanded its work to assess the nesting populations at El Cocal and the surrounding area on the south-east coast (Lagueux and Campbell, 2005).

In addition, WCS is investigating the distribution and identification of populations through a tagging programme. By mid-2005, this programme had tagged 745 turtles: 255 Hawksbill Turtles, 452 Green Turtles, 37 Loggerheads, and one Leatherback (Campbell and Lagueux, unpubl. data). In 2000, WCS began collaboration with the US National Marine Fisheries Service on a satellite-tracking programme to determine long-range movements of post-nesting Hawksbill marine turtles from the Pearl Cays rookery and identify important feeding



Credit: WCS

The WCS (Wildlife Conservation Society) Pearl Lagoon Youth Group in the Pearl Cays, Nicaragua, August 2005. With the Group is a post-nesting Hawksbill Turtle which was deployed with a transmitter.



Credit: C.L. Campbell

Local onlookers observing the release of a post-nesting Hawksbill Turtle with a satellite tracking device attached to her carapace at Pearl Cays, Nicaragua.

areas for Caribbean Hawksbill Turtles. Five female Hawksbill Turtles were fitted with transmitters from 2000 to August 2004. These deployment events have been used as an opportunity to educate locals about marine turtles and their conservation needs.

Habitat conservation

A national system of protected areas was formalized in Nicaragua in 1996. As of 2004, this system incorporated 76 protected areas in different management categories, intended to ensure the conservation, protection and sustainable management of the natural resources within and around them. These areas comprise core zones where intensive use is prohibited and buffer zones, where different controlled uses are permitted. As part of an integrated coastal zone management project, local coastal zone management plans were produced for at least two areas along the Caribbean coast and incorporate marine turtle needs, but their implementation has been limited by a shortage of human and financial resources (MARENA, 2001).

No fewer than four protected areas have been established in Nicaragua with the main objective of protecting marine turtles. On the Pacific coast, the Juan Venado Nature Reserve was established in 1983 and on the Caribbean coast the Miskito Cays Marine Biological Reserve was designated in 1991, to conserve important coral reef and associated habitats, which are particularly important for Hawksbill Turtles (MARENA, 2001; CITES-Nicaragua, 2002). This area, covering ca. 85 000 ha in the RAAN, was designated as an international Ramsar site in November 2001. According to the Ramsar information sheet for this site, last updated in 2000 and available on the Ramsar Convention website, a general management plan for the reserve had been prepared, but there were few elements of the plan that had been implemented. On the Pacific coast, the major nesting beaches for Leatherbacks and Olive Ridleys have been designated as wildlife reserves: the Río Escalante-Chacocente Wildlife Reserve in 1983 (Leatherbacks) and La Flor Wildlife Reserve in 1996 (Olive Ridleys).

Lagueux *et al.* (2003) have identified a number of habitat-related threats to the Hawksbill nesting population in the Pearl Cays, including the construction of houses, clearing and burning of beach vegetation and mangroves, artificial lighting, and an increased presence of humans and dogs. In their assessment, uncontrolled development on the nesting beaches is compounding the threat to Hawksbill Turtles from poaching, thus putting at risk the recovery of this globally important Hawksbill nesting population. On the south-east coast, Lagueux and Campbell (2005) note the need for fishing gear restrictions off the marine turtle nesting beaches during the nesting season to reduce incidental mortality of marine turtles in fishing operations. Arrivillaga and García (2004) note that the Caribbean coastline of Nicaragua has suffered considerable deforestation, which has resulted in increased sediment loads that have degraded coastal reefs. In addition, excessive and damaging fishing practices, as well as pollution from untreated sewage, have had negative impacts on these reefs.

Education and public awareness

An array of outreach and education activities on behalf of marine turtles has been undertaken by WCS as part of their marine turtle research and conservation efforts on the Caribbean Coast. These include several workshops with stakeholders to discuss the need for management of the Green Turtle fishery (e.g. Lagueux *et al.*, 2002). As part of the Pearl Cays Hawksbill project, meetings have been held with local communities and RAAS regional government officials to inform them of the research project and its results and engage their support in the conservation effort. Prior to and during the field surveys, radio announcements and three-minute “spots” produced by

community members were broadcast in three languages several times a week informing listeners of the conservation project and reminding them to protect the turtles and their eggs. In addition, the project hires local people from nearby communities to conduct daily surveys and protection activities and provides opportunities to university students to gain field experience and a field site to conduct research for their undergraduate theses. These efforts were very successful in securing support, including the unanimous support of the RAAS government, for the project. As noted above, these efforts also succeeded in significantly reducing poaching of turtles and nests.



Credit: C.L. Campbell/WCS

Local WCS field staff in Nicaragua, including local university students and fishers, relocating a clutch of Hawkbill Turtle eggs, to protect it from poachers.

In addition, MARENA and WCS have conducted lectures and produced posters and leaflets warning locals and tourists not to consume turtles or purchase Hawkbill shell handicrafts. WIDECAS has provided a variety of technical and outreach materials to keep local and national stakeholders abreast of wider Caribbean research and conservation efforts, as well as internationally accepted best practices, and has sponsored workshops and exchange programmes that expose coastal community leaders to marine turtle programmes elsewhere in the Caribbean region. Finally, as mentioned above, the Hawkbill satellite-tracking work has also incorporated community outreach activities.

Constraints to marine turtle conservation and management

There are numerous constraints to more effective management of marine turtles in Nicaragua. According to the CITES Management Authority (CITES-Nicaragua, 2002) and Lagueux and Campbell (2002a), these constraints include: shortcomings and inconsistencies in the legal framework in relation to both marine turtles and their habitats; lack of awareness amongst the urban population of marine turtles and wildlife in general; limited human resources (such as for wildlife enforcement), including a lack of trained personnel; insufficient funding; lack of public and political support; and extreme poverty in rural communities where there are few alternative sources of food and income to turtle exploitation and trade. Although these will not be solved in the next few years, Lagueux and Campbell (2002a), based on achievements thus far, express confidence that significant improvements in marine turtle management will be made.

According to the CITES Management Authority (CITES-Nicaragua, 2002), the most important ingredients for better management of marine turtles in Nicaragua are a legal base with clear administrative and legal procedures that enable the staff of MARENA to enforce the law and personnel whose sole responsibility is to control illegal trade in marine turtle products. While a major advance has been made with the enactment of the new fisheries law and regulations, the jurisdictional issues relating to natural resource exploitation and management in the autonomous regions, the RAAS and the RAAN, clearly complicate implementation and enforcement of federally adopted legislation.

Summary and recommendations

The regime in place for marine turtles in the Caribbean region of Nicaragua has failed to achieve management and has been inconsistent with the principles and practice of sustainable use. The largely commercial Green Turtle fishery, which has consumed more than 11 000 turtles per year (Lagueux, 1998), has been restricted, until 2005, only through a four-month closed season that has been little-enforced and considered to be ineffective, and the full legal protection afforded the other three marine turtle species occurring in the region has been neither vigorously enforced nor commonly respected. A final problem has been the extensive trafficking in Hawksbill shell products that includes national and export markets.

The fact that the Green Turtle fishery is drawing from juvenile turtles that would otherwise recruit, for the most part, into the Tortuguero (Costa Rica) nesting population, one of the two largest Green Turtle rookeries in the world, means that this inadequate management undermines research and conservation and management efforts in Costa Rica. It also undermines management efforts in other Caribbean countries whose waters provide developmental habitat for Tortuguero Green Turtles that are killed when they recruit into Nicaragua waters and weakens the potential for smaller sustainable harvests in other range States which also draw their breeding adults from Nicaraguan foraging grounds. Quite possibly, the fishery compromises the species at the global level.

Implementation of the *Ley de Pesca y Acuicultura N° 489* and its implementing regulations, which restrict the Green Turtle fishery to subsistence use only and stipulate other prohibitions, as well as penalties for violations of these provisions, may prove to be an important step in addressing many of these gaps. However, not only is it too early to gauge its effectiveness, but the “subsistence use only” provision overlooks not only the socio-economic reality of marine turtle exploitation but, as importantly, the issue of managing for biological sustainability. There is a clear need for a management plan—and a management planning process—that focuses on that goal.

That shortcomings in marine turtle management have been recognized by government agencies and that efforts are being made to both consolidate and modernize the management framework are laudable. Also notable is the emerging consensus within national and regional government agencies, local communities and stakeholder groups, and NGOs and marine turtle researchers regarding the urgent need to institute science-based, effective management for marine turtles in the Nicaraguan Caribbean. This management needs to bring the Green Turtle fishery to scientifically based sustainable levels and protect Hawksbill and other turtles more effectively from poaching and illegal trade, as well as from incidental mortality in fishing operations. It also needs to protect critical habitats. In so doing, this management must clearly address the reality that marine turtles are the principal marine resource for largely indigenous and ethnic communities inhabiting the country's Caribbean coast by incorporating specific alternative income-generation schemes at a level that is consistent with the size of the problem (cf. MARENA, 2001). Ideas for such schemes have included those based on other fisheries, agriculture and animal husbandry, as suggested to WCS in meetings that they have held in coastal communities, and these and other suggestions have been outlined in the Draft Management Strategy for Sea Turtle Conservation on the Caribbean Coast of Nicaragua (Lagueux *et al.*, 2002).

Despite clear legislative advances made in the adoption of the *Ley de Pesca y Acuicultura N° 489* and its implementing regulation in 2004, including full protection for the Critically Endangered (cf. IUCN) Leatherback and Hawksbill Turtles and eggs of all species on the Caribbean coast, current restrictions on the legal Green Turtle fishery do not reflect long-recognized biological realities in the management of marine turtles. Large juvenile and adult turtles are the most important age classes to conserve in order to maintain populations and promote population recovery and yet, in the absence of maximum size limits and in the context of a closed season that does not encompass peak nesting periods, these age classes remain vulnerable. There is no comprehensive, government-mandated mechanism in place to record landings associated with the fishery systematically and, only recently, through NGO efforts, has information become available with which to evaluate the extent to which the capture of breeding-age animals is compromising the sustainability of the fishery and the population as a whole.

It should be noted that the efforts of WCS in particular, in relation to the Green Turtle fishery and more effective protection of Hawksbill Turtles in the Pearl Cays, have demonstrated the effectiveness of sustained community outreach in enhancing appreciation of and support for marine turtle conservation and management. This suggests that, despite the enormity and complexity of the marine turtle management challenge in Nicaragua, adequate resources, effective leadership, and, possibly most importantly, persistence in supporting collaborative efforts may prove very effective in ensuring the long-term survival of marine turtle populations and their availability as a resource.

In accordance with the FAO Code of Conduct for Responsible Fisheries (FAO, 1995), an explicitly precautionary code, which states that “the right to fish carries with it the obligation to do so in a responsible manner so as to ensure effective conservation and management of the living aquatic resources”, the management of marine turtle resources in Nicaragua should seek to maintain the availability of the resource “in sufficient quantities for present and future generations in the context of food security, poverty alleviation and sustainable development”. Management measures should, *inter alia*, prevent over-fishing, rehabilitate depleted populations, incorporate the best scientific evidence (taking into account traditional knowledge, as well as relevant environmental, economic and social factors), assign priority to research and data collection (including at international scales), and promote environmentally safe fishing gear and practices in order to protect both the target resource and the ecosystems upon which it depends.

Among the fundamental components of any regime aimed at management of wild populations are: restrictions on exploitation that are consistent with the species' biological requirements; a monitoring programme—systematic, sustained, and rigorous collection and review of data—either on the specifics of exploitation or of wild populations so as to discern trends that can inform management; mechanisms to identify, monitor and address other threats to the species being exploited, so that these threats can be factored with exploitation to assess what level of overall mortality the species might sustain; and a high level of compliance (sometimes achievable only through vigorous enforcement) with the restrictions put in place to ensure that management goals are achieved. Few of these elements and conditions feature in the current management framework for marine turtles in Nicaragua.

Numerous recommendations for improving the conservation and management of marine turtles of the Nicaraguan Caribbean have been formulated in recent years (e.g. Lagueux, 1998; Campbell, 2003; Campbell and Lagueux, 2002b; Lagueux *et al.*, 2002; Chacón, 2002; Lagueux and Campbell, 2005). The following recommendations reflect and build on many of these.

1. MARENA and the regional governments of RAAS and the RAAN, NGOs, fishing communities and other local stakeholders, and scientific advisors should move expeditiously to develop and agree on a management plan and establish the mechanisms for an effective, sustained marine turtle management programme for the Nicaraguan Caribbean. This programme should address not only the Green Turtle fishery but also the continued exploitation of protected marine turtles and their eggs and the trade that results from that exploitation. In the context of the Green Turtle fishery in particular, this plan should provide for co-operation with the conservation and management efforts of other countries, most notably Costa Rica with respect to the Tortuguero nesting population. The governments should consider whether a moratorium on marine turtle exploitation may be advisable as an interim measure. This question should be reviewed in the context of the importance of the marine turtle resource in the coastal communities of the RAAN and the RAAS, while equitably considering the regional and global implications of over-exploiting the foraging assemblages of Green Turtles on the Nicaragua foraging grounds.
2. In the context of the development of a marine turtle management plan, MARENA and the regional governments of the RAAS and the RAAN should undertake a comprehensive review of the regulatory framework for marine turtle management and conservation and their broader institutional mandates, priorities, and capacities in particular as they relate to implementation of the *Ley de Pesca y Acuicultura N° 489* and its regulations *Decreto N° 9-2005 Reglamento de la Ley N° 489*.
3. If legal exploitation of marine turtles is to continue in the Nicaraguan Caribbean, the restrictions on exploitation must reflect the biological parameters of marine turtles, take into account their depleted status, where such has been documented, and aim, at a minimum, at preventing any further population declines. Any exploitation regime promoting population maintenance and/or recovery should be conducted according to sound management principles and practice, which should include the following:
 - A. Bringing exploitation (in this case the Green Turtle fishery) in line with biological principles, including:
 - complete protection of nesting females at all times;
 - complete protection during the primary nesting season, 1 March to 30 November;

- maximum size limits, based on length (which is easier to undertake in the field) rather than weight, so as to safeguard large juveniles and adults;
- a conservative limit on the numbers of animals that may be exploited, such as through quotas and/or licences for taking turtles; and
- a requirement that capture or collection limits be based, if not on a stock assessment, on data derived from national processes and research activities, and that, as far as practicable, these data be collected in such a way as to be compatible with the goal of assessing stocks throughout their full geographic ranges.

B. Managing the legal fishery through an enforceable, high-compliance monitoring programme aimed at establishing trends and monitoring these over time. Such as has been initiated through the efforts of WCS, a national programme to monitor marine turtle exploitation should document comprehensively and systematically, and in a manner allowing such records to be analysed and compared over time, the following:

- number of fishers taking marine turtles and by what means;
- number, size and species distribution of the marine turtles landed;
- localities where turtles were taken;
- catch-per-unit effort; and
- disposition of the marine turtles landed, including value of the animal and/or products if sold or traded.

In further support of reliable monitoring of the fishery, the following should be considered as requirements for participation:

- that ownership identification tags be installed on approved gear (e.g. nets);
- that turtles be landed alive or intact; prohibiting, for example, the use of spear guns and extended net sets that can result in drowning and providing for reliable recording and verification of turtle landings; and
- that the licensing process include as a criterion full participation in the monitoring programme.

Government authorities at all levels should formalize and provide appropriate support to the present efforts of WCS and Green Turtle fishing communities to conduct these monitoring and evaluation activities.

C. Establishing and maintaining a systematic marine turtle population monitoring programme, building on the success of current efforts led by WCS in collaboration with participating turtle fishing communities, to:

- document distribution and abundance of local populations;
- identify major nesting grounds and foraging areas;
- designate Index nesting beaches and Index foraging grounds and document the numbers of marine turtles occurring in these over time;
- manage data records such that statistically significant trends in abundance can be identified and inform management; and
- identify and monitor threats and other factors influencing marine turtle survival.

4. Recognizing that a sustainable level of exploitation of Green Turtles is likely to amount to a fraction of the number that is currently taken and also recognizing that Green Turtles constitute an important component of the diet, culture and socio-economy of the coastal communities of the Nicaraguan Caribbean, there is a need to build on current scientific findings (including population modelling and exploitation strategies, see Campbell, 2003) to design and implement specific recommendations that ensure the sustainability of the Green Turtle resource, both in the context of the economy and ecology of coastal Nicaragua and with respect to reducing the potential impact of the fishery on the Tortuguero nesting colony. The broader community, including government authorities, NGOs and the rural development sector, should provide the financial means and expertise necessary to assist communities in a collaborative effort to regulate the Green Turtle fishery in the country.
5. As identified by MARENA (2001) and Lagueux *et al.* (2002), there is a need for dedicated efforts to develop alternative livelihoods for the coastal communities that rely heavily on the marine turtle resource. Funding and technical assistance should be provided to identify alternative income-generation schemes, assess their feasibility and provide materials and other resources for their implementation.
6. Greatly expanded efforts should be made to reduce illegal exploitation and trade of marine turtles and marine turtle products and to reduce demand for these products. As recommended by MARENA (2001), a permanent campaign should be established to support the prohibition on the sale of Hawksbill articles, including surveillance and control. Such a campaign should include:
 - a clear legal and regulatory basis for enforcement—the rationalized legal framework should specify competent authorities and the penalties to be imposed for marine turtle offences;
 - enhanced enforcement capacity and effort—including through permanent, regular training, logistical support and technical materials for personnel involved in CITES implementation and implementing trade controls (for example, Customs officers, quarantine staff, and police) (Chacón, 2002)—and the establishment of a department of inspectors within MARENA and other agencies to ensure compliance with broader wildlife and fisheries legislation;
 - mechanisms for co-ordination and collaboration amongst law enforcement agencies, including between border personnel and relevant agencies in neighbouring countries, in the investigation and control of wildlife trade across borders (Chacón, 2002);
 - sustained outreach with user groups and other stakeholders to ensure their knowledge of the specifics of and rationale for the restrictions in place; and
 - mechanisms that enable the quantification and monitoring of illegal exploitation and trade, so as to inform containment strategies.
7. Communications and public awareness efforts in support of marine turtle conservation and management should be greatly expanded, drawing on lessons from the work of WCS in Nicaragua and government agencies and NGOs elsewhere in the region, including those affiliated with the WIDECASST network. Increased efforts should be made to engage local communities, including fishers, in marine turtle conservation and management.
8. Continued support should be provided to relevant government agencies, NGOs and local communities to conduct research on marine turtles, particularly that which will elucidate the status and trends of populations

and inform management measures and provide specific *in situ* protection, such as at nesting beaches in the Pearl Cays and at El Cocal.

9. As recommended by Lagueux *et al.* (2003) in relation to their work in the Pearl Cays, efforts should be made to increase community involvement in marine turtle conservation and management activities, such as through the direct participation of community residents and university students in these efforts and the provision of training to these individuals in order to improve their skills and knowledge. Fisheries extension efforts should be implemented that involve regular exchanges of information with fishers on the subject of marine turtles and their conservation and management needs. The participation of fishers in efforts to manage marine turtles so as to enhance compliance with regulations and support for marine turtle conservation should be encouraged. Support directed towards sustainable fishery practices should be provided, as relevant and necessary, to assist fishers meaningfully in their efforts to comply with revised marine turtle regulations.
10. Habitat conservation measures should be developed to minimize destruction and degradation of marine turtle nesting and foraging habitat. These should include the development, through local, regional and national government agencies, of regulations and specific penalties for non-compliance. As strongly recommended by Lagueux *et al.* (2003), a management plan should be developed for the Pearl Cays with the involvement of all stakeholders, in order to regulate development, promote conservation and minimize threats to Hawksbill Turtles and their habitats. Within this context, a permitting process should be established for proposed land-use and water-based activities, accompanied by strict enforcement and strong penalties for violations.
11. Consideration should be given to establishing specific measures to enhance the protection of marine turtles in existing protected areas and to expanding protected areas. As proposed by Lagueux *et al.* (2003), particular consideration should be afforded to establishing a protected area in the Pearl Cays to protect important terrestrial and marine habitats for Hawksbill Turtles and to protecting the marine turtle nesting populations at El Cocal.
12. Financial, logistical and political support and encouragement should be extended to relevant government agencies, local communities and other stakeholders to develop and implement a modern, scientifically based conservation and management regime for marine turtle stocks, including for the revision of the legal framework, scientific studies, monitoring programmes, enforcement capacity and institutional strengthening of government agencies whose mandate includes marine turtles and their habitats. Both private and public foreign investment in the fisheries sector in Nicaragua should take account of the increased responsibilities—and costs—of fisheries and other government agencies in managing for sustainability the resources concerned and the broader biodiversity impacts that may ensue.
13. Community outreach, fishery monitoring, population monitoring and other management and conservation efforts being undertaken by NGOs in collaboration with government and local stakeholders should be expanded through increased financial commitments from bilateral and multilateral assistance agencies. Co-management agreements between government and NGOs and CBOs, developed by consensus and building on current partnerships and successes, are encouraged.

References

- Anon. (2002). CITES Document CoP12 Doc. 28. Working document of the 12th meeting of the Conference of the Parties, Santiago (Chile), 3–15 November 2002. Accessible at www.cites.org. Viewed 12 December 2005.
- Anon. (2005). Decomisan subproductos de la tortuga carey en Bluefields. 9 April 2005. *La Prensa*. www.laprensa.com.ni
- Arostegui Montiel, R. (1984). National Report for Nicaragua. Pp. 337–343. In: P. Bacon *et al.* (Eds). *Proceedings of the Western Atlantic Turtle Symposium, 17–22 July 1983, San José, Costa Rica*, III. Appendix 7. University of Miami Press, Florida.
- Arrivillaga, A. and M.A. García. (2004). Status of coral reefs of the Mesoamerican Barrier Reef Systems Project. Region and reefs of El Salvador, Nicaragua and the Pacific coasts of Mesoamerica. Pp. 473–491. In: C. Wilkinson (Ed.) *Status of Coral Reefs of the World: 2004*, II. Australian Institute of Marine Science. www.aims.gov.au/pages/research/coral-bleaching/scr2004.
- Bass, A.L., C.J. Lagueux and B.W. Bowen. (1998). Origin of Green Turtles, *Chelonia mydas*, at “sleeping rocks” off the northeast coast of Nicaragua. *Copeia* 1985(4):1064–1069.
- Bjorndal, K.A., A.B. Bolten and C.J. Lagueux. (1993). Decline of the nesting population of hawksbill turtles at Tortuguero, Costa Rica. *Conservation Biology* 7(4):925–927.
- Bjorndal, K.A., A. Carr, A.B. Meylan, J.A. Mortimer. (1985). Reproductive biology of the hawksbill *Eretmochelys imbricata* at Tortuguero, Costa Rica, with notes on the ecology of the species in the Caribbean. *Biological Conservation* 34:353–368.
- Campbell, C.L. (2003). *Population Assessment and Management Needs of a Green Turtle, Chelonia mydas, Population in the Western Caribbean*. Ph.D. dissertation, University of Florida. 124 pp.
- Campbell, C.L. and C.J. Lagueux. (2005). Survival probability estimates for large juvenile and adult green turtles (*Chelonia mydas*) exposed to an artisanal marine turtle fishery in the western Caribbean. *Herpetologica* 61(2):91–103.
- Carr, A., M.H. Carr and A.B. Meylan. (1978). The ecology and migration of sea turtles, 7. The west Caribbean green turtle colony. *Bulletin of the American Museum of Natural History* 162(1):1–46.
- Carr, A., A. Meylan, J. Mortimer, K. Bjorndal and T. Carr. (1982). *Surveys of sea turtle populations and habitats in the Western Atlantic*. NOAA Technical Memorandum NMFS-SEFC-91. US Department of Commerce.
- Chacón, D. (2002). *Diagnóstico sobre el comercio de las tortugas marinas y sus derivados en el istmo centroamericano*. Red Regional para la Conservación de las Tortugas Marinas en Centroamérica (RCA), San José, Costa Rica. 247 pp.
- CITES-Nicaragua. (2002). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of the Marine Turtles of the Lesser Antilles, Central America, Colombia and Venezuela. Completed by René Salvador Castellón, Supervisor Técnico, responsable del tema de las tortugas marinas, Oficina CITES-Nicaragua, Dirección General de Biodiversidad y Recursos Naturales, MARENA. Dated 23 August 2002.
- FAO. (1995). Code of Conduct for Responsible Fisheries. Adopted by the 28th Session of the FAO Conference. Food and Agriculture Organization of the United Nations, Rome. 34 pp. + annexes. www.fao.org/fi/agreem/codecond/codecon.asp
- Frazer, N.B. and R.C. Ladner. (1986). A growth curve for Green sea turtles, *Chelonia mydas*, in the U.S. Virgin Islands, 1913–14. *Copeia* 1986(3):798–802.
- Gómez Silva, A.J. and D. Castro. (1998). Memoria del encuentro para analizar la problemática del uso de las tortugas marinas del Caribe de Nicaragua. Un taller participativo con los autores principales de la Región Autónoma del Atlántico Sur, Tasba Pauni, RAAS, 15–19 de julio de 1998. 17 pp. Unpublished.

- Groombridge, B. and R. Luxmoore. (1989). *The Green Turtle and Hawksbill (Reptilia: Cheloniidae): World Status, Exploitation and Trade*. Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Lausanne, Switzerland. 601 pp.
- Hernández Munguía, J.G. (2002a). *Manual Jurídico de Fauna Silvestre*, I. MARENA. Managua, Nicaragua. 115 pp.
- Hernández Munguía, J.G. (2002b). *Manual Jurídico de Fauna Silvestre*, II. MARENA. Managua, Nicaragua. 397 pp.
- Lagueux, C.J. (1998). Marine turtle fishery of Caribbean Nicaragua: human use patterns and harvest trends. Doctoral dissertation, University of Florida, Gainesville. 215 pp.
- Lagueux, C.J. and C.L. Campbell. (2002a). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of the Marine Turtles of the Lesser Antilles, Central America, Colombia and Venezuela. Dated 21 October 2002.
- Lagueux, C.J. and C.L. Campbell. (2002b). Overview of mechanisms to mitigate current and potential threats. Pp. 76–85. In: C.J. Lagueux, C.L. Campbell and L.W. Lauck, (Eds). Draft Management Strategy for Sea Turtle Conservation on the Caribbean Coast of Nicaragua. Project #99-033-001, National Fish and Wildlife Foundation, Washington, DC. 113 pp.
- Lagueux, C. and C. Campbell. (2005). Marine turtle nesting and conservation needs on the south-east coast of Nicaragua. *Oryx* 39(4): 398–405.
- Lagueux, C.J., C.L. Campbell and L.W. Lauck (Eds). (2002). Draft Management Strategy for Sea Turtle Conservation on the Caribbean Coast of Nicaragua. Project #99-033-001, National Fish and Wildlife Foundation, Washington, DC. 113 pp. Unpublished.
- Lagueux, C.J., C. Campbell and W.A. McCoy. (2003). Nesting and conservation of the hawksbill turtle, *Eretmochelys imbricata*, in the Pearly Cays, Nicaragua. *Chelonian Conservation Biology* 4(3):588–602.
- MARENA. (2001). Informe Nacional sobre Tortugas Carey—Nicaragua. Prepared for First CITES Wider Caribbean Hawksbill Dialogue Meeting (Mexico City, 14–17 May 2001). Ministerio del Ambiente y los Recursos Naturales (MARENA), Dirección General de Biodiversidad y Recursos Naturales (DGBRN). Elaborado por L.I. González, Co-ordinadora Zonas Costeras y Humedales. 5 pp. Unpublished.
- Meylan, A.B. (1999). International movements of immature and adult hawksbill turtles (*Eretmochelys imbricata*) in the Caribbean region. *Chelonian Conservation and Biology* 3(2):18–194.
- Milliken, T. and H. Tokunaga. (1987). *The Japanese Sea Turtle Trade 1970–1986*. A special report prepared by TRAFFIC (Japan). Center for Environmental Education, Washington, DC. 171 pp.
- Mortimer, J.A. (1976). Observations on the Feeding Ecology of the Green Turtle, *Chelonia mydas*, in the Western Caribbean. Masters thesis, University of Florida, Gainesville. 100 pp.
- Mortimer, J.A. (1981). The feeding ecology of the west Caribbean green turtle (*Chelonia mydas*) in Nicaragua. *Biotropica* 13(1):49–58.
- Nietschmann, B. (1971). The Exploitation of Hawksbill Turtles, East Coast of Nicaragua: Results and Recommendations from a Preliminary Study. Report to Departamento de Recursos Naturales Renovables, Ministerio de Agricultura y Ganadería, Managua, Nicaragua. 12 pp.
- Nietschmann, B. (1973). *Between Land and Water: the Subsistence Ecology of the Miskito Indians, Eastern Nicaragua*. Seminar Press, New York. 279 pp.
- Nietschmann, B. (1974). When the Turtle Collapses, the World Ends. *Natural History* 83:34–43.
- Nietschmann, B. (1975). *Who Will Kill the Last Turtle?* Collected Papers on Vanishing Species and Societies, Nicaragua. Department of Geography, University of Michigan. 199 pp.

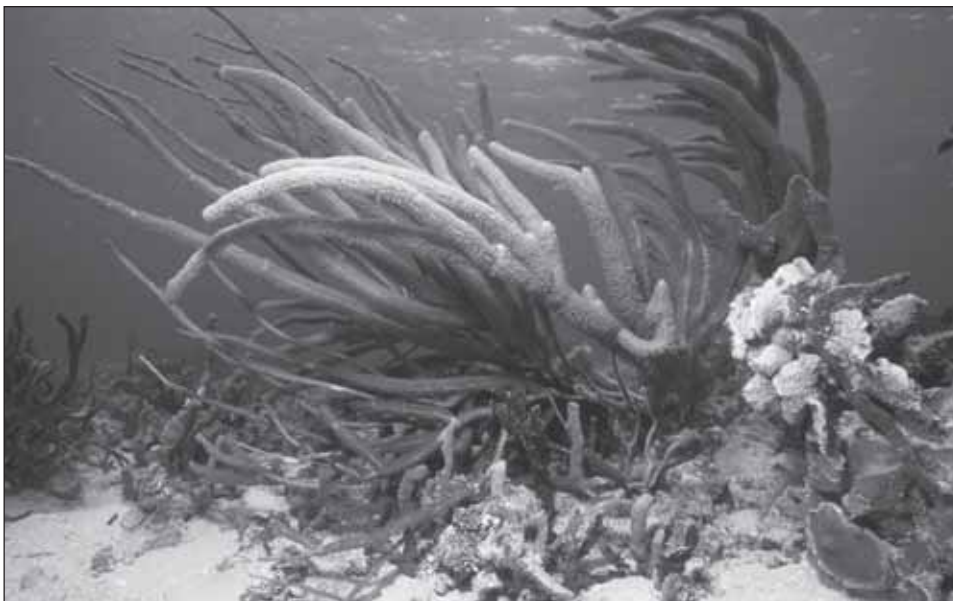
- Nietschmann, B. (1979a). *Caribbean Edge: the Coming of Modern Times to Isolated People and Wildlife*. The Bobbs-Merrill Company, Inc., New York. 280 pp.
- Nietschmann, B. (1979b). Ecological change, inflation and migration in the far western Caribbean. *The Geographical Review* 69:1–24.
- Nietschmann, B. (1981). Following the underwater trail of a vanishing species—the hawksbill turtle. *National Geographic Society Research Report* 13:459–480.
- Parsons, J. (1962). *The Green Turtle and Man*. University of Florida Press, Gainesville. 121 pp.
- Rebel, T.P. (1974). *Sea Turtles and the Turtle Industry of the West Indies, Florida, and the Gulf of Mexico*, revised edn. University of Miami Press, Coral Gables. 250 pp.
- Ruiz, G.A. and L.E. Jarquín Ch. (1997). Legislación nacional que afecta la tortuga marina en Nicaragua. Centro de Derecho Ambiental y Promoción para el Desarrollo (CEDAPRODE), Managua. 21 pp. Unpublished.

Panama

Introduction

The southernmost country in the Central American isthmus, bordering on Colombia, Panama is rich in species, habitat and ecosystems and in cultural and ethnic diversity; seven indigenous peoples comprise at least 8% of the country's population (ANAM, 2004). Panama's Caribbean coast extends over 1287 km and incorporates and abuts important habitats for foraging, reproduction and migration of marine turtles, including 250 km of coral reefs, mangroves, seagrass beds and sandy beaches. To the west lies the Archipelago of Bocas del Toro, with more than 50 cays, and to the east the Archipelago of San Blas, with more than 300 coralline islands (ANAM, 2004). Playa Chiriquí, on the north-west coast near Bocas del Toro, harbours one of the largest nesting colonies of Leatherbacks in the Western Hemisphere and is believed to have once been the largest nesting site for Hawksbill Turtles in the Western Hemisphere; although the nesting Hawksbill population is greatly depleted, it remains of regional significance.

Panama is divided into nine provinces and five *comarcas*, the latter being regions that are primarily inhabited—and administered with a certain degree of autonomy from central government—by indigenous groups. The two largest of these *comarcas* are situated along the Caribbean coast: the Comarca de Ngöbe-Buglé, established in 1997 along the north-western coast adjacent to Bocas del Toro province, and the Comarca de Kuna Yala (formerly San Blas), first established in 1938, which extends eastwards along the Caribbean coast towards Colombia and incorporates 3206 km² of land area and ca. 5500 km² of both land and sea (Chapin, 2000).



Credit: WWF/www.JSGrove.com

Corals on a sandy sea floor in the Golfo de San Blas, on the north-east coast of Panama, where Green and Hawksbill Turtles, Loggerheads and Leatherbacks occur.

Exploitation of marine turtles in the Caribbean sector of Panama dates from pre-Columbian times and continues to this day (Ruiz *et al.*, in review). The species most heavily used in the region are the Hawksbill and Green

Turtles for meat, eggs, fat, and Hawksbill shell. Although there has been relatively little scientific research and exchange of information on the status of marine turtles in the region, over-exploitation, including the killing of nesting females, capture of mating turtles in nearshore waters, intensive collection of eggs, and incidental capture in the shrimp fishery are recognized as having caused populations to decline dramatically as compared with those occurring as recently as 40 to 50 years ago (Ruiz *et al.*, in review; GOP, 2001). Garcia (1987), for example, noted that until the 1960s there were some 500 marine turtle nesting beaches in Panama, but by 1987 more than 100 of these had lost their nesting population, and the number of nesting females on others had dropped so dramatically that they risked disappearing altogether.

The Green Turtle has been listed as threatened with extinction and protected from hunting since 1967 and the Loggerhead and Olive Ridley since 1974. In 1980, all marine turtle species occurring in Panama were listed as threatened and legally protected from exploitation and trade, with important exceptions being the collection of eggs, which has been restricted by a closed season that includes most of the nesting season. There appears to be confusion as to what extent these legal proscriptions have been completely superseded by the 1995 *Wildlife Law*, which itself appears unclear by allowing subsistence hunting and fishing but prohibiting hunting and fishing of formally declared threatened species and prohibiting the destruction of wildlife eggs and nests without a permit. In addition, it appears unclear—since all these measures were established by central government—to what extent these regulations apply in the indigenous *comarcas*. This is particularly so in the light of provisions in the 1998 national environmental law that recognize traditional natural resource rights in these areas and the recent establishment and implementation of a six-month closed season on fishing and trade of marine turtles in the Comarca de Kuna Yala. Except for a government-sponsored project at Isla Cañas on the Pacific coast, which involves the collection and commercial use of marine turtle eggs by the local community, there is no locally based management or formal data-collection effort with respect to marine turtle exploitation in the country.

The province of Bocas del Toro has been reported by several authors to have been a centre of exploitation and trade of both Hawksbill and Green Turtles since at least the late 18th century (Ruiz *et al.*, in review). The most important marine turtle trade has undoubtedly been international exports of Hawksbill shell, which, based on Panamanian export statistics presented by Diaz (1984), totalled 83.5 t from 1967 to 1981 and, based on Japanese Customs import statistics, totalled ca. 160 t from 1964 to 1986. For the period 1970–1986, Panama was third only to Indonesia and Cuba as the world's largest exporter of Hawksbill shell to Japan (Groombridge and Luxmoore, 1989). Panama ceased to be recorded as a country of origin for Hawksbill shell imports into Japan in 1986, and the Japanese import market for Hawksbill shell closed on 1 January 1993.

A Sea Turtle Recovery and Action Plan (STRAP) for Panama has been under development under the auspices of the Wider Caribbean Sea Turtle Conservation Network (WIDECAST) and the United Nations Caribbean Environment Programme (Ruiz *et al.*, in review). In addition to bringing together available information on the status of marine turtles in the region, the STRAP identifies numerous threats to the recovery of marine turtle populations; in addition to over-exploitation. These include a range of habitat factors, including intensive tourism linked with cruise-ships and yachts, transport of petroleum and shipping in general, destruction of coral reefs, and contamination from solid and toxic wastes. The STRAP proposes a five-year national marine turtle conservation programme along two major axes: the acquisition of definitive, real data on the distribution of developmental, nesting and foraging habitats for marine turtles, and implementation of conservation, protection and recovery actions for remaining marine turtle populations. One of the many gaps noted in the STRAP is the absence, at the national level, of an integrated management programme for the environment and natural resources of the

Caribbean region of the country, which is identified as essential to addressing the increasing pressures on the marine resources of the region.

Summary of the status of marine turtles in Panama

Four species of marine turtle occur in the Caribbean sector of Panama, from Bocas del Toro and the Comarca de Ngöbe-Buglé, on the border with Costa Rica, to the Comarca de Kuna Yala bordering Colombia. Green and Hawksbill Turtles are present throughout the year, as both foragers and nesting females. Loggerheads appear to occur primarily as foraging sub-adults and there is little evidence of their nesting along the Caribbean coast of the country (A. Meylan, Florida Fish and Wildlife Conservation Commission—Florida Wildlife Research Institute, *in litt.*, 15 March 2005). The Leatherback occurs only seasonally, to nest.

Occurrence of marine turtles in Panama

English common name	Scientific name	Occurrence
Loggerhead	<i>Caretta caretta</i>	N, F
Green Turtle	<i>Chelonia mydas</i>	N, F
Leatherback	<i>Dermochelys coriacea</i>	N
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	N, F
Kemp's Ridley	<i>Lepidochelys kempii</i>	A
Olive Ridley	<i>Lepidochelys olivacea</i>	A

Key: N=nesting; F= foraging; A=absent

There appears to be limited nesting by Green Turtles on the Caribbean coast of Panama: nesting has been recorded at a number of beaches, but the frequency appears to be low at all these sites (A. Meylan, *in litt.*, 15 March 2005). By contrast, nesting by Hawksbill Turtles is more extensive: surveys conducted on Playa Chiriquí in 2003 and 2004 suggest that ca. 400–500 Hawksbill nests are laid on the beach each year (Caribbean Conservation Corporation, *in litt.*, 4 March 2005); 465 nests were recorded in 2004 (Ordoñez *et al.*, 2005). Playa Chiriquí was once described as the most important nesting beach in the Caribbean for the Hawksbill Turtle, but surveys in the 1980s and 1990s suggested nesting had declined by as much as 98% from 1950 levels (Meylan and Donnelly, 1999). Although today's nesting population constitutes a fraction of what it once was, it remains important at the regional level. Significant nesting also occurs on other beaches in Bocas del Toro province and the Comarca de Ngöbe-Buglé. The Caribbean coast of Costa Rica and Panama also harbours one of the four largest remaining Leatherback rookeries in the world (Troëng *et al.*, 2004); Playa Chiriquí is the highest-density nesting site for this species in Panama, with 3000 nests recorded there in 2004 (Ordoñez *et al.*, 2005).

Ruiz *et al.* (in review) list 22 major marine turtle nesting sites along the Caribbean coast that have been identified through surveys undertaken by Panama's natural resource management agency and others for the First and Second Western Atlantic Turtle Symposia (Diaz, 1984; Garcia, 1987). They note that there is general information on marine turtle foraging areas along the coast but insufficient information on which to identify those that are principal foraging sites.

There are numerous records of international movements of marine turtles to and from Panama. Meylan (1999) cited the report (Bjorndal *et al.*, 1985) of a female Hawksbill Turtle tagged at Tortuguero (Costa Rica) in 1967 that was recaptured less than four months later at Colón, Panama, and Nietschmann's report (1981) of a male Hawksbill Turtle tagged at Little Sandy Bay, Nicaragua, in 1972, which was recaptured two years later at Almirante Bay, Panama. Data from international tag returns and seven turtles fitted with satellite transmitters suggest that Bocas del Toro is an important station along the migratory corridor for Green Turtles nesting at Tortuguero, Costa Rica (Meylan and Meylan, 1994; Meylan and Meylan, unpubl. data). Meylan (*in litt.*, 15 March 2005) reports that turtles captured in nets and tagged or satellite-tracked from Bocas del Toro have travelled to the nesting beach at Tortuguero or to presumed feeding grounds in Nicaragua; some have done both. Although the majority of tag returns are from Nicaragua, a single satellite track documented a male Green Turtle's travel to the Archipelago of San Bernardo in Colombia. In addition, Meylan reports that many of the adult turtles captured in nets in Bocas were mating or showed evidence of mating, suggesting that Bocas also serves as a mating station.

According to Meylan (*in litt.*, 15 March 2005), the distances of migrations from Panama of post-nesting Hawksbill Turtles documented by satellite-tracking have been comparable to or greater than those of Green Turtles. Three of four adult, female Hawksbill Turtles satellite-tracked after nesting at Playa Chiriquí travelled to distant countries, including Nicaragua and Jamaica, where they stayed for extended periods. The fourth was captured and killed in Bocas del Toro province shortly after her release from the nesting beach. A female satellite-tracked after nesting at the Zapatilla Cays travelled to a reef area offshore from Honduras and remained there for several months, after which the transmitter battery failed; this same female was recorded again on the nesting beach at Zapatilla Cays two years later (Meylan and Meylan, unpubl. data).

Overview of the legal framework for marine turtle management

Membership in international and regional treaties

Panama is party to most multilateral environmental agreements of primary relevance to marine turtles, the notable exception being the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC) (see table opposite). Panama is also party to the trilateral *Acuerdo de Cooperación para la Conservación de las Tortugas Marinas en la Costa Caribeña de Costa Rica, Nicaragua y Panamá (Acuerdo Tripartito)*, the sub-regional initiative aimed at co-operation in management efforts for these species. Panama is not party to International Labour Organization Convention N° 169 Concerning Indigenous and Tribal Peoples in Independent Countries.

Laws and regulations relating to marine turtles

There is a long history and abundance of legal norms in Panama relating to wildlife, including marine turtles. These range in type and weight and include the country's constitution and ratifications of international treaties, laws, codes, decrees, resolutions, determinations (*resueltos*), regulations and other legal requirements (Gedalov and Díaz de Melgarego, 2003). The Government of Panama (GOP, 2001) has noted that some of the rules governing the protection of marine turtles in Panama are incomplete or have become obsolete and, thus, do not provide all that is necessary to guarantee the protection of the Hawksbill Turtle (and presumably other marine turtle species) in the country. In addition, based on this review of available legislation, legal analyses and other

Membership of Panama in multilateral agreements relating to marine turtles

Convention	Panama
Cartagena Convention	07.11.1987 (R)
Protocol Concerning Specially Protected Areas and Wildlife (SPAW)	27.09.1996 (R)
Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region	07.11.1987 (R)
Protocol Concerning Pollution from Land-based Sources and Activities	09.07.2003
Convention on Biological Diversity (CBD)	17.01.1995 (R)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	15.11.1978 (E)
Convention on Migratory Species (CMS)	01.05.1989 (E)
Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	No
MARPOL 73/78 (Annex I/II)	20.05.1985 (A)
MARPOL 73/78 (Annex III)	20.05.1985 (A)
MARPOL 73/78 (Annex IV)	20.05.1985 (A)
MARPOL 73/78 (Annex V)	20.05.1985 (A)
Convention on Wetlands of International Importance (Ramsar)	26.11.1990 (E)
UN Convention on Law of the Sea (UNCLOS)	01.07.1996 (Ds)
Western Hemisphere Convention	16.03.1972 (R)
World Heritage Convention	03.03.1978 (R)

Key: Date of: Ratification (R); Accession (A); Declaration (Ds); Entry into force (E).

reports, there appears to be some confusion—and quite possibly conflict—as regards the rules that apply. Marine turtles are variably characterized in the many documents reviewed while compiling this analysis as completely protected, subject to an annual closed season and available for subsistence use.

According to ASLAP (1997), the first regulations relating to fishing for turtles in Panama were adopted in 1918 and 1919, and the first legal protection measures on behalf of marine turtles were adopted in the 1960s. *Decreto Ejecutivo N° 23* of 30 January 1967, amongst other provisions, listed the Green Turtle as one of several species identified as threatened with extinction and established absolute and indefinite protection from hunting for this species, throughout national territory. This was followed by *Decreto Ejecutivo N° 104* of 4 September 1974, which reiterated this protection for the Green Turtle and extended it to the Loggerhead and Olive Ridley. It established a five-month closed season, from 1 May to 30 September, during which it was prohibited to collect and sell the eggs of any marine turtle species, and prohibited at all times the capture of hatchling turtles. This decree also established fines for infractions: 50 Balboas (PAB50) for the capture or killing of the three protected species; PAB10 for each turtle hatchling captured; and PAB1 for each illegally collected turtle egg. The next measure taken on behalf of these species was *Resolución N° DIR-002-80* of 24 January 1980, issued by the *Dirección Nacional de Recursos Naturales Renovables* (RENARE—the National Directorate of Renewable Natural Resources). This measure declared 82 species, including all five species of marine turtle occurring in the waters and on the beaches of Panama, as threatened with extinction and in urgent need of protection. It prohibited the hunting, purchase, sale and export of all these species. This resolution was republished in the *Gaceta Oficial N° 24 850* on 23 July 2003, thus reaffirming these specific protections for these animals (but not their eggs, which presumably were still subject to the seven-month open season created by the decree of 1974).

In addition to specific legal provisions for marine turtles, Panama has adopted at various times and through various instruments general protections for wildlife species. Groombridge and Luxmoore (1989) note, for example, *Presidential Decree (Decreto) N° 18* of 1976, which prohibited trade in wildlife and wildlife products and hunting, commerce, imports and exports of indigenous wildlife, and Gedalov and Díaz de Melgarego (2003) and Ruiz *et al.* (in review) note *Resolución N° DIR-003-86* of 31 June 1986, which prohibited hunting, purchase and sale as well as any commercial activity involving wildlife, with the exception of hunting for scientific purposes, captive-breeding facilities, and subsistence.

The Government of Panama (GOP, 2001) reports that exploitation of marine turtles is currently primarily governed through the wildlife law, *Ley de Vida Silvestre No. 24* of 7 June 1995, and the environment law, *Ley General de Ambiente No. 41* of 1 July 1998. The former specifically repeals *Decreto Ejecutivo N° 23* of 1967. The most pertinent provisions of the *Ley de Vida Silvestre No. 24* for marine turtles are:

- its inclusion of marine and aquatic species;
- a requirement that the environment agency (at that time the *Instituto Nacional de Recursos Naturales Renovables* (INRENARE—the National Institute for Renewable Natural Resources), now the *Autoridad Nacional de Ambiente* (ANAM—the National Environment Authority) co-ordinate with the *Dirección de Recursos Marinos* (Directorate of Marine Resources) of the *Ministerio de Industria y Comercio* (Ministry of Commerce and Industry) in conservation, research, trade and management;
- a provision that individuals conducting hunting or fishing for their own subsistence or that of their family may do so without a permit (but INRENARE reserved the right to regulate the “specimens” that were subject to those activities (Art. 39));
- a prohibition on collecting products, parts or derivatives of wildlife without the necessary permits, as well as prohibition on destroying, *inter alia*, eggs, nests and feeding sites, and prohibition of any other action impinging on the conservation of wildlife (Art. 40); and
- a prohibition on hunting and fishing of species included in the national list of threatened or endangered species (developed as mandated by this law) and hunting or fishing during closed seasons as declared by the *Dirección Nacional de Areas Protegidas y Vida Silvestre* (National Directorate of Protected Areas and Wildlife) of INRENARE (Art. 58).

The law also specifies penalties—including fines, prison terms, and/or confiscation of equipment—for different types of offences.

The national environmental law, *Ley General de Ambiente No. 41*, is the framework law for environmental protection and management in Panama. As does the *Ley de Vida Silvestre*, it sets forth important regulations that affect marine turtles, including the stipulations:

- that the *Autoridad Marítima de Panamá* (AMP—Marine Authority of Panama) co-ordinate with ANAM in developing a strategic plan for aquatic resources and ensuring strict compliance with the plans adopted to conserve and recover these resources and use them sustainably (Art. 85);
- that the rights of the *comarcas* and indigenous peoples are recognized in relation to the use, management and “traditional, sustainable exploitation” of renewable natural resources within legally created *comarcas* and indigenous reserves. These will be used within the framework of environmental protection and conservation as set out in the Constitution, the current law and other national laws (Art. 98); and

- that exploitation for industrial or commercial purposes of resources in community or indigenous lands requires issuance of a permit by the competent authority (Art. 101).

Other than the re-gazetting of *Resolución N° DIR-002-80* in 2003 and repeal of *Decreto N° 23* of 1967, there appears not to have been any clarification provided by ANAM as to how these recent laws relate to preceding legal measures and how they affect: a) subsistence hunting or fishing of threatened marine turtles, including in the *comarcas*; b) commercial use (in apparent contravention of “subsistence” privileges) of marine turtles and turtle products in the *comarcas*; and c) collection of marine turtle eggs for subsistence or other purposes (which has been illegal during a five-month closed season that covers most of the nesting season but, based on the 1995 wildlife law, appears now to be completely prohibited), including in the *comarcas*. In addition, although the above-mentioned provisions of the wildlife law could be interpreted as prohibiting even subsistence use of marine turtles, as formally declared threatened species, the opposite interpretation seems equally possible. The existence of press reports (e.g. in *La Prensa*: www.mensual.prensa.com and *Panamá América*: www.elpanamaamerica.com.pa) and other information referring to commencement of the closed season suggests that the 1974 closed season provisions—which apply to eggs only—continue to apply; however, they also suggest that the open season may be interpreted in some instances as allowing the capture of turtles—at least for subsistence purposes as may be provided for in the wildlife law.

Further raising confusion about the legal measures in effect is the fact that, in July 2004, the *Congreso General Kuna* (CGK—Kuna General Congress), the highest governmental authority in the Comarca de Kuna Yala, agreed for the first time a set of specific protections for marine turtles, reported in *La Prensa* (Bonilla, 2004a): a) a prohibition on the capture for any purpose and commercial use of marine turtles occurring in the *comarca* during an annual closed season from 1 April to 30 September, inclusive, which was to enter into force in 2005; and b) a prohibition of the capture, pursuing, harassment or threatening of nesting or “reproducing” turtles at any time of the year and the destruction of natural habitat conducive to turtle nesting and reproduction. Whether or not the Resolution that established these measures includes eggs is unclear from the report in *La Prensa*, although the period of the closed season, which covers most of the nesting season, and the prohibition of destruction of nesting habitat would appear to protect eggs as well. The adoption of this measure suggests that central government legislation, such as the marine turtle provisions of the *Ley de Vida Silvestre* (including the subsistence-use restriction) and quite possibly the previous protections conferred on marine turtles, is not considered to apply automatically in the *comarcas*.

A series of legal measures have been adopted in Panama over the past decade in an effort to reduce incidental mortality of marine turtles in trawl fisheries, in particular the shrimp fishery. The current law, *Decreto Ejecutivo N° 82* of 1 April 2005, not only requires the deployment of turtle excluder devices (TEDs) in all trawl fisheries in Panamanian waters, but also requires, *inter alia*, that all trawl fisheries land their catch in ports that have been accredited to inspect and control TEDs. Further, a captain’s licence for operating a trawler will only be issued if the individual has completed an accredited course on the installation and deployment of TEDs. Finally, the *Decreto* provides for revocation of a captain’s licence in cases of infractions of these provisions.

As is the case with respect to wildlife, there is a large body of legislation relating to protected areas in Panama. The national system of protected areas (SINAP) and the different management categories within SINAP were established in 1994 via *Resolución N° JD-09-94* within INRENARE (now ANAM). The *Ley General de Ambiente* formalizes the operation of SINAP and makes numerous provisions to foster the development and management of the system.

Under the Constitution of Panama, international treaties are not afforded superior status to domestic law but rather the same status; a separate law is not required to render the provisions of international treaties immediately applicable (Chacón, 2002a). The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was ratified in Panama via *Ley N° 14 of 28* of October 1977, published in the *Gaceta Oficial* on 27 January 1978. The CITES National Legislation Project initially assessed Panama's legislation as "believed generally not to meet all requirements for the implementation of CITES" (Anon., 2002a). By May 2004, draft CITES legislation had been submitted by the Government of Panama to the CITES Secretariat for review and, on 19 May 2004, ANAM adopted *Resolución N° AG-0172-2004 "Que reglamenta lo relativo a las especies de fauna y flora amenazadas y en peligro de extinción y se dictan otras disposiciones"*. Panama's CITES-implementing legislation is now considered by the CITES National Legislation Project as "believed generally to meet the requirements for implementation of CITES" (Anon., 2004). Among the many provisions of the new law is the prohibition (Art. 5) on national or international trade in specimens or products derived directly from the wild and not subject to any of the management measures specified in the law; this would include marine turtles. Further, the law establishes a monetary fine of PAB5000–10 000 for infractions of the provisions and a prison term in instances of failure to pay these fines.

Responsible authorities

Responsibility for managing marine turtles in Panama currently rests with ANAM, successor to INRENARE, as provided for in the *Ley General de Ambiente*, in co-ordination with AMP. CITES Management Authority functions are carried out by the Protected Areas and Wildlife Office of ANAM. As is suggested by the 1998 national environmental law and testified to by the recent developments in the Comarca de Kuna Yala, authority for marine turtles also rests with the governing bodies of the *comarcas*.

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective

According to León and Bjorndal (2002), current Hawksbill Turtle populations in the Caribbean represent 10%, at most, of their pre-Columbian levels. This pattern is typified in Panama, where Playa Chiriquí is believed to have been at one time the most important Hawksbill nesting colony in the western Caribbean region, but surveys in the 1980s and 1990s suggest that nesting has declined by as much as 98% from 1950s levels (Meylan and Donnelly, 1999). Ruiz *et al.* (in review) cite several authors in reporting on the use of marine turtles in Panama over many centuries. Carr *et al.* (1982) reported that human exploitation of marine turtles was "heavy", with eggs taken regularly, nesting females often killed, and turtles captured in nets set offshore or speared with harpoons, especially in the Islas de San Blas (Comarca Kuna Yala). Although Green Turtle meat was preferred, both Green Turtle and Hawksbill meat was consumed by coastal residents. Garcia (1987) reported that, despite legal protection at the time of his writing, the low level of surveillance on the nesting beaches made it easy to capture nesting turtles and trade in eggs, meat and Hawksbill shell. He provided no data, however, on this exploitation, only export figures (see next section), thus suggesting that these are the only official data that exist on these activities.

Meylan (*in litt.*, 15 March 2005) reports that, during the 1980s, fishers in Bocas del Toro were capturing more than 500 turtles per year with nets, but that use of these nets has been largely discontinued.

Recent (since 1992) exploitation

Ruiz *et al.* (in review) note that coastal populations in Bocas del Toro, Colón and the Comarca de Kuna Yala depend on marine turtles (meat, eggs, fat) for subsistence and as a source of protein. They further report that the consumption of marine turtles has moved inland from the coast and that, in the last decade, illegal trade in marine turtle products has proliferated, owing to persistent demand. Green Turtles, Hawksbill Turtles and Loggerheads are valued for their meat and eggs. Although the Hawksbill Turtle was formerly captured only for its shell, the meat has come to have the same commercial value as Green Turtle meat, owing to presumed aphrodisiac and curative properties. The Leatherback is exploited primarily for eggs. The indigenous Ngöbe-Buglé use the fat of Green and Hawksbill Turtles for medicinal purposes, for example to treat asthma, tuberculosis, bronchitis and other respiratory problems (Soto *et al.*, 1998, cited in Ruiz *et al.*, in review).

There are few formal data available on the current extent of marine turtle exploitation in the Panamanian Caribbean. The *Fundación para la Protección del Mar*—PROMAR (1998) reported on the results of a field investigation of marine turtle exploitation in the province of Bocas del Toro during the period May–August 1998. It concluded that the majority of the exploitation was oriented towards commercial trade rather than subsistence use and that Hawksbill Turtles were caught incidentally while fishing with harpoons for lobsters and other species and that Green Turtles were caught with nets. It estimated, based on its findings, that as many as 3000 Green Turtles were captured during the nesting season along the coast of the province.

Ruiz *et al.* (in review) reported that during surveys undertaken by the Institute for Tropical Ecology and Conservation (ITEC)'s turtle conservation programme in Bocas del Toro from May to August 2001, 34 Leatherback females were recorded slaughtered along four kilometres of Playa Soropta, Bocas del Toro, of which ca. 30% had been killed prior to nesting.

More recently, the Caribbean Conservation Corporation (CCC) and partners (Ordoñez *et al.*, 2003) have reported the following in relation to continued exploitation of marine turtles in and around their study sites in Bocas del Toro:

“Although the Zapatilla Cays are part of the Bastimentos Island National Marine Park and are essentially unoccupied, both nesting turtles and their eggs are still threatened by poachers. The threat to turtles and their eggs from poachers is much greater on Playa Chiriquí which is bounded by two communities.Anecdotal information suggests that a major threat to Hawksbill survival is harpooning of Hawksbill Turtles by members of the Kusapin, Tobobe and Playa Roja communities. In the latter community, Hawksbill Turtles are occasionally taken from the nesting beach. In the vicinity of the Palo Blanco, San Pedro and San Pedrito communities, marine turtles are caught with nets. Informants estimated that at least five Green Turtles and 12 Hawksbill Turtles (some reportedly carrying tags from Playa Chiriquí) were harpooned from Kusapin and as many as 10 marine turtles with Playa Chiriquí tags were caught at the other sites. If these numbers are correct, local fishing may represent a major threat to the Playa Chiriquí Hawksbill Turtles. Similarly, turtle harpooners are visible from the Zapatilla Cays daily after June 1. Most of these boats pass through the waters of the Bastimentos Island National Marine Park on their way to and from striking. The primary target of these strikers is the Green Turtle, but Hawksbill Turtles are taken whenever found.”

Chacón (2002a) reported on the results of market surveys and site visits undertaken from 2000 to 2002 by the *Red Regional para la Conservación de las Tortugas Marinas en Centroamérica* (RCA—Central American Marine Turtle Conservation Network) in partnership with WIDECAS. These were conducted in five cities in Panama, four of them along the Caribbean coast. A major finding of this work was its confirmation of the trafficking of Hawksbill scutes and other handcrafted items from the Comarca de Kuna Yala in the south of the country to Bocas del Toro for sale to the tourists that are increasingly visiting the area. Particularly noteworthy findings from the RCA surveys are presented below.

- **Hawksbill shell.** Ten of the sixteen vendors found selling Hawksbill shell items indicated to the RCA surveyors that the product was an important sales item and the same number identified both Panamanian nationals and nationals of other Latin American countries as the most important buyers. One manufacturer interviewed reported using ca. 40 lb of Hawksbill shell over two to three months and that he had bought Hawksbill shell in both Bastimentos and Carenero but also from Costa Ricans who had brought the shell in from Costa Rica via Bocas del Toro; he reported having been informed that Hawksbill shell items were crafted by prisoners in the Bocas gaol who then sold them for pocket money.
- **Oils and creams.** Two establishments were found selling turtle cream products, and turtle oil was found for sale on Carenero Island, Bocas del Toro, where the vendor reported that locals consume a lot of Green Turtle oil; people interviewed in five more establishments all noted that this oil was excellent for respiratory problems.
- **Eggs.** As in other Central American countries, collection of turtle eggs in Panama was found to be directed to two purposes, namely subsistence consumption and for trade—“for eating in bars, restaurants, soccer games and at busy intersections”—and that they are popular as special nourishment and because of their presumed aphrodisiac properties. Although the trade is “ubiquitous”, it is often conducted quietly. On the Caribbean coast, marine turtle eggs—primarily Leatherback and Green Turtle but also Hawksbill eggs when they are found—are sold in a clandestine manner. The RCA surveys found eggs for sale in Changuinola, Puerto Amirante, Isla Colón, Isla Bastimento, Chiriquí Grande and Colón and Hawksbill eggs specifically in Isla Colón, Isla Bastimento and Colón.

Ruiz *et al.* (in review) note that most of the shrimp fishery in Panama operates off the Pacific coast but that an industrial shrimp fleet of 8–16 boats has in recent years begun operating in the Caribbean during two to three months of the year, principally in Bocas del Toro province. Although TEDs have been deployed in the country since 1992, they express concern that this fishery risks having a major impact on marine turtles and their habitats. In addition, they report that incidental mortality of marine turtles occurs through “ghost” fishing, in the nets that have been abandoned by both artisanal and commercial fishers.

International trade

Historical perspective

Ruiz *et al.* (in review) cite several authors in reporting that an export trade in Hawksbill Turtles from the Caribbean coast of Panama existed as far back as the late 18th century and that Bocas del Toro was a centre of exploitation and trade for both Hawksbill Turtles and Green Turtles since at least that time. Parsons (1962)



Credit: WWF-Cannon/Carlos Drews

Staff of the Caribbean Conservation Corporation and WWF after the attachment of a satellite transmitter to “Fermina”, a Leatherback in Playa Chiriquí, Panama, 18 June 2005.

reported that, at the time of his writing, the best export market for Costa Rican Green Turtles was Colón, presumably Isla Colón, the northernmost and most heavily inhabited island in the Bocas del Toro Archipelago.

CITES trade statistics derived from the UNEP-WCMC CITES Trade Database document very little trade in marine turtles involving Panama. No trade was reported from 1975 to 1980, the first years of the Convention’s operation, and most of the trade reported during the next 12 years was of specimens exported for scientific purposes. The remaining trade consisted of: 26 skin/leather Cheloniidae items (1983); eight Hawksbill carvings; 13 kg of Cheloniidae meat (1990); and two carapaces, all of which were seized on entry. All of the reported trade involved imports into the USA.

In stark contrast to CITES statistics, Panamanian export statistics and Japanese Customs statistics document very large quantities of Hawksbill shell traded from Panama to Japan. Panamanian export statistics reported by Diaz (1984) document exports of 13 200 kg of Hawksbill shell from 1967 to 1970 and a total of 83 500 kg during the 15-year period from 1967 to 1982.

Exports (kg) of Hawksbill shell from Panama, 1967–1982, as recorded by the *Departamento de Comercio Exterior* of Panama

1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	Total
3000	4700	5500	8100	5900	10 900	11 800	6800	8700	6100	3500	2700	2700	1800	1300	83 500

Source: Diaz, 1984.

Japanese Customs statistics for the period 1970–1986 (Milliken and Tokunaga, 1987) document imports of Hawksbill shell from Panama totalling 98 679 kg (with an additional 63 772 kg imported during the previous six years (1964–1969)—Mack *et al.*, 1979, cited in Garcia, 1987). Based on the Japanese Customs data (which differ by tonnes in some years from the Panamanian data), during the period 1972–1986 Panama was the third-largest supplier, after Indonesia and Cuba, of Hawksbill shell to the Japanese market (Groombridge and Luxmoore, 1989). No imports of Hawksbill shell from Panama were recorded by Japanese Customs from 1985 to 1992, the last year that Japan permitted Hawksbill shell imports. Garcia (1987) characterized this trade as illegal since INRENARE, the government agency responsible at that time for marine turtles and wildlife exports (it has been succeeded by ANAM), had not issued a single export permit for any of these shipments.

Japanese imports (kg) of Hawksbill Turtle shell, 1970–1992, from Panama, as recorded in Japanese Customs statistics

Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
	10 744	11 981	8389	8990	9350	9313	5885	4450	6505	4810	3360	3011
Year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Total
	2243	3889	4259	1500	0	0	0	0	0	0	0	98 679

Sources: Milliken and Tokunaga, 1987; H. Kiyono, TRAFFIC East Asia-Japan Office, *in litt.* to TRAFFIC International, 29 July 2002.

An unknown proportion of these exports is known to derive from Hawksbill Turtles taken in neighbouring Costa Rica (Chacón, 2002b), traded through Panama.

Recent (since 1992) international trade

Available statistics suggest that international trade in marine turtles involving Panama during the past two decades is negligible in comparison with the trade that existed until 1986. CITES trade statistics document very few exports from Panama since 1992; these were either scientific specimens or small quantities of products—e.g. two Cheloniidae carvings, one pair of Cheloniidae shoes, one [unit of] oil, nine eggs, five kilogrammes of Cheloniidae meat, presumably imported as personal items and most of them recorded as having been seized on entry into the USA.

Based on the information collected in the market surveys and interviews by RCA, Chacón (2002a) concluded that at least some of the Hawksbill shell currently used in and exported from Panama originates in Costa Rica; a former buyer of Hawksbill shell in Costa Rica confirmed that all Hawksbill scutes collected from Barra del Colorado to the border with Panama were sold in Bocas del Toro and exported from there.

Enforcement issues

The apparent confusion regarding certain aspects of the prevailing legal framework notwithstanding, there is clearly a range of marine turtle enforcement problems in Panama, including poaching of marine turtles in national

parks and extensive exploitation of turtles and eggs for commercial purposes and trade in marine turtle products. While Ruiz *et al.* (in review) emphasize the need for a greater monitoring and enforcement presence in protected areas, nature reserves and other areas where marine turtles naturally occur, there is also a clear need for greater enforcement effort in relation to the marketing of marine turtle products.

A number of successful interventions have been made to address these problems. CCC and partners (Ordoñez *et al.*, 2003) report that the small amount of data that they collected in their first full marine turtle monitoring season in 2003 suggested that the nearly continuous presence of surveyors on the beaches during the entire nesting season conferred a high level of protection to nesting females and their nests, a finding that would be consistent with results associated with systematic nest-monitoring elsewhere in the region.

La Prensa (Anon., 2002b) reported on the confiscation of 10 live marine turtles, as well as other illegal items, in an enforcement operation (“*operativo de control de la veda*”) undertaken by personnel of the *Dirección General de Recursos Marinos y Costeros* (General Directorate of Marine and Coastal Resources) of AMP in the province of Coclé; the marine turtles were found in a restaurant and, after being confiscated, were released at sea. The case was referred to the legal office of AMP to implement the appropriate penalties. More recently, in May 2005, *La Prensa* (Rivera, 2005) reported on public announcements by ANAM warning of the monetary fines and prison penalties that would be imposed for any commercial use of marine turtles or products and that, in the province of Chiriquí, active “surprise” operations were to be undertaken on beaches and along the coasts to stop the illegal sale of turtles, their meat and eggs.

According to Chacón (2002a), there have been judiciary proceedings in Panama relating to wildlife and marine turtles. In one case, the Santos Circuit Court of Appeals and Claims prosecuted an individual for trafficking 6000 marine turtle eggs and imposed a sentence of five months in prison as well as an 80-day fine set at 3.60 US dollars (USD3.60) per day. Also in Los Santos, there have been five court cases since 2000 relating to illegal collection and marketing of marine turtle eggs. One local on Isla Bastimento reported in 2001 that a friend caught by the police with two Green Turtle flippers was fined the equivalent of USD100 (Chacón, 2002a).

A particularly noteworthy development in relation to enforcement of marine turtle and other environmental legislation has no doubt been the creation, in January 2005, of a special office, the *Oficina de Recepción de Denuncias y Quejas Telefónicas*, within ANAM, dedicated to receiving and acting on information from citizens reporting infractions of the country’s environmental legislation. These may be submitted through the ANAM website (www.anam.gob.pa) or by telephone. The office, within the *Dirección Nacional de Planificación y Política Ambiental*, not only receives reports from the public, but maintains a registry of these and advises those calling in on the various steps to follow to pursue the issue. The office also files a report on each case, including on follow-up action that has been taken (ANAM, 2005).

Marine turtle management

Other than the legal measures that have been taken over the past forty years and a project at Isla Cañas on the Pacific Coast, there appears to have been, until recently, very little active, on-the-ground management of marine turtles, including of exploitation or trade and of wild populations, in Panama. The paucity of active management is particularly noteworthy in the light of Panama’s former major role in the global Hawksbill trade. A number of initiatives in recent years hold a great deal of promise in filling at least some of these gaps, namely the development of a STRAP for Panama and implementation of field-based conservation programmes in Bocas del Toro province and the Comarca de Ngöbe-Buglé.

This growing number of conservation activities is being implemented by a range of local, national and international actors, in collaboration with ANAM and local and regional government authorities and agencies, such as the General and Ño Kribo Regional Congress of the Ngöbe Buglé Comarca, and in increasing collaboration with local communities. In the Comarca Ngöbe-Buglé, the Ngöbe Regional Congress has established a technical committee to plan for and manage the natural resources of the Ngöbe area, the *Asociación para la Conservación de los Recursos Naturales Ngöbe-Buglé* (ACORENANB—the Association for the Conservation of the Natural Resources of Ngöbe-Buglé). In the Comarca de Kuna Yala, the *Proyecto de Estudio para el Manejo de Areas Silvestres de Kuna Yala* (PEMASKY—the Study Project for Management of the Wildlands of Kuna Yala), *Fundación Osiskun* and others have been developing actions for the protection of marine turtles and their habitats (Ruiz *et al.*, in review).

Management of exploitation

Other than the legal measures that have been in place since the 1960s and those enacted in the 1990s, which have clearly been unenforced and ineffective in preventing widespread exploitation and trade in marine turtles, and a project at Isla Caña on the Pacific coast, there have been no active, specific measures or activities undertaken in Panama to manage the exploitation of marine turtles. The current, presumed exemption for subsistence take is neither controlled nor monitored (Ruiz *et al.*, in review) and there appear to be few other restrictions that would ensure that such exploitation is consistent with the principles and practice of sustainable use. In addition, other than official international trade statistics and the findings from market surveys and site visits by RCA reported by Chacón (2002a), there has been no effort to quantify or characterize marine turtle exploitation in the Caribbean region of Panama. This leads to the conclusion that there has been and continues to be little effective management of exploitation of marine turtles in this region. Recent efforts by ANAM to enforce prohibitions on trade in marine turtle products are laudable but clearly do not address reports of widespread exploitation on both nesting and foraging grounds.

Species research and conservation

A range of agencies and institutions have been involved directly and indirectly in marine turtle conservation and research in the Caribbean sector of Panama. In addition to ANAM and its government agency predecessors, these include local NGOs, such as *Asociación Conservacionista CARIBARO* and *Fundación PROMAR*; other local entities, such as ACORENANB and the *Asociación para la Protección de los Recursos Naturales Ngöbe-Buglé* (APRORENANB—the Association for the Protection of the Natural Resources of Ngöbe-Buglé), a surveillance team established to patrol the Isla Escudo de Veraguas and Playa Chiriquí in the Comarca de Ngöbe-Buglé, and PEMASKY in the Comarca Kuna Yala; and international entities, such as the Smithsonian Tropical Research Institute (STRI), Wildlife Conservation Society (WCS), CCC, Institute for Tropical Ecology and Conservation (ITEC) and WIDECAS (Ruiz *et al.*, in review). Additional organizations, such as the *Asociación Nacional para la Conservación de la Naturaleza* (ANCON—the National Association for Nature Conservation) have been involved in efforts to establish national parks.

The longest-running marine turtle research project in Panama, entitled “Ecology and Migrations of Marine Turtles of Bocas del Toro Province, Panama”, has been conducted by Drs Peter and Anne Meylan since 1979. During the early years of the project, reconnaissance was carried out on nearly all nesting beaches and foraging areas in Bocas del Toro Province via aerial and ground surveys, and extensive interviews were conducted with fishers and residents. These results were summarized as part of the Western Atlantic Survey (Carr *et al.*, 1982)

and in documents of the Western Atlantic Turtle Symposia. Early surveys revealed the importance of Playa Chiriquí as a nesting site for Leatherbacks and documented its historical importance as a nesting site for Hawksbill Turtles (Meylan *et al.*, 1985; Meylan and Donnelly, 1999). The discovery of spongivory as the primary feeding habit of Hawksbill Turtles was based in part on fieldwork carried out by A. Meylan in Bocas del Toro Province (Meylan, 1988). In 1987, in-water studies were initiated, first at Secretary on the Valiente Peninsula, and in 1990 at the Zapatilla Cays in the Isla Bastimentos National Marine Park. Since 1989, this work has been supported by WCS. At both sites, turtles are captured with traditional tangle nets, measured, tagged and released. Studies have focused on various life-history stages of Green Turtles, Hawksbill Turtles and Loggerheads. Data have been collected on reproductive biology (including studies via laparoscopy), genetic identity (Engstrom *et al.*, 2002) and migratory movements. Several hundred turtles have been flipper-tagged and nine tagged with satellite transmitters to determine routes of travel and resident feeding grounds. The netting study has provided the opportunity to study the biology of both reproductive male and female Green Turtles en route to the nesting beach at Tortuguero, Costa Rica. Nest surveys carried out as part of the project on the Zapatilla Cays since 1990 have documented the importance of these beaches for Hawksbill nesting.

In 2003, this project was expanded to include studies at Playa Chiriquí and Escudo de Veraguas in the Comarca de Ngöbe-Buglé and Isla Bastimentos National Park through a consortium of organizations, including CCC, WCS, STRI, ANAM and APRORENAMB. The project has also expanded to involve local students and indigenous Ngöbe leaders in an effort to build a connection between the community and the project. Under the project's auspices, daily surveys have been conducted for the last three years throughout the Hawksbill nesting season at Playa Chiriquí and on the Zapatilla Cays (Ordoñez *et al.*, 2005; in press). Surveys follow the protocol for Index beaches that was developed to allow assessment of trends of Hawksbill populations in the Wider Caribbean. A large number of Hawksbill nests have been evaluated after hatching to assess hatchling productivity. Surveys of Leatherback nesting at Playa Chiriquí have also been conducted since 2003 with the help of members of the nearby Ngöbe communities.

Numerous agencies and institutions are involved in funding and implementation of this programme, including: the central (Panama City) and regional (Changinola, Bocas del Toro and the Ngöbe Buglé Comarca) offices of ANAM; General and Regional Congress of the Ngöbe Buglé Comarca; National Police of Panama (PNP); APRORENANB; communities of Río Caña and Río Chiriquí; ACORENANB; STRI; Florida Fish and Wildlife Conservation Commission's Florida Wildlife Research Institute (FFWCC-FWRI); CCC; Eckerd College; WIDECAST; International Fund for Animal Welfare (IFAW); the US National Fish and Wildlife Foundation (NFWF); the US Fish and Wildlife Service (USFWS); the US National Marine Fisheries Service (NMFS); and WCS (Ordoñez *et al.*, 2003).

With the exception of these initiatives, there has been no long-term field research with marine turtles undertaken in the Caribbean sector of Panama.

Habitat conservation

Marine turtles in Panama face a range of habitat pressures. Ruiz *et al.* (in review) point to contamination from oil spills, primarily in the area of the Trans-Isthmus oil pipeline and the Panama Canal, as a particular threat, along with coastal development and its concomitant effects.

Since its establishment in the early 1990s, Panama's national system of protected areas (SINAP) counts 50 protected areas in different management categories that have been established through a range of legal instruments (ANAM, 2004). Of these, 24 include coastal zones, several of these along the Caribbean coast (ANAM, 2004). Ruiz *et al.* (in review) report that in the Caribbean there are two marine protected areas classified as national parks that provide protection for marine turtles and their habitat. These are the Parque Nacional Marino Isla de Bastimentos in Bocas del Toro province and the Parque Nacional Portobelo in the province of Colón. The former was established in September 1988 and covers 13 226 ha, of which 11 586 ha are marine. It includes the island of Bastimentos and its neighbouring cays and the coral reef platform of the Costa de Bocas del Toro. Playa Larga on Isla Bastimentos and the beaches of the two Cayos Zapatillas are important areas for nesting by Hawksbill Turtles, Leatherbacks and the occasional Green Turtle. Various prohibitions have been established for the park, including on hunting, forestry and other extractive activities. The Parque Nacional Portobelo was established in December 1976 and covers 34 846 ha and a narrow band of coast of ca. 70 km that comprises bays, coral reefs, islets, mangroves and swamps. As specified in *Ley No. 91* of 1996, which created it, hunting, fishing, oil and gas and mining exploration and extraction, forestry, and exploitation or damage of any wildlife within the park are prohibited. A management plan for the park, which included a zoning plan, was adopted in 1994 and other proscriptions, *inter alia*, prohibit construction on the beach and mining of sand.

In addition, as mentioned above, the Congreso Regional Ngöbe of the Comarca de Ngöbe-Buglé has established a technical committee for planning and management of the natural resources of the Ngöbe area, which includes the Isla Escudo de Veraguas and Playa Chiriquí, both important for marine turtles (Ruiz *et al.*, in review).

Education and public awareness

A range of activities have been undertaken to heighten awareness of and increase support for marine turtle conservation in the Caribbean sector of Panama. Ruiz *et al.* (in review) note that a working group of government agencies, NGOs and others, including the Ministry of Education, INRENARE (now ANAM), IUCN, ANCON and STRI was established in 1991 to work with communities in the Bocas del Toro province, both in the islands and along the coast to develop and implement environmental education in the province. Anne Meylan and Argelis Ruiz of STRI have also instituted informal education programmes for marine turtles in Isla Colón (Meylan) and the Comarca de Kuna Yala (Ruiz), while ITEC's programmes operating from the Bocas del Toro Field Station and the above-mentioned collaborative marine turtle project in Bocas del Toro incorporate numerous activities to engage and involve local communities in marine turtle conservation. Ruiz *et al.* (in review) point to the need for expansion of these efforts both geographically and to involve more actors, such as the fisheries sector regarding existing and prospective restrictions on subsistence fishing and other activities affecting marine turtles, and the tourism industry, which has rapidly developed along areas of the Caribbean coast.

A variety of outreach materials, including curriculum tools, narrated slide shows, brochures, leaflets and posters as well as standard guidelines and criteria documents, technical manuals, and scientific literature have been made available to national stakeholders through the long involvement of Panamanian NGOs and individuals with WIDECAST. These have been widely distributed and incorporated into current education and public awareness campaigns.

Constraints to marine turtle conservation and management

Ruiz *et al.* (in review) identify a range of issues that constrain effective marine turtle management and conservation in Panama. At a fundamental level, they point to an inadequate legal framework, which, in addition to being unclear and conflictive, does not provide for the full scope of measures necessary to manage marine turtle exploitation, marine turtle populations, or marine turtle habitats. These authors note the following constraints faced by government agencies in developing and implementing plans and programmes for marine turtles:

- insufficient funding to fulfill the mandate of environmental protection and management, including a shortage of technical field personnel;
- insufficient public information on legal rules;
- lack of campaigns aimed at engaging the general public in support of environmental conservation; and
- a lack of environmental education programmes in schools in critical zones;
- insufficient infrastructure, e.g. offices, equipment and staff in relevant government departments and in particular at the field level, to ensure effective protection;
- lack of information and capacity in regional authorities to implement effectively environmental laws and regulations; and
- lack of economic alternatives for coastal communities.

At a more general level, they note the following needs:

- more efficient mechanisms to integrate the efforts of the many local, regional and national actors in marine turtle conservation, protection and management; and
- a larger cadre of capacitated individuals, supported by government or the private sector, dedicated to marine turtle conservation and management.

Summary and recommendations

Although there are no long-term population data on marine turtles in the Caribbean region of Panama, populations appear to be viewed universally as severely depleted, in large part owing to persistently high levels of exploitation, including for international trade during the 1960s to the mid-1980s. Complete protection of marine turtles and a closed season for the take of marine turtle eggs established by law in 1974 were clearly little-enforced and widely ignored, such that they were ineffective in preventing continued widespread exploitation of marine turtles and their eggs, for both domestic consumption and trade and international export.

The regime currently in place for marine turtles in the Caribbean region of Panama depends virtually exclusively on an inadequate legal framework that is at once unclear in terms of the rules that apply, for example to subsistence exploitation and use of turtles and collection of turtle eggs, including in the indigenous *comarcas*, and incomplete in terms of the suite of measures that are required to achieve management that is consistent with the principles and practice of sustainable use. A subsistence exemption enacted through the 1995 wildlife law, whether it applies to marine turtles or not, has clearly not contributed to closing this huge gap between what appears on paper and what occurs in reality. In addition, this provision overlooks not only the socio-economic reality of marine turtle exploitation, whereby marine turtles are exploited for cash income as well as for protein, but, as importantly, the issue of managing for biological sustainability. There is a clear need for a management plan—and a management planning process—that focuses on that goal.

Vigorous enforcement by ANAM and AMP of a suite of progressive environmental laws passed in Panama over the past decade, which provide for specific penalties for environmental, including wildlife, infractions and other measures, may over time prove effective in stemming what Ruiz *et al.* (in review) suggest is an expanding rather than a retracting domestic trade in marine turtle products. However, the jurisdictional questions relating to natural resource management in the indigenous *comarcas*, as well as the reality of exploitation “on the ground” by local fishers point to the need for a major shift in effort towards working with local communities and other actors to assess and address marine turtle exploitation with the view of identifying lasting solutions that will secure the future of marine turtle populations as well as the livelihoods of the inhabitants of this region.

The recent marine turtle conservation activities of a consortium of federal and regional government agencies and entities, NGOs and local committees, and communities in Bocas del Toro, although in their early years, hold promise that efforts that involve local communities in practice will be successful not only in improving the knowledge base and reducing poaching on nesting beaches but in fostering support for and engagement in marine turtle management and conservation over the long term. However, these efforts will need to be greatly expanded along the coast, in particular in the Comarca de Kuna Yala, where recent policy decisions indicate a clear recognition of the need for marine turtle conservation, in particular as regards exploitation.

In accordance with the FAO Code of Conduct for Responsible Fisheries (FAO, 1995), an explicitly precautionary code, which states that “the right to fish carries with it the obligation to do so in a responsible manner so as to ensure effective conservation and management of the living aquatic resources”, the management of marine turtle resources in Panama should seek to maintain the availability of the resource “in sufficient quantities for present and future generations in the context of food security, poverty alleviation and sustainable development”. Management measures should, *inter alia*, prevent over-fishing, rehabilitate depleted populations, incorporate the best scientific evidence (taking into account traditional knowledge, as well as relevant environmental, economic and social factors), assign priority to research and data collection (including at international scales), and promote environmentally safe fishing gear and practices in order to protect both the target resource and the ecosystems upon which it depends.

Among the fundamental components of any regime aimed at management of wild populations are: restrictions on exploitation that are consistent with the species’ biological requirements; a monitoring programme—systematic, sustained, and rigorous collection and review of data—either on the specifics of exploitation or of wild populations so as to discern trends that can inform management; mechanisms to identify, monitor and address other threats to the species being exploited, so that these threats can be factored with exploitation to assess what level of overall mortality the species might sustain; and a high level of compliance (sometimes achievable only through vigorous enforcement) with the restrictions put in place to ensure that management goals are achieved. Few of these elements and conditions feature in the current management framework for marine turtles in Panama.

A suite of recommendations for recovering marine turtle populations in Panama has been formulated in the forthcoming STRAP (Ruiz *et al.*, in review), in particular in relation to implementation of a comprehensive marine turtle conservation programme that involves investigation and research, integrated management of marine turtle populations, capacity-building for conservation and management of marine turtles, public awareness and education, status assessment, co-operation and financing. Additional recommendations relating specifically to marine turtle trade have been presented by Chacón (2002a). Drawing on many of these, the following recommendations are proposed.

1. Recognizing the apparent confusion, if not conflict, between the various legal measures that have been adopted in relation to wildlife generally and marine turtles specifically over recent decades and whether and to what extent these apply in the *comarcas*, a thorough legal analysis should be undertaken and a synthesis prepared to clarify the norms that apply to the exploitation and trade of marine turtles and their eggs. This synthesis should be brought together in a single document specifying the prohibitions and restrictions that are in effect, the statutory bodies responsible for implementing and enforcing that legislation, and the penalties that apply. These should specifically address the killing of turtles at sea and on nesting beaches; excavation of nests and collection of eggs; and the marketing of eggs and other marine turtle products. A summary of these rules should be widely disseminated throughout the country through a range of media, including, for example, the ANAM website, as well as through dedicated outreach and extension work with local coastal communities.

2. As recommended by Ruiz *et al.* (in review), a marine turtle fishery survey (*censo de pesca de tortugas marinas*) should be undertaken to quantify and characterize exploitation and use of marine turtles in the Caribbean sector of Panama, in particular in the *comarcas* of Ngöbe-Buglé and Kuna Yala, where marine turtle meat and eggs are important sources of protein and Hawksbill shell an important product for generating income. The survey should document the full range of extractive uses of marine turtles, including:
 - the collection of eggs, hunting on nesting beaches, and take of turtles at sea;
 - numbers of individuals (fishers and others) actively involved in taking turtles, collecting eggs, or processing or marketing marine turtle products;
 - the types of gears involved in landing marine turtles at sea, and the extent to which these marine turtle landings result from incidental or opportunistic take in other fishing operations or from a targeted fishery;
 - marketing, including prices paid, and the income derived from the sale of marine turtles, turtle products, and eggs; and
 - importance to the livelihoods, i.e. as a source of protein and cash income, of individuals and communities, of the products and income derived from marine turtle exploitation.

This investigation should also aim to assess the extent to which marine turtle exploitation relies on indigenous take or other exemptions in prevailing law and the extent to which it is illegal, including the extent to which it is understood to be illegal by those engaged in these activities.

It should be noted that this information is essential to the development of an effective management strategy, but also that such a project will also provide an opportunity to engage fishers and fishing communities in discussions about the conservation and management needs of marine turtles.

3. ANAM, AMP, appropriate regional governmental and non-governmental agencies, other NGOs, fishing communities and other local stakeholders, and scientific advisors should engage in an active consultative process to review marine turtle management and conservation needs in the Caribbean sector of Panama as a basis for revising the current inadequate marine turtle management regime. A particular emphasis must be on feasible measures to restrict any legally permitted take so as to bring it in line with biological principles, prevent further population declines and promote population recovery.

4. If legal exploitation of marine turtles is to be permitted in the Caribbean sector of Panama, the restrictions on this exploitation must reflect the biological parameters of marine turtles, take into account their depleted status, and aim, at a minimum, at preventing any further population declines. Any exploitation regime promoting population maintenance and/or recovery should be conducted according to sound management principles and practice, which should include the following:

A. Bringing exploitation (including subsistence or indigenous take) in line with biological principles, including:

- complete protection of nesting females at all times;
- complete protection of all species during the primary nesting season, 1 March to 30 November;
- complete protection of the Leatherback, which occurs in the country only as an adult, and typically as an egg-bearing female;
- maximum size limits, based on length (which is easier to undertake in the field) rather than weight, so as to safeguard large juveniles and adults;
- a conservative limit on the numbers of animals that may be exploited, such as through quotas and/or licences for taking turtles, or eggs that may be collected; and
- a requirement that capture or collection limits be based, if not on a stock assessment, on data derived from national processes and research activities, and that, as far as practicable, these data be collected in such a way as to be compatible with the goal of assessing stocks throughout their full geographic ranges.

B. Managing legal exploitation through an enforceable, high-compliance monitoring programme aimed at documenting trends and monitoring these over time. A national programme to monitor marine turtle exploitation should be instituted in conjunction with local actors and document comprehensively and systematically, and in a manner allowing such records to be analysed and compared over time, the following:

- the number of individuals taking marine turtles or collecting marine turtle eggs, and by what means;
- the number, size and species distribution of the marine turtles landed and the localities where the animals were taken;
- the number of eggs/nests collected and the sites of collection;
- catch-per-unit effort; and
- the disposition of the marine turtles landed or eggs collected, including the value of the animal, eggs, and/or products if sold or traded.

In further support of reliable monitoring of the fishery, the following should be considered as requirements for participation:

- that ownership identification tags be installed on approved gear (e.g. nets);
- that turtles be landed alive or intact; prohibiting, for example, the use of spear guns and extended net sets that can result in drowning and providing for reliable recording and verification of turtle landings; and
- that the licensing process include as a criterion full participation in the monitoring programme.

- C. Establishing and maintaining a systematic marine turtle population monitoring programme, building on current efforts in Bocas del Toro and the Comarca de Ngöbe-Buglé and expanding collaboration with local communities, including those involved in marine turtle exploitation, in order to:
- document distribution and abundance of local populations;
 - identify major nesting grounds and foraging areas;
 - designate additional Index nesting beaches as well as Index foraging grounds, and document the numbers of marine turtles occurring in these over time;
 - identify and monitor threats and other factors influencing marine turtle survival;
 - manage data records such that statistically significant trends in abundance can be identified and inform management, including in assessing the effectiveness of conservation actions.
5. As identified by Ruiz *et al.* (in review), efforts should be directed to developing alternative livelihoods for those dependent on the marine turtle resource, including sustainable income-generating activities for the communities and alternative sources of protein. These efforts could draw on existing government programmes and projects, including those oriented towards supporting micro- and medium-sized enterprises and mitigating rural poverty.
6. In order to institute a scientifically based management programme, ANAM, AMP and the appropriate regional—including *comarca*—entities should undertake an analysis of the revisions that must be made to the legal and regulatory framework for marine turtle management and conservation, as well to their broader institutional mandates, priorities, and capacities as they relate to implementing such a programme effectively.
7. Greatly expanded efforts should be made to reduce illegal exploitation and trade of marine turtles and marine turtle products and reduce demand for these products. As recommended by Chacón (2002a), such measures should include sustained training and dissemination of technical materials to Customs and law enforcement agents regarding wildlife trade, regulations and enforcement, with specific reference to marine turtles.
8. In addition to measures to reduce and manage exploitation, there should be an expansion of efforts to protect and manage marine turtle habitats, including in relation to such impacts as sand-mining, removal of beach vegetation, lighting, access to nesting beaches, and anchorages. As recommended by the Government of Panama (GOP, 2001) and Ruiz *et al.* (in review):
- specific management plans should be developed for important nesting and foraging areas, with the participation of local entities along the coast;
 - regulations should be developed and promulgated to prevent and mitigate degradation of nesting and foraging habits, and mechanisms identified to implement and enforce the regulations, including specific penalties for infractions; and
 - measures to reduce predation of eggs and hatchlings by dogs, as has been documented at Playa Chiriquí, should be implemented in consultation with local communities.
9. Consideration should be given to establishing specific measures to enhance the protection of marine turtles in existing protected areas and to expanding protected areas to include mating areas and migratory corridors in addition to nesting and foraging sites.

10. As recommended by Ruiz *et al.* (in review), marine turtle conservation and management efforts in the Caribbean region of Panama should expand to involve more actors, in particular the fishing sector and the tourism industry, which has rapidly developed along areas of the Caribbean coast. Much more active involvement of fishers, fishing communities, fishing co-operatives and the *Dirección General de Recursos Marinos y Costeros* of AMP is needed as regards reviewing legal restrictions on marine turtle exploitation and implementing conservation and management activities. Fisheries extension efforts should be implemented that involve regular exchanges with fishers of information on marine turtles and their conservation and management needs and the participation of fishers in efforts to manage marine turtles so as to enhance compliance with regulations and support for marine turtle conservation. Support directed towards sustainable fishery practices should be provided, as relevant and necessary, to assist fishers meaningfully in their efforts to comply with marine turtle regulations.
11. Communications and public awareness efforts in support of marine turtle conservation and management should be greatly expanded, drawing on lessons from the work of government agencies, NGOs and CBOs elsewhere in the region, including those affiliated with the WIDECAST (see www.widecast.org) network.
12. Financial, logistical, and political support and encouragement should be extended to relevant government agencies, NGOs, local communities and other stakeholders to develop and implement a modern, scientifically based conservation and management regime for marine turtle stocks, including for the revision of the legal framework, scientific studies, monitoring programmes, enforcement capacity, and institutional strengthening of government agencies whose mandate includes marine turtles and their habitats. Both private and public foreign investment in the fisheries and tourism sectors in Panama should take account of the increased responsibilities—and costs—to government agencies and other bodies in managing for sustainability the resources affected and the broader biodiversity impacts that may ensue.
13. Community outreach, fishery monitoring, population monitoring and other management and conservation efforts being undertaken by NGOs in collaboration with government and local stakeholders should be expanded through increased financial commitments from bilateral and multilateral assistance agencies. Co-management agreements between government and NGOs and CBOs, developed by consensus and building on current partnerships and successes, are encouraged.
14. Mechanisms should be established to bring together the various local and central actors in executing marine turtle conservation, management and protection plans. These can be drawn from examples from other countries, such as a national marine turtle working group and/or regular meetings of stakeholders on specific marine turtle conservation and management issues.

References

- ANAM (Autoridad Nacional del Ambiente, Panama). (1998). *Primer Informe de la Riqueza y Estado de la Biodiversidad de Panamá*. 175 pp. + annexes.
- ANAM. (2004). *Informe del Estado del Ambiente*. GEO Panamá 2004. Autoridad Nacional del Ambiente, Panamá, Panamá.
- ANAM. (2005). Boletín de Prensa 7 January 2005. www.anam.gob.pa
- Anon. (2002a). CITES Document CoP12 Doc. 28. Working document of the 12th meeting of the Conference of the Parties, Santiago (Chile), 3–15 November 2002. Accessible at www.cites.org. Viewed 12 December 2005.

- Anon. (2002b). Control de la veda. *La Prensa* web, 2 de marzo de 2002. <http://mensual.prensa.com/mensual/contiendo/2002/03/02/hoy/nacionales/467972.html>
- Anon. (2004). CITES Document CoP13 Doc. 22 (Rev. 2). Working document of the 13th meeting of the Conference of the Parties, Bangkok (Thailand), 2–14 October 2004. Accessible at www.cites.org. Viewed 12 December 2005.
- ASLAP (Asociación Legal y Administrativa de Panamá). (1997). Aspectos legales y manejo de las tortugas en Panamá. 22 pp. Unpublished.
- Bonilla, A. (2004). Prohíben a kunas el intercambio por molas. Ese fue uno de los aspectos aprobadas por el Congreso General Kuna. *La Prensa* web, 5 de julio de 2004. <http://mensual.prensa.com/mensual/contiendo/2004/07/05/hoy/nacionales/1750346.html>
- Carr, A., A. Meylan, J. Mortimer, K. Bjorndal and T. Carr. (1982). *Surveys of sea turtle populations and habitats in the Western Atlantic*. NOAA Technical Memorandum NMFS-SEFC-91. US Department of Commerce.
- Chacón, D. (2002a). *Diagnóstico sobre el comercio de las tortugas marinas y sus derivados en el istmo centroamericano*. Red Regional para la Conservación de las Tortugas Marinas en Centroamérica (RCA), San José, Costa Rica. 247 pp.
- Chacón, D. (2002b). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of the Marine Turtles of the Lesser Antilles, Central America, Colombia and Venezuela. Dated 10 September 2002.
- Chapin, M. (2000). *Defending Kuna Yala: PEMASKY, the Study Project for the Management of the Wildlands of Kuna Yala, Panama. A Case Study for Shifting the Power: Decentralization and Biodiversity Conservation*. Biodiversity Support Program, US Agency for International Development (US-AID), Washington, D.C. www.worldwildlife.org/bsp/publications/aam/panama/panama.html
- Diaz, E. (1984). National Report for Panama. Submitted 30 November 1982. Pp. 344–348. In: P. Bacon *et al.* (Eds). *Proceedings of the Western Atlantic Turtle Symposium, 17–22 July 1983, San José, Costa Rica*, III, Appendix 7. University of Miami Press, Florida.
- Engstrom, T.A., P. Meylan and A. Meylan. (2002). Origin of juvenile loggerheads (*Caretta caretta*) in a tropical developmental habitat in Caribbean Panama. *Animal Conservation* 5:125–133.
- FAO. (1995). Code of Conduct for Responsible Fisheries. Adopted by the 28th Session of the FAO Conference. Food and Agriculture Organization of the United Nations, Rome. 34 pp. + annexes. www.fao.org/fi/agreem/codecond/codecon.asp
- Garcia V., F.A. (1987). National Report for Panamá. 12 October 1987. Prepared for the Second Western Atlantic Turtle Symposium, 12–16 October 1987, Mayagüez, Puerto Rico. WATS2 066. 8 pp. + annexes. Unpublished.
- Gedalov, R. and K. Díaz de Melgarego. (2003). Informe de Panamá [sobre la legislación relacionada con la vida silvestre existente en Panamá]. Unpublished. www.iucn.org/places/orma/publica_gnl/2003.htm
- GOP (Government of Panama). (2001). Informe Nacional República de Panamá. Primera Reunión de Dialogo CITES Sobre la Tortuga Carey del Gran Caribe. Ciudad de México (México), 15–17 de mayo de 2001. 7 pp.
- Groombridge, B. and R. Luxmoore. (1989). *The Green Turtle and Hawksbill (Reptilia: Cheloniidae): World Status, Exploitation and Trade*. Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Lausanne, Switzerland. 601 pp.
- León, Y.M. and K.A. Bjorndal. (2002). Selective feeding in the hawksbill turtle, an important predator in coral reef ecosystems. *Marine Ecology Progress Series* 245:249–258.
- Mack, D., N. Duplaix and S. Wells. (1979). The Sea Turtle: an Animal of Divisible Parts. International Trade in Sea Turtle Products. TRAFFIC (USA). Prepared for the International Conference on Sea Turtle Conservation, 26–30 November 1979, Washington, DC. 84 pp.
- Meylan, A. (1988). Spongivory in hawksbill turtles: a diet of glass. *Science* 239:393–395.

- Meylan, A.B. (1999). International movements of immature and adult hawksbill turtles (*Eretmochelys imbricata*) in the Caribbean region. *Chelonian Conservation and Biology* 3(2):189–194.
- Meylan, A.B. and M. Donnelly. (1999). Status justification for listing the hawksbill turtle (*Eretmochelys imbricata*) as Critically Endangered on the 1996 IUCN Red List of Threatened Animals. *Chelonian Conservation and Biology* 3(2):200–224.
- Meylan, A. and P. Meylan. (1994). Description of a migratory fleet of Green Turtles (Abstract). P. 107. In: B. Schroeder and B. Witherington (Eds). *Proceedings of the 13th Annual Symposium on Sea Turtle Biology and Conservation*. NOAA Technical Memorandum NMFS-SEFC-341. US Department of Commerce.
- Meylan, A., P. Meylan, and A. Ruiz. (1985). Nesting of *Dermochelys coriacea* in Caribbean Panama. *Journal of Herpetology* 19(2):293–297.
- Milliken, T. and H. Tokunaga. (1987). *The Japanese Sea Turtle Trade 1970–1986*. A special report prepared by TRAFFIC (Japan). Center for Environmental Education, Washington, DC. 171 pp.
- Nietschmann, B. (1981). Following the underwater trail of a vanishing species—the hawksbill turtle. *National Geographic Society Research Report* 13:459–480.
- Ordoñez, C., A. Meylan, P. Meylan, A. Ruiz and S. Troëng. (2003). Hawksbill turtle population recovery and research in the Comarca Ngöbe-Buglé Chiriquí Beach/Escudo de Veraguas and the Bastimientos Island Natoinal Marine Park. Results through December 10, 2003. <http://www.cccturtle.org/panama/2003-season-results.htm>
- Ordoñez, C., A. Ruiz, S. Troëng, A. Meylan and P. Meylan. (2004). *2003 Hawksbill Turtle (Eretmochelys imbricata) Research and Population Recovery at Chiriquí Beach and Escudo de Veraguas Island, Ñö Kribo Region, Ngöbe-Buglé Comarca, and Bastimientos Island Marine National Park*. Final project report presented to Caribbean Conservation Corporation, National Environmental Authority (ANAM), Ngöbe-Buglé Comarca, Ñö Kribo Region, and Association for the Protection of the Ngöbe-Buglé Natural Resources (APRORENANB). July 2004. 20 pp. www.cccturtle.org/panama/panama_season_reports.htm
- Ordoñez, C., A. Ruiz, S. Troëng, A. Meylan, and P. Meylan. (2005). *2004 Hawksbill Turtle (Eretmochelys imbricata) Research and Population Recovery at Chiriquí Beach and Escudo de Veraguas Island, Ñö Kribo region, Ngöbe-Buglé Comarca, and Bastimientos Island Marine National Park*. Final project report to ANAM, Ngöbe-Buglé Comarca and APRORENANB.
- Ordoñez, C., S. Troëng, A. Ruiz, E. Possardt, D. Godfrey, P. Meylan, A. Meylan and N. Decastro. (In press.) Hawksbill (*Eretmochelys imbricata*) and leatherback (*Dermochelys coriacea*) turtle nesting at Comarca Ngöbe-Buglé Chiriquí Beach, Escudo de Veraguas, and Bastimientos Island National Marine Park. *Proceedings of the 25th Annual Symposium on Sea Turtle Biology and Conservation*, NMFS Technical Memorandum.
- Parsons, J. (1962). *The Green Turtle and Man*. University of Florida Press, Gainesville. 121 pp.
- PROMAR (Fundación para la Protección del Mar). (1998). Informe Acerca de la Carcería y Comercialización de Tortugas Marinas en la Provincial del Bocas del Toro. 5 pp. Unpublished.
- Rivera, S.A. (2005). Cárcel y multas por comerciar tortugas. *La Prensa* web, 26 de mayo de 2005. <http://mensual.prensa.com/mensual/contenido/2005/05/26/hoy/nacionales/230183.html>
- Ruiz, A., R.A. Merel H. and M. Díaz. (In review). Plan de Acción para la Recuperación de las Tortugas Marinas de Panamá (H. Guada, Ed.). WIDECAST (*Red para la Conservación de las Tortugas Marinas en el Gran Caribe*) and PNUMA-UCR/CAR.
- Soto, R., H. Guzmán, Z. Pinzón, J. Moreno, C. Gamboa, M. Montoya and R. Vargas. (1998). *Evaluación Ecológica Rápida del Parque Nacional Marino Isla de Bastimiento y Areas Adyacentes, Provincial de Bocas del Toro. Tomo 3: Recursos Costeros-marinos*. Asociación Nacional para la Conservación de la Naturaleza (ANCON), Panamá, Panamá. 210 pp.
- Troëng, S., D. Chacón and B. Dick. (2004). Possible decline in leatherback turtle *Dermochelys coriacea* nesting along the coast of Caribbean Central America. *Oryx* 38(4):395–403.

NATIONAL REVIEWS: SOUTH AMERICA

Colombia

Introduction

The national territory of Colombia includes lands bordering on and waters covering an Exclusive Economic Zone of some 900 000 km² in both the Caribbean Sea and Pacific Ocean (Córdoba *et al.*, 2000). In the Caribbean, Colombian territory extends over ca. 1650 km of coastline and a very large area of open ocean, with more than 1000 km² of coral reefs scattered over 21 areas in three major groups: fringing reefs on rocky shores of the mainland coast (e.g. Santa Marta and Urabá); continental shelf reefs around offshore islands (e.g. the Rosario and San Bernardo archipelagos); and the San Andrés Archipelago oceanic reef complexes in the western Caribbean, which lie 1000 km north-west of Colombia (and 200 km east of Nicaragua) and cover ca. 300 000 km² of land and sea, including atolls, banks, barrier reefs, fringing reefs and patch reefs, and three small inhabited islands (57 km² in total) (Garzón-Ferreira *et al.*, 2002).

The communities living along the Caribbean coast of Colombia have always used marine turtles as a source of protein (Córdoba *et al.*, 2000) and the islands and keys of the San Andrés Archipelago are known to have long served as a nexus of marine turtle exploitation and trade since their colonization by English settlers in the early 17th century. Although marine turtles have been protected by law in Colombia from commercial exploitation since 1978, exploitation has continued in the form of subsistence take, which is permitted by law and not regulated, and illegal take that is aimed at or results in the commercial use of turtles. Over-exploitation has caused the extirpation or near-extirpation of numerous local populations of marine turtles in Colombia (MMA, 2002) and reduced numbers to the point where the marine turtles occurring in the country are considered to be mere remnants of what were once much larger populations and at serious risk of extinction.

Numerous research and conservation efforts have been undertaken by a range of institutions on behalf of marine turtles in Colombia over the past several decades, but these have been undertaken independently rather than as part of an overall strategic framework, such that until very recently the state of knowledge of marine turtles and their habitats in the country has been poor and fragmented (INVEMAR, 2002). However, several major advances for marine turtles in Colombia have been made in recent years. A draft Action Plan for the Conservation of Marine Turtles of the Colombian Caribbean (Córdoba *et al.*, 2000) was prepared in 2000 under the auspices of the *Ministerio del Medio Ambiente* (MMA—Ministry of the Environment).

The draft Action Plan was subsequently revised as a collaborative effort of the MMA, several regional autonomous environmental corporations (CARs—*Corporaciones Autónomas Regionales*) that form part of the decentralized national environment system, and a number of universities, research institutions and NGOs, and incorporated into the *Programa Nacional para la Conservación de las Tortugas Marinas y Continentales de Colombia* (National Programme for the Conservation of Marine and Continental Turtles of Colombia), which was published in 2002 (MMA, 2002). In addition, a major project, *Tortugas Marinas del Caribe Colombiano* (hereafter referred to as the *Proyecto Tortugas Marinas*), was undertaken in 2002 by the *Instituto de Investigaciones Marinas y Costeras* (INVEMAR—the Institute of Marine and Coastal Research), to compile and update biological and ecological information on marine turtles, including exploitation levels and other threats, in the Colombian Caribbean. The results of this last project (INVEMAR, 2002), while presented as only a “first

step” towards documenting the status of marine turtles in the country, have greatly enhanced understanding of the conservation status and needs of these animals in this region.

These recent initiatives have identified persistent over-exploitation of both nesting and foraging populations, including extensive collection of eggs, as the greatest threat to marine turtles in Colombia (Córdoba *et al.*, 2000; INVEMAR, 2002; MMA, 2002) and the greatest overall threat to these animals in the Colombian Caribbean, where they are an important resource for coastal communities with few economic options. Other threats in the Caribbean region include the loss and degradation of nesting habitat to coastal development and industrialization, beach erosion, dumping of both organic and inorganic wastes, and degradation of foraging habitats resulting from coastal development and other activities (INVEMAR, 2002). Among the many actions proposed for the recovery of marine turtle populations in the final action plan (MMA, 2002) are studies aimed at quantifying and characterizing this exploitation, the development of economic alternatives for coastal communities that use and rely on marine turtles, and other efforts to reduce the unsustainable exploitation of the country’s marine turtle populations.

Although these recent initiatives constitute a major step forward and hold a great deal of promise, the complexities of geography and culture are compounded by difficult economic and political circumstances in Colombia, such that adequate financing and sustained leadership to support the implementation of the many actions that have been identified as priorities for the recovery of marine turtles have yet to be secured.

Summary of the status of marine turtles in Colombia

Four marine turtle species are known to occur in the extensive Caribbean waters of Colombia as foragers, nesters and migrants. Although relative numbers are unknown, the Loggerhead may be the most common nesting species in the country; it is the most common species in the San Andrés Archipelago (McCormick, 2001) and has been found to nest there in recent years (Córdoba *et al.*, 2000). The Green Turtle has been reported to nest, forage and migrate through Colombian waters. The Leatherback has been recorded to nest in several areas along the coast and, recently, on Roncador in the San Andrés Archipelago (McCormick, 2001); the largest known nesting population in the country is in the Golfo de Urabá in the department of Chocó (Córdoba *et al.*, 2000; INVEMAR, 2002). The Hawksbill Turtle occurs and nests in several areas, including in the San Andrés Archipelago. Although there are some records of Kemp’s and Olive Ridleys in the waters of the Colombian Caribbean, the occurrence of these two species in the region is considered no more than “accidental” (INVEMAR, 2002).

Occurrence of marine turtles in Colombia

English common name	Scientific name	Occurrence
Loggerhead	<i>Caretta caretta</i>	N, F
Green Turtle	<i>Chelonia mydas</i>	N, F
Leatherback	<i>Dermochelys coriacea</i>	N, F?
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	N, F
Kemp’s Ridley	<i>Lepidochelys kempii</i>	A
Olive Ridley	<i>Lepidochelys olivacea</i>	I?

Key: N=nesting; F= foraging; I=infrequent; A=absent

Although a great deal of information has been collected on marine turtles in Colombia and published in numerous reports (including grey literature), the full extent and importance of nesting areas and principal foraging areas have not yet been fully documented. The *Proyecto Tortugas Marinas* (INVEMAR, 2002) has made a major step forward in this regard, through documenting observations of marine turtle nestings and other sightings and characterizing potential nesting and foraging habitats along the continental Caribbean coast, by means of a comprehensive literature review and interviews and site visits along 1072 km (65%) of coastline. This project documented that 730 km (ca. 44%) of the 1650 km of the Caribbean coast constituted marine turtle habitat, in the form of 181 beaches that were important areas for “turtle activities”, defined as former or current nesting or foraging sites. The latter category included sites where turtles were landed after having been captured at sea before processing and marketing. Four species were recorded as nesting on a total of 127 beaches covering 534.6 km (32.4% of the coast) or observed in fishing grounds or other coastal areas where coral reefs and seagrasses were present. Hawksbill Turtles were documented to nest over the largest area (470 km of coastline), followed by Green Turtles (401 km), Loggerheads (360 km) and Leatherbacks (309 km). The Green Turtle was the species most frequently (84.5%) documented as “rare” on the nesting beaches on which it was found, while the Loggerhead was the species most frequently recorded as “common” (50% of nesting beaches). The only species that was recorded in high nesting densities was the Leatherback, on beaches of the north-west of the Golfo de Urabá.

The most important marine turtle nesting areas in the Caribbean region of Colombia are the beaches of Acandí and Playona in the Golfo de Urabá, which together host a regionally important nesting population of Leatherbacks (estimated at 250–300 females), and the beaches of Don Diego, Buritaca and Quintana, which once hosted a very important Loggerhead nesting population (MMA, 2002). The most important marine turtle foraging area is located around the Guajira Peninsula, where there are extensive turtle grass beds (Rueda Almonacid, 1987).

Marine turtle nesting and foraging activity has been summarized by the *Proyecto Tortugas Marinas* (INVEMAR, 2002) as follows:

- **Alta Guajira (26 beaches):** marine turtles once nested here in large numbers, principally Green and Hawksbill Turtles, but also Loggerheads and Leatherbacks. All four species still nest here but in lower numbers; they are, however, frequently observed at sea.
- **Media Guajira (26 beaches):** marine turtle nesting is described as non-existent, although it is probable that there is sporadic nesting by individual turtles on uninhabited beaches; by contrast, this area was recorded as having the highest number of in-water turtle observations for the entire Caribbean coast.
- **Baja Guajira (19 beaches):** nesting was recorded for all four species but in different abundances, with the Loggerhead being the most frequent, including observed and captured at sea.
- **Parque Tayrona (21 beaches):** all four species were documented to nest but in low numbers, probably no more than 15 individuals of each species, except for the Hawksbill Turtle, which was recorded as nesting in “moderate” numbers on beaches between Playa Brava and Cinto; there were no reports of observations of marine turtles at sea, which coincides with the lack of seagrass and reef habitat and, also, the absence of inhabitants and fishers in the Park who could report them.
- **Santa Marta–Tasajera (19 beaches):** virtually no nesting and only sporadic sightings and captures at sea were reported in this area. Minimal information was collected for the Vía Parque Isla de Salamanca, since the beach (ca. 70 km) is uninhabited; some fishers reported a small number of turtles to be nesting, and this has also been reported in the literature.



Parque Tayrona, Colombia, where Hawksbill and Green Turtles, Leatherbacks and Loggerheads are reported to nest.

- **Barranquilla–Cartagena sector (10 beaches):** currently only Hawksbill Turtles are recorded to nest where historically all four species nested. Marine turtles are sighted and intensively captured at sea off these beaches—“principally Hawksbill Turtles owing to the value of their shell”. The situation is similar in the Rosario and San Bernardo archipelagos, where both juvenile and adult Hawksbill and Green Turtles are found, thus suggesting that this area is both nesting and foraging habitat for these species.
- **Cartagena–Golfo de Morrosquillo:** only three beaches were reported, where only Hawksbill Turtles nest, and there were few reports of sightings of marine turtles at sea; this area appears to offer little foraging habitat.
- **Bahía de Tinajones–Punta Arenas:** 11 beaches were recorded as nesting sites for Green and Hawksbill Turtles; sightings of marine turtles at sea were “moderate”, principally around Fuerte and Tortuguilla islands.
- **Golfo de Urabá (27 beaches):** these beaches have the highest nesting density, particularly of Leatherbacks which concentrate on a few beaches (Playona and Acandí) in the north-west. Hawksbill Turtles were reported to be nesting in small numbers on many of these beaches; Loggerheads and Green Turtles were observed in low numbers at sea.

In the San Andrés Archipelago (which was not surveyed by the *Proyecto Tortugas Marinas* but which has been surveyed over the past decade by the *Corporación Autónoma Regional* (CAR) in this region, the *Corporación para el Desarrollo Sostenible del Archipelago de San Andrés, Providencia y Santa Catalina* (CORALINA—the Corporation for the Sustainable Development of the Archipelago of San Andrés, Providencia and Santa Carolina)), the beaches of the southern keys, Bolívar and Albuquerque, and northern keys, Rocador, Serrana and Serranilla, have been and are still used for nesting by Green and Hawksbill Turtles and Loggerheads, while the seagrass beds of Albuquerque serve as foraging areas for both Green Turtles and Hawksbill Turtles. The northern

keys are more important for nesting, probably owing to lower fishing pressure from artisanal fishers, which is believed to be the reason that Bolívar and Albuquerque (in that order) have the lowest number of nests. The number of marine turtle nests recorded by monitoring programmes in the Archipelago has been found to vary greatly, with ca. 60 nests recorded per year in 1997 and 1998 and only 35 in 1999 (McCormick, 2001). Although marine turtles have been reported for the islands of Old Providence and Santa Catalina, no monitoring programmes have yet been initiated there.

Information is available on international movements of marine turtles occurring in Colombia. Córdoba *et al.* (2000) report, for example, that female Leatherbacks tagged in the Golfo de Urabá were captured in 1986 and 1987 in the Gulf of Mexico and Yucatán Peninsula and more recently along the Panamanian coast. Carr *et al.* (1978) reported the capture in San Andrés of Green Turtles that had been tagged at Tortugero, Costa Rica. Information on tag recoveries in Guajira Department has been compiled as part of a recent university thesis, but marine turtle tag recoveries from around the country have not been collected systematically (C. Ceballos, INVEMAR, *in litt.*, 27 February 2004).

Overview of the legal framework for marine turtle management

Membership in international and regional treaties

Colombia is party to a range of agreements relating to the protection, conservation and use of marine turtles and their habitats. The country acceded to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in August 1981 and has acceded to the Convention for the Protection and Development

Membership of Colombia in multilateral agreements relating to marine turtles

Convention	Colombia
Cartagena Convention	03.03.1988 (R)
Protocol Concerning Specially Protected Areas and Wildlife (SPAW)	05.01.1998 (R)
Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region	03.03.1988 (R)
Protocol Concerning Pollution from Land-based Sources and Activities	02.10.2000 (S)
Convention on Biological Diversity (CBD)	28.11.1994 (R)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	29.11.1981 (R)
Convention on Migratory Species (CMS)	No
Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	No
MARPOL 73/78 (Annex I/II)	02.10.1983 (A)
MARPOL 73/78 (Annex III)	02.10.1983 (A)
MARPOL 73/78 (Annex IV)	02.10.1983 (A)
MARPOL 73/78 (Annex V)	02.10.1983 (A)
Convention on Wetlands of International Importance (Ramsar)	18.10.1998 (E)
UN Convention on Law of the Sea (UNCLOS)	S
Western Hemisphere Convention	17.01.1941 (S)
World Heritage Convention	24.05.1983 (Ac)

Key: Date of: Signature (S); Ratification (R); Accession (A); Entry into force (E); Acceptance (Ac)

of the Marine Environment of the Wider Caribbean Region, or Cartagena Convention, and all its protocols, most notably that concerning Specially Protected Areas and Wildlife (SPA Protocol). However, Colombia has not yet acceded to the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC), which entered into force in May 2001. Colombia has ratified International Labour Organization Convention N° 169 Concerning Indigenous and Tribal Peoples in Independent Countries, which, *inter alia*, protects and regulates the rights of the peoples concerned to use the natural resources in the areas in which they live.

Laws and regulations relating to marine turtles

There is an extensive body of legislation in Colombia that relates directly or indirectly to marine turtles. In addition to the commitments established through the country's accession to relevant multilateral agreements, numerous provisions for marine turtles have been made through various legal instruments. Those most pertinent to marine turtles in the Caribbean sector of Colombia are set out below (MMA, 2002; Ceballos, 2002):

- *Resolución N° 167* of 1966, issued by the *Instituto de Desarrollo de los Recursos Naturales Renovables* (INDERENA, now the MMA), established restrictions on the use of trawl nets in fisheries on both the Atlantic and Pacific coasts and prohibited their use at distances of less than one nautical mile from all coasts, islands and keys on national territory.
- *Resolución N° 1032* of 1977, issued by INDERENA, prohibited the capture of Hawksbill Turtles across all of national territory.
- *Resoluciones N° 726* of 1974 and *N° 709* of 1981 and *Acuerdos N° 24* of 1983 and *N° 54* of 1988, issued by INDERENA, prohibited trawling in areas with large concentrations of marine turtles, including the Golfo de Morrosquillo, San Bernardo Archipelago, Golfo de Urabá, and the coast of Guajira.
- *Decreto N° 622* of 1977, establishing the National Parks system, prohibits fishing in areas that are important for turtles, either as nesting or foraging zones or migration routes. These areas coincide with areas designated as national parks, such as Corales del Rosario and San Bernardo, Tayrona, Sanquianga, Gorgona, Ensenada de Utría and certain areas in San Andrés and Providencia (Seaflower Biosphere Reserve).
- *Decreto N° 1608* of 1978, which established regulations for the Natural Resources Code (*Código Nacional de los Recursos Naturales y Protección del Medio Ambiente, Decreto N° 2811* of 1974), prohibits the capture and commercial use of individuals and products of wild fauna, including the collection of eggs or neonates and the destruction or alteration of wildlife breeding areas.
- *Decreto N° 1681* of 1978 regulates the exploitation of living aquatic resources such as through capture, extraction or collection. Article 149 of this law indirectly protects marine turtle foraging areas.
- *Ley N° 17* of 1981, through which Colombia ratified CITES, prohibits the export and import of marine turtles and their products.
- *Acuerdo N° 021* of 1991, issued by INDERENA, establishes specific protection measures for all marine turtle species, as well as for nesting beaches and foraging areas.
- *Resolución N° 108* of 1992, issued by the *Instituto Nacional Para la Pesca y Acuicultura* (INPA—the National Institute for Fishing and Aquaculture), prohibits the exploitation of marine turtles incidentally captured in shrimp trawls and requires the use of turtle excluder devices (TEDs) throughout the Colombian Caribbean.
- *Resolución N° 157* of 15 March 1993, issued by INPA, requires the use of TEDs by the shrimp trawl fleet operating in the Colombian Caribbean. This resolution was subsequently revised by *Resolución N° 148* of 1994, which requires the use of a hard-type TED.

- *Resolución N° 2879* of 21 November 1995, issued by the CAR of Guajira, the *Corporación Autónoma Regional de La Guajira* (CORPOGUAJIRA—the Autonomous Regional Corporation for Guajira), establishes a regional prohibition on the exploitation of marine turtles.
- *Resolución N° 107* of 15 February 1996, issued by INPA, requires the use of TEDs by the shrimp fleet operating on the Pacific Coast.
- *Resolución N° 68* of 1999 amends *Resoluciones N° 148* and *N° 157* to broaden the use of TEDs and regulates other materials used in their construction.
- *Ley N° 599* of 2000 is the current Penal Code (*Código penal*).

Although this body of legislation is extensive, Ceballos (2002) notes that its implementation is deficient, as there are insufficient financial and logistical resources to ensure compliance and enforce the laws and, in many instances, the laws are inconsistent with the economic and social realities in the different coastal zones. The blanket ban on the take and commercialization of wildlife adopted through *Decreto N° 1608* in 1978, for example, has been recognized to have been unrealistic and over-simplistic and is considered anachronistic. It is in the process of revision, but no date has been set for adoption of eventual revisions.

More importantly, it should be noted that subsistence fishing of marine turtles is permitted by law in Colombia. *Ley de Pesca N° 13* of 1990 (the General Fishing Law) stipulates, in Article 47, that subsistence fishing, defined as that undertaken without intent to profit and for providing food for the fisher and his family, is unrestricted throughout national territory (Córdoba *et al.*, 2002). This definition would appear to render illegal the commercial use of products from marine turtles taken in a subsistence fishery and, thus, to provide a major loophole for a take of marine turtles that would be more appropriately characterized as artisanal (which results in commercialization of the products) and which would be affected by protective legislation. However, Ceballos (*in litt.*, 27 February 2004) cautions that there may be a difference of interpretation on this and that commercial use of marine turtles at the local level, such as to purchase foodstuffs for one's family, may be considered part of a "subsistence take".

The CITES National Legislation Project assessed Colombia's legislation as "believed generally to meet the requirements for the implementation of CITES" (Anon., 2002).

Responsible authorities

Since decentralization of environmental authorities in Colombia in 1991, responsibility for "administering" natural resources, including marine turtles, rests with the more than 20 regional, autonomous corporations established as part of the *Sistema Nacional Ambiental* (SINA—the National Environment System). These responsibilities include regulating use and promoting conservation of these resources. Although these regional corporations have police powers, law enforcement is generally carried out by other government authorities, including the police and the *Departamento Administrativo de Seguridad* (DAS—the Department of Security). In the San Andrés Archipelago, for example, CORALINA is the government agency responsible for all aspects of marine turtle management, conservation, and enforcement.

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective

The communities inhabiting Colombia's Caribbean coast have exploited marine turtles as a source of protein since pre-Columbian times and exploitation of marine turtles in the San Andrés Archipelago dates at least as far back as colonization by English settlers in the 17th century. At the national level, marine turtle exploitation has focused on all species for eggs, Hawksbill and Green Turtles (primarily) and other species for meat and other viscera and oil, and Hawksbill shell, which supplied a "large and thriving" local jewellery industry as well as export markets (Groombridge and Luxmoore, 1989).

Despite the obvious importance of marine turtles as a resource and the extensive exploitation of these animals over centuries, there are no official statistics on marine turtle landings in the Colombian Caribbean, as fisheries statistics for the region do not include marine turtle landings (Córdoba *et al.*, 2000). There have been no systematic studies aimed at establishing reliable landings estimates, including of the number of individuals involved in taking marine turtles, and those numbers that are available result from specific studies in specific areas over specific periods of time. There is, thus, no basis on which to derive a global overview of marine turtle exploitation in the Colombian Caribbean over any period of time.

In addition to marine turtles landed by fishers, the collection of marine turtles is also widespread.

The *Programa Nacional para la Conservación de las Tortugas Marinas y Continentales de Colombia* (MMA, 2002) documents several examples of marine turtle declines from over-exploitation as recorded over the past half-century, including the following:

- The "massive and persistent" slaughter of female Loggerheads, compounded by the intensive collection of eggs (up to 70 000 per season—Medem, 1962) that took place on the beaches east of Santa Marta, caused the decline of this nesting colony over less than a decade: when protection efforts were suspended in 1976, the colony was estimated to fluctuate between 400 and 600 nesting females, yet in 1987 when the next survey of this population was conducted, the population had declined by 95%. Currently, only dispersed nesting by this species has been recorded along the entire coast between Santa Marta and Dibuilla, on the Guajira Peninsula, thus making it much more difficult and expensive to monitor and protect these turtles.
- The other three marine turtle species nesting in the Buritaca–Don Diego sector (Department of Magdalena) have been virtually exterminated; since 1973, only two Green Turtles have been recorded coming to shore to nest and only two nests, one Hawksbill and one Leatherback were recorded in 1987, both of which had been excavated (Anzola and Gómez, 1987).
- Gutierrez and Merizalde (2001) reported from interviews with fishers near the Los Flamencos wildlife sanctuary in Guajira that, until the 1950s, they excavated 12–18 Hawksbill, Leatherback, Loggerhead and Green Turtle nests daily on the beaches of Caricari during the nesting season—Hawksbill nests were the most abundant. After 1985, however, there had been no indications of any marine turtle nesting.

Mast (1986, cited in Groombridge and Luxmoore, 1989) reported that, in the Colombian Caribbean, turtles were regularly fished on the Guajira Peninsula but also between Puna Canoas and Taganga, in the Golfo de Morrosquillo and in the San Andrés Archipelago. The main abattoir in Riohacha (at least three smaller ones were also known to process turtles) was thought to purchase over 1250 turtles per year, two-thirds of them Green Turtles and one-third Hawksbill Turtles. The total quantity of Hawksbill shell purchased each year by the main buyers was thought to be ca. 300–400 kg, estimated to derive from 150–266 large Hawksbill Turtles. The total annual mortality from targeted fishing and incidental take by trawlers was estimated to be 2500–3500 Green Turtles and 300–1000 Hawksbill Turtles. Finally, nesting turtles were thought to be killed whenever found.

According to INVEMAR (2002), CORPOGUAJIRA estimated that 3700 turtles were landed in Guajira department in 1986. Rueda *et al.* (1992) undertook four months of surveys in 1988 to document the commercial capture of marine turtles on the Guajira Peninsula. They identified the city of Riohacha, the capital of the department of Guajira, as the largest centre of stockpiling and local trade in marine turtles in the Colombian Caribbean. They reported that the consumption of fresh meat and marketing of other products, such as fat, oil, shells and Hawksbill shell, were traditional activities that were entrenched in the culture of all the social groups in the region. Green Turtles, followed by Hawksbill Turtles, were the most intensively captured and consumed in both Alta and Media Guajira, but Leatherbacks and Loggerheads were also captured and consumed. They estimated that a minimum of 120 turtle nets were deployed in Guajira throughout the year and 400 turtles per month were landed during six months of the year. They also recorded during the period of their study a total of 404 Green Turtles and 52 Hawksbill Turtles in different markets in Riohacha that were reported as originating from several different sites. Based on these results, they suggested that annual mortality of marine turtles in artisanal fisheries along the Atlantic coast of Colombia could involve ca. 5000–6000 Green Turtles, 800–1500 Hawksbill Turtles, and 100 Loggerheads, which would make it one of the most active marine turtle fisheries in the Caribbean.

In addition, Rueda *et al.* (1992) reported that each product and subproduct of marine turtles had a specific use and monetary value—nothing was discarded. These products were marketed widely on the Guajira Peninsula, although most turtles were consumed in the major cities, for example, Riohacha and Maicao. Occasionally, live and frozen turtles were transported to other cities in other departments, such as Magdalena, Atlántico and Cesar, and even less frequently to Bogotá, for sale in luxury restaurants. As such, the marine turtle resource was an important source of income for some sectors of the population, particularly indigenous coastal communities and local vendors; they estimated about 3000 inhabitants to be involved directly and indirectly in the use of this resource and that this use generated annual income exceeding 100 million Colombian pesos (COP100 million or 200 000 US dollars [USD200 000] at the time), an amount that they judged could be higher than the income from artisanal fishing in the same area.

Recent (since 1992) exploitation

As was the case in the 1980s, exploitation and trade of marine turtles have continued in the last decade despite legal protection from commercial exploitation conferred in 1978. This exploitation takes the form of capture of turtles on nesting beaches and at sea and extraction of eggs from nests. Some of this exploitation is for subsistence use and is permitted by law, but much if not most appears aimed at, or results in, the commercial use of some or all of a turtle and its products, which would appear to be illegal.

As reported by MMA (2002), the “artisanal” fishery for marine turtles on the Guajira Peninsula is traditional and economically important for the indigenous Wayúu, who, it is estimated (Instituto Humboldt, 2000), capture more than 2000 turtles per year from their foraging areas off the coast. Other important fisheries in the Caribbean region of Colombia operate in the Islas de Rosaria and the Archipelagos of San Bernardo and San Andrés. In the latter, the southern keys appear to be the most affected by exploitation from artisanal fishers, as the northern keys are farther away, but the northern keys are believed to be affected by industrial fishers targeting conches and lobsters, as reported by Colombian Navy personnel posted in the keys (McCormick, 2001). Córdoba and López (1997, cited in MMA, 2002) estimated the total annual capture of Hawksbill and Green Turtles and Loggerheads in the San Andrés Archipelago at ca. 1000 animals.

The take of marine turtles is generally conducted by local fishers on an opportunistic basis, such as when they find a turtle nesting on the beach or when they catch one in a net. However, because turtles are a good source of income for fishers who generally depend on few resources for their livelihoods, it is probable that some fishers fish for and trade in turtles as their main occupation. Information on the take and commercialization of marine turtles has been collected as part of the *Proyecto Tortugas Marinas* (INVEMAR, 2002).



Credit: WWF-Cannon/Roger LeGuen

A Leatherback returns to the ocean.

Because exploitation occurs on the margins of the law, it is not openly publicized. Green Turtle eggs are collected and Green Turtles are taken for their meat in the department of Guajira and sold in markets there and in Riohacha and Cartagena at prices ranging from COP2000 to 4000. Leatherbacks and Loggerheads are not often taken for their meat but rather for the eggs. Turtle meat and eggs are sold locally and regionally, including to restaurants, along the coast but are not marketed in the interior of the

country, where there is no tradition of eating turtle meat. Hawksbill Turtles are taken primarily for their shell, which is widely traded to make spurs of different sizes for cockfighting and for fashioning into buckles, jewellery boxes, cooking ladles, hair combs and other objects sold at handicraft fairs and probably to tourist souvenir shops; it is said that in Cartagena there are home workshops where Hawksbill shell is fashioned into different objects (INVEMAR, 2002). In Guajira, the trade is more common in meat for human consumption in restaurants or local homes (INVEMAR, 2002). INVEMAR (2002) reports that the capture and commercial use of Hawksbill Turtles in the Colombian Caribbean appears highest in the Cartagena region.

In terms of incidental take, Colombia has required the use of TEDs in the trawl fisheries, but the effectiveness of these measures, including the extent to which TEDs are used correctly, is not known. However, observations of stranded turtles apparently drowned in shrimp nets suggests a need for investigation of the impact of this and other commercial fisheries, including the conch and lobster fleets operating in the San Andrés Archipelago, on marine turtle populations, through observers on board to record turtle captures and other efforts to record fishing activities and links to turtle strandings (Córdoba *et al.*, 2002).

International trade

Historical perspective

There is a long history of marine turtle exploitation and trade by English settlers in the San Andrés Archipelago beginning in the 17th century. Aspects of this history, including the cultural and trading links between the Archipelago and other English-speaking turtling communities along the Miskito Coast of Central America and in Jamaica and the Cayman Islands, are documented by Parsons in several publications (e.g. 1956 and 1962); in the latter publication, he reported that “as early as 1633” a trading station among the Miskitu had been established at Cape Gracias a Dios (now Nicaragua) by English “adventurers from the Puritan colony at Old Providence Island, some 160 miles to the south-east”. Córdoba *et al.* (2000) cite Dunn and Saxe (1950), as well as Parsons (1964), in highlighting the past importance of the San Andrés Archipelago, in particular the island of Old Providence, in international trade in marine turtles, first as the site of seasonal visits by inhabitants of the continental coasts (most probably Miskitu) to capture and kill nesting turtles, and subsequently in the 19th century, as a major trading point for Hawksbill shell bought by traders from New England (USA).

In particular, the northern keys of the Archipelago—Serrana, Serranilla and Roncador—are known to have been used by turtlers from the Cayman Islands; most of the two tonnes of tortoiseshell exported annually from the Cayman Islands between 1932 and 1939 were thought to have come from these waters (Parsons, 1972, cited in Groombridge and Luxmoore, 1989). Parsons (1956) reported that Cayman turtle boats were “regularly visiting Roncador, though in reduced numbers, as recently as twenty years ago” and that a party of men was occasionally left on the reef for several weeks, to be picked up on the return journey from the Miskito Cays. At least one such incident, in 1931, prompted an official complaint from the Colombian Government.

Based on the information that they compiled, Groombridge and Luxmoore (1989) concluded that, at least since the 1950s, domestic rather than export trade accounted for the great majority of the turtles killed in Colombia. Export of marine turtles and their products from Colombia was prohibited in 1981, when Colombia acceded to CITES. Analysis undertaken for this review of CITES trade statistics derived from the UNEP-WCMC CITES Trade Database found indication of very little trade in marine turtles from Colombia. No trade in marine turtle products exported from Colombia was reported to CITES during the first years after the Convention came into force, and almost all exports recorded during the period 1980–1992 were reported by the USA but not recorded in Colombia’s CITES annual reports. These included: five bodies, 47 carapaces, five carvings, 40 “claws”, and 40 skin/leather items, some of them personal items that may have been allowed entry and others items that were recorded as having been seized on entry. The only other reported trade comprised exports reported by Colombia of a few shipments of turtle specimens to Puerto Rico, including two kilogrammes of Loggerhead specimens, two kilogrammes of Green Turtle specimens and two kilogrammes of Hawksbill specimens, all for scientific purposes.

There has been very little trade from Colombia to Japan in Hawksbill shell reported in Japanese Customs statistics. There were no such imports recorded for the period 1950–1965, nor for the period 1976–1992, 1992 being the last year that Japan allowed Hawksbill shell imports. During the 10-year period 1966–1976, a total of 1028 kg of Hawksbill shell was recorded imported into Japan from Colombia (Groombridge and Luxmoore, 1989; Milliken and Tokunaga, 1987); this is the total for the entire 1950–1992 period.

Mast (1986, cited in Groombridge and Luxmoore, 1989) uncovered anecdotal evidence of international trade in marine turtles. His informants reported that regular visits were made by those involved in the local tortoiseshell industry to Isla Margarita, Venezuela, for supplies and that Japanese buyers visited Old Providence annually to purchase Hawksbill shell. Further, he was told of a small export trade from Riohacha in turtle leather to Italy that had ceased and of clandestine imports to San Andrés of Green Turtles caught off Costa Rica, which were sometimes intercepted by the authorities.

Recent (since 1992) international trade

There is virtually no evidence to suggest that the incidence of international trade in marine turtles from Colombia has changed markedly in the past decade. There is evidence (e.g. INVEMAR, 2002) that illegal trade continues to occur, but given its clandestine nature, it is impossible to establish levels or trends.

CITES-reported exports of marine turtles from Colombia for the period 1993–2004, inclusive, consist virtually entirely of items apparently seized on arrival in either the USA or Spain. Six of the shipments to the USA (including one of 468 Hawksbill carvings in 1994 and another of 10 Hawksbill carapaces in 1992) were recorded as commercial, while the remaining shipments are presumed to have been for personal use (e.g. 60 eggs) or tourist souvenir specimens. These records indicate a certain level of international trade, including for commercial purposes, 10 years ago and, although it is likely that it represents only a portion of the specimens actually exported, the true volume of exports, including for very recent years, is impossible to establish. That this reported trade included two Flatback *Natator depressus* carapaces when this species does not occur in Colombia (it is endemic to Australia) further underscores the difficulty in drawing definitive conclusions from CITES statistics.

The seizure, in 2000, by the regional environment authorities, the CAR of *Canal del Dique* (CARDIQUE), of a shipment of Hawksbill shell in Cartagena airport, possibly destined for Panama, is the only other documented evidence of international commercial trade from Colombia in recent years. The two packages of Hawksbill scutes were packed with coconut shells and seashells (INVEMAR, 2002). Customs authorities in Aruba report seizing annually, on average, ca. 100 pairs of cockfighting spurs made from Hawksbill shell originating from Colombia; despite the fact that cockfighting is illegal in Aruba, the spurs are clearly intended for local use and there is no indication of re-export (CSA, 2004).

International trade in marine turtles is also thought to be occurring to and from the San Andrés Archipelago. Exports are in the form of animals taken by industrial fishing fleets from Honduras that are targeting conches and lobsters in the northern keys. Based on reports from Navy personnel in the area, marine turtles are taken as they are encountered in the course of these fishing activities (McCormick, 2001). Imports are in the form of animals and meat particularly sought after during Holy Week (J.M. Mow, CORALINA, pers. comm., 2003).

Enforcement issues

Illegal take and trade of marine turtles continue in Colombia and, although levels are unknown, persistent over-exploitation is recognized as the major overall threat to marine turtles in the Colombian Caribbean (Córdoba *et al.*, 2002; INVEMAR, 2002; MMA, 2002). Addressing this problem is complicated, however, by the apparent legality of subsistence take of marine turtles, which is neither monitored nor regulated. As mentioned above, there appears to be a need for clarification of the laws governing subsistence *versus* commercial take in the case of marine turtles.

Although this situation points up a need for greater enforcement, Ceballos (*in litt.*, 27 February 2002) argues this should only be pursued in the context of a broader strategy rooted in current political and socio-economic realities and that a more effective approach than punitive actions would be to work “on the ground” with those who are directly and indirectly involved in the use of marine turtles. Such community-based programmes should focus on alternative livelihoods and income-generating activities and enhancing education efforts so that there is greater understanding of, and appreciation for, marine turtle conservation. Especially in rural areas, these communities need great access to resources to support socio-economic development.

In the San Andrés Archipelago, enforcement of protection for marine turtles and other restrictions on marine resources is a huge logistical challenge, as there is currently little capacity to police the southern and northern keys, which are of greatest importance for these species. The presence of the Colombian Navy in the northern keys has facilitated the collection of information on marine turtles and their exploitation, but fisheries and wildlife law enforcement is outside their mandate.

INVEMAR (2002) provides statistics on confiscations of marine turtle products by CARDIQUE between 1997 and 1999, which included 32 processed specimens valued at COP705 000, 10 stuffed turtles valued at COP415 000 and 50 kg of parts (probably meat) valued at COP500 000. All but the meat (which was not identified to species) derived from Hawksbill Turtles. These and other items confiscated by government authorities become government property, but their ultimate disposition, and whether or not any national inventory of these confiscations and the resulting stockpiles is maintained, is not indicated in any of the documents examined or information provided for this review.

Marine turtle management

A number of management plans for marine turtles in Colombia have been developed over the past 30 years, beginning with the *Plan Nacional para la Investigación y Conservación de las Tortugas Marinas*, a national plan developed by INDERENA in 1986 (INDERENA, 1986), followed by a proposed national plan for marine and continental turtles—the *Plan Nacional para la Conservación de las Tortugas Marinas y Continentales con Distribución en Colombia* prepared under the auspices of the MMA (Ceballos, 1996). This was then followed by a second proposal from the MMA, for an Action Plan for the Conservation of the Marine Turtles of the Colombian Caribbean, prepared by the *Dirección General de Ecosistemas* (Directorate General for Ecosystems) (Córdoba *et al.*, 2000). These efforts culminated in the publication of the *Programa Nacional para la Conservación de las Tortugas Marinas y Continentales de Colombia* (National Programme for the Conservation of Marine and Continental Turtles of Colombia) (MMA, 2002), which was developed through extensive collaboration and consultation between government agencies, NGOs, research institutions and universities, and endorsed by local fishing communities at a national workshop on the conservation and management of marine and continental turtles convened in November 2001, in Dibulla, Guajira (INVEMAR, 2002; MMA, 2002).

During this time, actual conservation and management activities have been implemented independently by various government agencies, NGOs and others, and most of these have relied on the persistence of their principal investigators rather than government financial or political support to be effective (MMA, 2002). The adoption of a national action plan produced through a participatory process that has included local fishing communities and departmental government agencies has the potential to advance marine turtle conservation greatly in Colombia.

The action plan for marine turtles that is included in the *Programa Nacional para la Conservación de las Tortugas Marinas y Continentales de Colombia* (MMA, 2002) sets forth the following objectives:

- generating the knowledge necessary for conserving, managing and “stabilizing” marine turtle populations in Colombia;
- developing and implementing management plans necessary to recover populations;
- promoting sustainable management practices for marine turtles;
- reducing unsustainable use of marine turtles;
- strengthening environmental education and community participation in support of marine turtle conservation;
- generating mechanisms for managing and disseminating information relevant to marine turtle conservation;
- and
- strengthening the capacity for management and co-ordination in the implementation of the action plan.

On this last point, Ceballos (2002) cautions that the financing for implementing the national conservation programme has not been identified.

Management of exploitation

The current regime for marine turtles in Colombia fails to achieve management and is inconsistent with the principles and practice of sustainable use. There has been no stock assessment in the usual sense for any species of marine turtle in Colombia, but it is apparent that both management and monitoring of the legal (subsistence) fishery have been insufficient in ensuring that it does not further reduce marine turtle numbers. Over-exploitation has caused the extirpation or near-extirpation of numerous local populations of marine turtles in Colombia (MMA, 2002) and almost annihilated some of the largest populations in the region, especially of Loggerheads.

As indicated above, national fishery statistics in Colombia do not include records of marine turtle landings, which are permitted for subsistence purposes, and there is no formal monitoring of the fishery (and never has been). As such, the levels and nature of this take are unknown, as is the proportion of the take that is used for subsistence *versus* commercial purposes. In addition to turtles captured at sea, nesting female turtles are also exploited, as are their nests. Although an overall assessment of the extent of exploitation is impossible owing to the lack of data, over-exploitation is recognized to be the major problem for conservation and recovery of marine turtles in the country. There is a clear need for restrictions and much more vigorous control of the “subsistence” fishery and of illegal marine turtle exploitation.

The national marine turtle action plan (MMA, 2002) identifies the need to control the collection of eggs and killing of females on nesting beaches, as well as to quantify levels of mortality in the artisanal fishery, from subsistence take, and from incidental killing not associated with either industrial or artisanal fisheries. In addition, the plan proposes actions to reduce marine turtle mortality, through management plans, economic alternatives for fishing communities, elimination of destructive fishing practices and increased vigilance so as to ensure strict compliance with the law. At a more specific level, INVEMAR (2002) recommends a focused study to document the number of Hawksbill Turtles captured, the methods of capture and the routes and forms of manufacture and trade of Hawksbill shell items.

Particularly worthy of note is a multi-institutional, multi-stakeholder effort under development in Guajira Department to develop a sustainable-use regime to alleviate heavy, largely illegal commercial exploitation of over 1000 marine turtles per year (Hernández, 2002). Bringing together indigenous Wayúu fishers, economists, biologists, and management agencies, a programme has been developed that includes a system of transferable capture quotas for certain size/age classes of turtles; these would be initially established with a 30% reduction in the number of turtles allowed to be captured, based on estimates of current landings, and decline in number over time, and apply only to local use of meat, thus excluding other marine turtle products and marketing and sale beyond these points. This programme has not yet been implemented, owing, it would appear, to complications with the legal framework in permitting such a programme (C. Ceballos, Iowa State University, *in litt.*, 25 May 2006); however, it appears to have been very successful in engaging not only local communities and both government and non-government entities, but also a wide range of expertise to analyse and develop solutions to this very complex management situation.

Species research and conservation

In addition to the Ministry of Environment and regional natural resource management agencies, universities and NGOs have, over several decades, been involved in projects or activities aimed at the conservation of marine turtles in Colombia. These include *la Fundación Darién*, the *Universidad de Antioquia in Playa Playona*, the *Fundación Tortugas Marinas de Santa Marta en el Magdalena* and the Wider Caribbean Sea Turtle Conservation Network (WIDECAST). The MMA (2002) credits WIDECAST with providing leadership in Colombia “over the past five years” in species research and conservation and, in particular, for impetus and mentoring in the development of the national marine turtle conservation network, *Red Tortugas Marinas* (RETOMAR—the national Marine Turtle Network), which has facilitated information exchange and collaboration and “promoted capacity-building on marine turtle conservation and management techniques with the participation of different entities (institutions and communities) in the country”.

One particularly relevant project noted by INVEMAR (2002) is a collaboration between the Alexander von Humboldt Institute and the CAR of Guajira (CORPOGUAJIRA) to quantify exploitation of marine turtles by Wayúu fishers along the coast of Guajira, as a basis for developing a system of regulated exploitation. A project along the central Caribbean coast implemented by WIDECAST (2001) and numerous partners, including the MMA, the *Unidad Administrativa Especial del Sistema de Parques Nacionales Naturales* (UAESPNN—the National Parks Administrative Unit), the *Universidad del Atlántico*, the *Fundación Tortugas Marinas de Santa Marta* (FTMSM), the ProSierra Foundation, the CAR of the department of Magdalena (CORPAMAG), CORPOGUAJIRA, the *Universidad Jorge Tadeo Lozano*, the *Universidad de La Guajira* and the communities of Palomino, Buritaca, San Diego, Camarones and Dibulla, has focused on an assessment of marine turtle nesting. The project has had an emphasis on Loggerheads, but has included associated activities such as community participation, environmental education, workshops, training courses, and beach patrols.

The Colombian NGO *Fundación Darién* initiated the Leatherback Turtle Protection Programme in the Golfo de Urabá in 1993, with emphasis on education and awareness, *in situ* habitat and species protection and research programmes within the larger context of community development. The Protection Programme focuses on Acandí and Playona beaches, located in the north-west sector of the Gulf and considered the most important nesting site for Leatherbacks on the Caribbean coast of Colombia (Rueda *et al.*, 1992). It has identified “high egg poaching, habitat deterioration and drowning in shrimp nets” as the primary threats. The Foundation promotes a “partici-

patory process with local communities” towards the sustainable use of turtles. For example, since 1993, when its “*Jornadas de Protección de la Tortuga Caná*” campaign started, it has celebrated yearly the arrival of female turtles to their beaches with parades, dances and other artistic expression, beach-cleaning, and “original cultural and recreational activities”. The campaign has reduced exploitation pressure on Leatherbacks and resulted, in general, in a greater respect for the law and for consensus-based management (C. Madaune, *Fundación Darien, in litt*, 7 November 2003).

While there have been a number of studies undertaken to assess marine turtle nesting along different beaches of the Colombian Caribbean, there have as yet been no long-term projects aimed at monitoring turtle populations through conventional tagging (monel flipper tags) or satellite transmitters, nor genetic analysis (Ceballos, 2002). The only long-term tagging programme undertaken in the country was in the 1970s on Loggerheads in Buritaca, but this was suspended after seven years. There has been some other tagging of turtles during certain periods (e.g. of female Leatherbacks during the nesting season in la Playona, Golfo de Urabá—Rueda *et al.*, 1992), as well as with Hawksbill Turtles involved in a headstarting project in the Islas Rosario (C. Ceballos, *in litt.*, 27 February 2004). In 2005, *Fundación Darién*, in partnership with WIDECAS, re-initiated the tagging of Leatherbacks nesting at Acandí and Playona beaches. One of the projects identified in the national action plan (MMA, 2002) is the identification and characterization of the different marine turtle nesting populations in the Colombian Caribbean based on genetic analysis.



Credit: WWF-Canon/Anthony B. Rath

Newly hatched Hawksbill Turtles, trapped in plastic washed up on the beach, illustrating the importance of beach cleaning before and during the nesting period.

In the San Andrés Archipelago, monitoring of marine turtle nesting and foraging was carried out by CORALINA from at least 1996 until 1999 and focused on foraging in the southern keys of Bolívar and Albuquerque and nesting in both these and the northern keys of Roncador, Serrana and Serranilla. This work has been assisted logistically and with manpower from the Colombian Navy. These activities ceased in 1999, but CORALINA expected to re-initiate them in 2003, again with the assistance of the Colombian Navy, and to collect data for the last four months of the 2003 nesting season and the entire 2004 nesting season (P. Herron, CORALINA, *in litt.*, 6 November 2003).

Habitat conservation

The national conservation programme for turtles (MMA, 2002) notes that marine turtles are poorly represented in protected areas: more than 75% of the most important nesting beaches fall outside protected areas and certain critical habitats, such as important seagrass areas of the Guajira Peninsula and many of the coral reefs of the Atlantic coast, lack protection and regulation of fishing and tourism development

activities. Further, the plan notes that even when the distribution of turtles extends to national parks, this does not guarantee their protection, as the threats may also arise in those areas. Four marine protected areas have been established in the Colombian Caribbean (Garzón-Ferreira *et al.*, 2002).

Interaction between *Fundación Darién* and local and national authorities has stimulated policy-level interest in defining important Caribbean nesting sites as protected areas. As a result, during the past decade the Municipality of Acandí has implemented: fishing restrictions during the nesting season, in agreement with fishers; limitations on sand extraction from the beaches; beach cleaning before and during the nesting period; and rules overseen by the Municipal Planning Office requiring certain conservation considerations prior to obtaining a building licence (C. Madaune, *in litt.* to K. Eckert, 7 November 2003).

Similarly, at the regional and national level, a variety of studies and research have prioritized the nesting sites at Acandí and Playona for protection. An interdisciplinary study (*Proyecto Biopacífico*) conducted in 1993 by the MMA included these sites as priority areas to be preserved in the larger context of a regional biodiversity preservation strategy. The recommendations served as the basis for *Resolución N° 1427* in December 1996, when the MMA established the 700 000-ha Special Management Area of the Darién (AME-Darién) along the border with Panama “to be managed and protected under sustainability principles”. The Special Management Area considered Acandí and Playona beaches as multiple-use and/or absolute protection areas and the ministerial resolution noted the importance of developing a participatory process with communities in order to decide how to manage the territory. Various workshops were subsequently organized with local inhabitants and landowners, a diagnosis of the marine turtle situation was made and local stakeholders “participated actively with proposals on how to proceed, manifesting their will for helping the species to be preserved” (C. Madaune, *in litt.* to K. Eckert, 7 November 2003).

In the San Andrés Archipelago, the Seaflower Biosphere Reserve was designated by UNESCO in 2000 and encompasses ca. 300 000 km² of land and sea—the islands of San Andrés, Old Providence and Santa Catalina and surrounding atolls, banks, cays and coral reef complexes and the waters around them. Although principally oceanic, the Biosphere Reserve includes at least 2200 km² of reef environments, with 826 km² of coral reefs, as well as the mangroves and seagrass beds around the major islands. A project has been under way since 1997 to establish four multiple-use marine protected areas within the Biosphere Reserve in order to preserve particularly sensitive areas and provide the framework for sustainable use of marine resources and biodiversity conservation, including through the establishment of no-take marine reserves. These marine protected areas were formally designated in late 2004.

Education and public awareness

Numerous education and awareness efforts have been undertaken on behalf of marine turtle conservation in Colombia, by government, NGOs and others. One such example is the Leatherback Turtle Protection Programme of *Fundación Darién* in the Golfo de Urabá, which has emphasized community awareness among its objectives, making use of hands-on educational experiences, audiovisual material, cultural expression (drawings, plays, tales about the *caná*), and media articles that recognize the communities’ efforts to care for the turtles. Most of the work is done by volunteers (C. Madaune, *in litt.*, 7 November 2003). However, there is a widely recognized need for expanded efforts to heighten awareness of the importance of conserving marine turtles and restoring their populations, in particular amongst the coastal communities that have long used and continue to depend on these animals for their livelihoods.

INVEMAR (2002), in noting the heavy fishing pressure on Hawksbill Turtles and extensive trade in Hawksbill products in the Cartagena region, for example, recommends an education campaign for regional tourists to decrease demand, as well as efforts to develop and promote alternative materials for cockfighting spurs made from Hawksbill shell.

Constraints to marine turtle conservation and management

According to Ceballos (2002), the major constraint to the recovery of marine turtles in Colombia is the lack of funding to implement the various management plans that have been developed at the national and regional level and to support individual and university research projects and the conservation efforts of government agencies, NGOs, and the CARs responsible for natural resource and environmental management. Most of these institutions have projects or project profiles for marine turtle management and conservation work but are unable to move forward with these owing to a lack of funds. A second problem is the absence of trained individuals to direct and lead these projects. Finally, there is a need for sustained leadership to guide implementation of the action plan for marine turtles that is included in the *Programa Nacional para la Conservación de las Tortugas Marinas y Continentales de Colombia*. An autonomous body, objective in its mandate and with sustained funding, would be the ideal entity to play this role (Ceballos, 2002). A national network of researchers, students and NGOs active in marine turtle conservation has been co-ordinated through RETOMAR and from this basis there is now a need to link more closely with the various government agencies whose mandate includes marine turtles.

Summary and recommendations

The legal protections for marine turtles that have been in place in Colombia for the past several decades have had little effect in stemming over-exploitation of these species, which remains the major threat to their survival in the Caribbean region of the country. The exemption for subsistence take provided for in the fishing law is clearly one factor behind this continued exploitation, but socio-economic circumstances and cultural traditions appear to be as, if not more, important. Major advances in understanding the status of marine turtles in the region and planning for their management and recovery have been made in recent years and there is a growing cadre of expert scientists and conservationists within government and the NGO sector that is well positioned to take this work forward. It would appear that the essential missing ingredient for success for marine turtle conservation and management of marine turtles in the region is adequate, sustained funding to enable and co-ordinate these efforts. This is particularly regrettable in the light of the numerous recommendations that have emerged from the recent action-planning and related processes (e.g. INVEMAR, 2002; MMA, 2002), several of which are presented below.

In accordance with the FAO Code of Conduct for Responsible Fisheries (FAO 1995), an explicitly precautionary code, which states that “the right to fish carries with it the obligation to do so in a responsible manner so as to ensure effective conservation and management of the living aquatic resources”, the management of marine turtles in Colombia should seek to maintain the availability of the resource “in sufficient quantities for present and future generations in the context of food security, poverty alleviation and sustainable development”. Management measures should, *inter alia*, prevent over-fishing, rehabilitate depleted populations, incorporate the best scientific evidence (taking into account traditional knowledge, as well as relevant environmental, economic and social factors), assign priority to research and data collection (including at international scales), and promote environmentally safe fishing gear and practices in order to protect both the target resource and the ecosystems upon which it depends.

1. In the light of the threatened status of marine turtles in the Caribbean region of Colombia and the fact that exploitation has been identified as the major pressure on remaining populations, efforts should be made to reduce exploitation levels through the development and implementation of management plans aimed at the recovery of marine turtle populations. More extensive and vigorous control should be exercised on the collection of eggs, killing of nesting females and capture of marine turtles at sea. Serious consideration should be afforded the nature of that control and the extent to which it should be based on community outreach and engagement and delivered through population monitoring and similar efforts rather than punitive measures.
2. Economic alternatives for coastal communities that rely on marine turtles as a resource should be developed in consultation with these communities in conjunction with measures designed to reduce exploitation of marine turtles.
3. A concerted effort should be organized on the part of the relevant CARs to assess the levels of, and characterize exploitation and trade of marine turtles in, their jurisdictions. Appropriate methods and frameworks should be designed and implemented so as to develop an accurate recording of these activities and to manage that information so that it can be analysed over time. As recommended by INVEMAR (2002), a focused investigation should be undertaken of the trade in Hawksbill shell, including the routes through which it is transformed into manufactured items and subsequently traded, including internationally.

In the San Andrés Archipelago, a focused effort should be made to quantify the level of exploitation of marine turtles by the conch and lobster fleets operating in the northern keys.

4. Appropriate revisions should be made to ensure that prevailing legislation provides not only for effective protection and conservation of marine turtles, but for the management of exploitation. In addition to greater clarity in the operation of the subsistence fishing exemption in the national fishing law, there is a need for greater flexibility in the types of management regimes that may be instituted and, along with broader authorities, in the capabilities of management agencies to implement—and adapt in a timely fashion—strategies to address marine turtle over-exploitation, such as has been proposed in Guajira Department.
5. Legal exploitation of marine turtles should be restricted in reflection of their biological parameters, take into account their depleted status and aim, at a minimum, to prevent any further population declines. Any exploitation regime promoting population recovery or maintenance should be established on the basis of sound management principles and practice, which should include the following:
 - A. Bringing exploitation in line with biological principles, including:
 - complete protection of nesting females at all times;
 - complete protection for all species during their primary nesting season, 1 March to 30 November;
 - maximum size limits, based on length (which is easier to undertake in the field) rather than weight, so as to safeguard large juveniles and adults;
 - a conservative limit on the numbers of animals that may be exploited or eggs that may be collected, such as through quotas and/or licences;
 - a requirement that capture or collection limits be based, if not on a stock assessment, on data

derived from national processes and research activities, and that, as far as practicable, these data be collected in such a way as to be compatible with the goal of assessing stocks through their full geographic ranges.

- B. Managing legal exploitation through an enforceable, high-compliance monitoring programme aimed at establishing trends and monitoring these over time. A national programme to monitor marine turtle exploitation should document comprehensively and systematically, and in a manner allowing such records to be analysed and compared over time, the following:
- the number of individuals taking marine turtles or collecting marine turtle eggs, and by what means;
 - the number, size and species distribution of the marine turtles landed and the locality where the animals were taken;
 - the number of eggs/nests collected and the sites of collection;
 - catch-per-unit-effort; and
 - the disposition of the marine turtles landed or eggs collected, including value of the animal and/or products if sold or traded.

In further support of reliable monitoring of legal marine turtle exploitation, the following should be considered as requirements for participation:

- that ownership identification tags be installed on approved gear (nets);
- that turtles be landed alive, prohibiting, for example, the use of spearguns and extended net sets that can result in drowning; and
- that the licensing process include as a criterion full participation in the monitoring programme

- C. Expanding on existing efforts, a systematic marine turtle monitoring programme should be implemented to:
- document distribution and abundance of local populations;
 - identify major nesting grounds and foraging areas;
 - designate Index nesting beaches and Index foraging grounds, and document the numbers of marine turtles occurring in these over time;
 - manage data records such that statistically significant trends in abundance can be identified and inform management; and
 - identify and monitor threats and other factors influencing marine turtle survival.

6. As with the targeted exploitation of marine turtles, efforts should be made to reduce the mortality of marine turtles in other fisheries, including by assessing the numbers of marine turtles that are taken incidentally in different types of fisheries, identifying methods and technologies that are most and least damaging, and promoting strict compliance with regulations requiring the use of TEDs. With respect to the latter, Ceballos (*in litt.*, 27 February 2004) notes a particular need for hands-on outreach and training with fishers on methods to release safely turtles that have been entangled in their fishing gear.
7. Important nesting and foraging areas for marine turtles should be protected and enabled with long-term monitoring programmes. According to C. Ceballos (*in litt.*, 27 February 2004), along the mainland Caribbean coast particular emphasis should be focused on:

- a. Playona and Acandí beaches (Leatherbacks);
 - b. San Bernardo islands (Hawksbill and Green Turtles);
 - c. Tayrona National Park beaches for all four Caribbean marine turtle species; and
 - d. the seagrass beds between Cabo Vela and Riohacha.
8. Mechanisms should be established to strengthen capacity in and co-ordination between the agencies and organizations involved in marine turtle conservation.
 9. Education programmes on behalf of marine turtle and natural resource conservation should be strengthened, and mechanisms for managing and disseminating information on marine turtles should be developed and implemented.
 10. Increased resources should be made available to community-level initiatives seeking to enhance the livelihoods of coastal peoples while safeguarding the marine turtle resource and preventing the further decline of local and regional stocks.
 11. Financial, logistical and political support and encouragement should be made available to assist government, NGOs, and communities in the development and implementation of a modern, scientifically based conservation and management regime, including, as necessary, for the revision of the legal framework, scientific studies, monitoring programmes, enforcement capacity, and institutional strengthening of government agencies whose mandate includes marine turtles and their habitats. Both private and public foreign investment in the fisheries sector in Colombia should take account of the increased responsibilities—and costs—of managing for sustainability the resources concerned and the broader biodiversity impacts that may ensue, including exploitation of marine turtles that is incidental to directed industrial and artisanal fisheries.

References

- Amorocho Llanos, D.F. and C.E. López Alonso. (1998). Conservación de las tortugas marinas en Colombia: guía temática. FES-WIDECAS-FARB. 56 pp.
- Anzola, N.R. and G. Gómez. (1987). Estado actual de las tortugas marinas en el área de Buritaca a Don Diego (Magdalena), marzo–junio 1987. Centro de Estudios para el Desarrollo y Manejo de la zona Costera–Costas de Inderena.
- Carr, A., M.H. Carr and A.B. Meylan. (1978). The ecology and migration of sea turtles, 7. The west Caribbean green turtle colony. *Bulletin of the American Museum of Natural History* 162(1):1–46.
- Ceballos, C. (1996). Plan Nacional para la Conservación de las Tortugas Marinas y Continentales con Distribución en Colombia. Subdirección de Fauna, Dirección General Forestal y Vida Silvestre, Ministerio del Medio Ambiente. Consultancy report. 45 pp.
- Ceballos, C. (Co-ordinadora Proyecto Tortugas Marinas, Programa Biodiversidad y Ecosistemas Marinos, Instituto de Investigaciones Marinas y Costeras—INVEMAR). (2002). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of the Marine Turtles of the Lesser Antilles, Central America, Colombia and Venezuela. Dated 27 August 2002.
- Córdoba, J.A., F. Gutiérrez, C.L. Rodríguez and D. Caicedo. (2000). Plan de Acción para la Conservación de las Tortugas Marinas del Caribe Colombiano. Draft document. Ministerio del Medio Ambiente, Dirección General de Ecosistemas. Santafé de Bogotá, Colombia.

- Córdoba, J.A. and C.E. López. (1997). Diagnóstico actual de las tortugas marinas, 1996, en el Archipiélago de San Andrés, Providencia y Santa Catalina. Tesis Biólogo Marino y Biólogo con énfasis en marina. Universidad Jorge Tadeo Lozano y Universidad del Valle. Facultad de Biología Marina y Facultad de Ciencias. 207 pp.
- CSA (CITES Scientific Authority, Aruba). (2004). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of Marine Turtles in the Lesser Antilles, Central America, Colombia and Venezuela. Completed by Theo Wools, DVM (Director, Veterinary Service, Government of Aruba) and Pieter Barendsen, DVM (Subst. Head of Service), Barcadera, Aruba. Dated 5 November 2004.
- Dunn, E.R. and L.H. Saxe, Jr. (1950). Results of the Catherwood–Chaplin West Indies expedition, 1948. Part V: Amphibians and Reptiles of San Andrés and Providencia. *Proceedings of the Academy of Natural Sciences of Philadelphia* 102:141–165.
- Garzón-Ferreira, J., J. Cortés, A. Croquer, H. Gúzman, Z. Leao and A. Rodríguez-Ramírez. (2002). Status of coral reefs in southern tropical America in 2000–2002: Brazil, Colombia, Costa Rica, Panama and Venezuela. Pp. 343–356. In: C. Wilkinson, (Ed.). *Status of Coral Reefs of the World: 2002*. Global Coral Reef Monitoring Network. Australian Institute of Marine Science, Townsville, Australia.
- Groombridge, B. and R. Luxmoore. (1989). *The Green Turtle and Hawksbill (Reptilia: Cheloniidae): World Status, Exploitation and Trade*. Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Lausanne, Switzerland. 601 pp.
- Gutiérrez, C.F. and L.A. Merizalde. (2001). Santuario de Flora y Fauna Los Flamencos, Via Parque Isla de Salamanca. Contribución al Conocimiento del Estado Actual de las Tortugas Marinas y sus Hábitats de Anidación en los Parques Nacionales de la Costa Atlántica. Convenio Asociación WIDECAS-Colombia-UAESPNN. Informe parcial.
- Hernández, P., S. (2002). Sistema de Aprovechamiento Sostenible de la tortuga verde (*Chelonia mydas*), la tortuga carey (*Eretmochelys imbricata*), la tortuga caguama (*Caretta caretta*), y la tortuga canal (*Dermochelys coriacea*). Presentación general, 11 de diciembre de 2002. Programa Uso y Valoración, Instituto Alexander von Humboldt.
- Instituto Alexander von Humboldt. (2000). El uso de la fauna silvestre como estrategia de conservación. Convenio de Cooperación Técnica y Científica 043. Ministerio del Medio Ambiente. Anexos.
- INVEMAR (Instituto de Investigaciones Marinas y Costeras). (2002). Determinación de la Distribución y del Estado Actual de Conservación de las Tortugas Marinas del Caribe Colombiano. Informe final. Convenio SECAB-INVEMAR 052-029/01. Diciembre 2002. 125 pp. + anexos.
- INDERENA. (Instituto de Desarrollo de los Recursos Naturales Renovables) (1986). Plan nacional para la investigación y conservación de las tortugas marinas. Draft document. División de la Fauna Terrestre. UNIFEM, Bogotá. 19 pp. Unpublished.
- Mast, R.B. (1986). Preliminary report on findings of the Second Western Atlantic Turtle Symposium sea turtle research survey of Colombia's Caribbean coast. Unpublished.
- McCormick Anzola, C. (2001). Eventos de anidación y forrajeo de tortugas marinas en los atolones del Archipiélago de San Andrés, Providencia y Santa Catalina, Caribe Colombiano. Abstract of paper presented to IX Congreso Latinoamericano sobre Ciencias del Mar. CORALINA. Unpublished.
- Milliken, T. and H. Tokunaga. (1987). *The Japanese Sea Turtle Trade 1970–1986*. A special report prepared by TRAFFIC (Japan). Center for Environmental Education, Washington, DC. 171 pp.
- MMA (Ministerio del Medio Ambiente). (2002). *Programa Nacional para la Conservación de las Tortugas Marinas y Continentales de Colombia*. Dirección General de Ecosistemas. 63 pp.

- Parsons, J.J. (1956). San Andrés and Providencia: English-speaking islands in the Western Caribbean. *University of California Publications in Geography* 12(1):1–84.
- Parsons, J.J. (1962). *The Green Turtle and Man*. University of Florida Press, Gainesville. 126 pp.
- Parsons, J.J. (1964). *San Andrés y Providencia: una Geografía Histórica de las islas Colombianas del Mar Caribe Occidental*. Banco de la República, Bogotá. 192 pp.
- Parsons, J.J. (1972). *Etudes de Géographie Tropicale Offerte à Pierre Gourou*. Ecole Pratique des Hautes Etudes-Sorbonne, Paris.
- Rueda Almonacid, J.V. (1987). Tortugas Marinas: Especies Colombianas en Peligro de Extinción. Reporte Nacional al II Simposio sobre Tortugas Marinas del Atlántico Occidental. STAO. Mayaguez, Puerto Rico. Instituto Nacional de los Recursos Naturales Renovables y del Ambiente—INDERENA. 80 pp. + annexes. Unpublished.
- Rueda, J.V., J.E. Mayorga and G. Ulloa. (1992). Observaciones sobre la captura comercial de tortugas marinas en la península de la Guajira, Colombia. Pp. 133–153. In: J.V. Rodríguez-Mahecha and H. Sánchez Páez (Eds). (1992).
- WIDECAS-Colombia. (2001). Sea turtle research and conservation: filling knowledge gaps, capacity-building and networking on the central Caribbean coast of Colombia. Phase II (2001–2002). Preliminary report, March–November 2001, to National Fish and Wildlife Foundation. Asociación WIDECAS-Colombia, Ministry of Environment (MMA), and National Parks Administrative Unit (UAESPNN). 17 pp. Unpublished.

Venezuela

Introduction

Venezuela has an extensive coastline of 3726 km—over 2700 km bordering the Caribbean Sea and 1000 km bordering the Atlantic Ocean—and an Exclusive Economic Zone (EEZ) of ca. 700 000 km², most of it in the Caribbean Sea. These coasts and some three hundred islands, keys and islets that lie off them include diverse and important habitats that are suitable for foraging, reproduction and migration of marine turtles (Guada and Solé, 2000). Among these is Aves Island, or Isla de Aves, which lies 650 km north-east of the Venezuelan coast and ca. 200 km west of Guadeloupe and supports an estimated annual nesting population of 500–700 female turtles. This is the most important marine turtle nesting site in Venezuela and the second-most important nesting site for Green Turtles in the entire Caribbean (after Tortuguero, Costa Rica) (Vera, 2004).

Documented exploitation of marine turtles in Venezuela, in particular by coastal communities for which these species have considerable socio-economic importance, dates back to the 18th century and continues, despite complete legal protection afforded in 1979 and these species' inclusion on Venezuela's endangered species list. Although absolute numbers of nesting and foraging turtles for the country as a whole are not known, information from a wide range of research and conservation efforts that have been under way over the past three decades points to a significant decrease in turtle populations as compared with numbers of four to five decades ago (Guada and Solé, 2000).

A Sea Turtle Recovery and Action Plan (STRAP) for marine turtles in Venezuela, prepared with the full collaboration of the Venezuelan *Grupo de Trabajo en Tortugas Marinas* (GTTM—Marine Turtle Working Group) and published under the auspices of the Wider Caribbean Sea Turtle Conservation Network (WIDECAST) and the United Nations Caribbean Environment Programme (Guada and Solé, 2000), identified “uncontrolled capture” of adult turtles as the greatest threat to these species in Venezuela, with other threats being the widespread collection of turtle eggs, destruction of coral and seagrass habitats by shipping and development, loss of coastal habitats through urbanization, contamination from ships and land-based sources of pollution, and other habitat-related factors. In addition to the capture of marine turtles for subsistence purposes, there is extensive exploitation for trade, in meat, eggs, carapaces, oil, Hawksbill shell and shell products and other products, and some of this trade is believed to be international. Finally, incidental mortality of marine turtles in artisanal fisheries is suspected to involve large numbers of animals and to exceed the number lost in the industrial trawl fisheries operating in the country, which, since 1993, have been required by law to deploy turtle excluder devices (TEDs). The little information that is available from throughout the country suggests that incidental mortality in fisheries is currently the worst threat to marine turtles in Venezuela (H. Guada, *Centro de Investigación y Conservación de Tortugas Marinas*, *in litt.*, 19 September 2004).

Several of the actions recommended in the STRAP aim to address problems associated with continued heavy exploitation of marine turtles, including: quantifying exploitation levels of marine turtles for subsistence purposes and illegal national and international trade so as to establish trends and set priorities for enforcement action; undertaking regular surveys of markets, restaurants, handicraft shops, and other sites in order to document the commercialization of marine turtle products; initiating assessments of the level of incidental capture of marine turtles in artisanal fisheries; resuming programmes to assess levels of incidental capture in the industrial trawl fishery; and increasing enforcement and public awareness efforts, in particular amongst fishers and coastal

communities who continue to take marine turtle extensively—with apparent impunity. Of particular importance would be clarification of the legality of marine turtle exploitation by indigenous coastal communities, which is widely considered illegal under national law but might be exempted through Venezuela’s membership to International Labour Organization Convention N^o 169 Concerning Indigenous and Tribal Peoples in Independent Countries.

In addition to a wide range of governmental agencies that have authorities in relation to marine turtle management, there are numerous NGOs and universities that have been involved in marine turtle research and conservation in Venezuela for the past thirty years. The national marine turtle working group, GTTM, has been working since 1987 to facilitate co-operation and co-ordination between these institutions and is actively involved in promoting the implementation of the STRAP. These efforts hold a great deal of promise, but the scale, complexity, and apparent urgency of the problems facing marine turtles in Venezuela clearly necessitate a far greater investment of human, logistical and financial resources than has heretofore been made, in particular on the part of national and State governments.

Summary of the status of marine turtles in Venezuela

Five marine turtle species occur in the waters of Venezuela, from the Guajira Peninsula in the west, to Punta Barima in the south-east, and around the offshore islands. Four species have been documented to nest on the country’s beaches. Adult and juvenile Loggerheads, Green Turtles, Hawksbill Turtles and Olive Ridleys can be found throughout the year in feeding areas. Leatherbacks are observed throughout the year, most frequently when the females come inshore to nest (CICTMAR, 2002).

Occurrence of marine turtles in Venezuela

English common name	Scientific name	Occurrence
Loggerhead	<i>Caretta caretta</i>	N, F
Green Turtle	<i>Chelonia mydas</i>	N, F
Leatherback	<i>Dermochelys coriacea</i>	N, F
Hawksbill Turtle	<i>Eretmochelys imbricata</i>	N, F
Kemp’s Ridley	<i>Lepidochelys kempii</i>	A
Olive Ridley	<i>Lepidochelys olivacea</i>	F

Key: N=nesting; F=foraging; A=absent

The STRAP presents information on important nesting and foraging areas as published in the literature and derived from personal observations. Other than one study in the mid-1990s of foraging of Green Turtles in Mochima National Park, all information on marine turtle foraging areas in the country derives from inferences from data on incidental capture in the artisanal and trawl fisheries and on directed take in certain areas of the country (CICTMAR, 2002).

According to Guada (CICTMAR, 2002 and *in litt.*, 16 March 2004), current knowledge of marine turtle distribution in Venezuela can be summarized as follows:

- The **Green Turtle** occurs throughout Venezuelan waters: the Golfo de Venezuela (the principal area of recapture of turtles tagged in Tortuguero), Paraguaná Peninsula, eastern coast of Falcón State, marine areas of Mochima National Park between Anzoátegui and Sucre States, along the entire coast of Sucre, but in particular the northern shore and the Golfo de Paria. These turtles forage along the central coast and are also found in the islands, such as Los Roques Archipelago National Park, Los Testigos Archipelago, Las Aves Archipelago, La Blanquilla, La Tortuga, La Orchila and Nueva Esparta State (including Isla de Margarita, Coche and Cubagua).
- The **Loggerhead** occurs in the Golfo de Venezuela, Paraguaná Peninsula, eastern coast of Falcón State, marine areas of Mochima National Park between Anzoátegui and Sucre States and along the entire coast of Sucre. These turtles also forage along the central coast. Nesting has been recorded in several of the islands, such as Los Roques Archipelago and Isla de Margarita.
- The **Hawksbill Turtle** occurs in the Golfo de Venezuela, Paraguaná Peninsula, eastern coast of Falcón State, marine areas of Mochima National Park between Anzoátegui and Sucre States and along the entire coast of Sucre but in particular the northern shore and the Golfo de Paria. Los Roques Archipelago National Park is particularly important for this species, although it also occurs in Los Testigos Archipelago, Las Aves Archipelago, La Blanquilla, and La Tortuga.
- The **Leatherback** occurs in the Golfo de Venezuela, Paraguaná Peninsula, eastern coast of the State of Falcón and along the entire coast of Sucre but in particular the northern shore of the Paria Peninsula. These turtles are known to nest in Isla de Margarita, Coche, La Blanquilla, Los Testigos and Los Roques Archipelago (although nesting in this last area is rare).
- The **Olive Ridley** occurs primarily in the Golfo de Paria and around Isla de Margarita. There are isolated reports of its occurrence further to the west, but recently there have been reports of sightings along the central coast of the country (areas adjacent to the Laguna de Tacarigua National Park).

The following are considered the major marine turtle nesting areas in Venezuela (CICTMAR, 2002; H. Guada, *in litt.*, 16 March 2004):

- **Green Turtle:** Aves Island Wildlife Refuge (the most important nesting site for this species in Venezuela); Mochima National Park between the States of Anzoátegui and Sucre; along the entire coast of Sucre State but in particular the northern shore of the Golfo de Paria; and in the islands, e.g. Los Roques Archipelago National Park.
- **Loggerhead:** along the central coast (Miranda State); in Mochima National Park between the States of Anzoátegui and Sucre; the north coast of the Paria Peninsula, in Sucre State, and the extreme south-east (to the Golfo de Paria).
- **Hawksbill Turtle:** Mochima National Park between Anzoátegui and Sucre States; along the entire coast of Sucre State but in particular the northern shore; and extreme south of Paria Peninsula. Important nesting

occurs in Los Roques Archipelago National Park, but is not evaluated elsewhere in the islands. A total of 61 nesting sites for the species have been recorded across the country. The most important nesting area along the continental coast is the Paria Peninsula, with 33 nests (19 nesting females) recorded from partial surveys in 1997 and 65 nests (estimate of 26 nesting females) recorded from partial surveys in 1998 (Guada, 2000). In the islands, Los Roques Archipelago is the next most important nesting area (Buitrago and Guada, 2002; de los Llanos, 2002); during the 2001 nesting season, more than 130 Hawksbill Turtle nests were observed there (de los Llanos, 2002), thus indicating a higher figure than the estimated 120–150 nests that had been suggested by Buitrago and Guada (2002) based on numbers recorded in 1998.

- **Leatherback:** the central coast (Miranda State) and the north-east region of the country. The most important zone on the continent is the north shore of the Paria Peninsula (Sucre State). In 2000, 37 females were tagged on one nesting beach (Cipara); 51 were tagged in 2001; in 2002 and 2003, 60 and 75 females were tagged, respectively, on the two most important beaches on the peninsula, Cipara and Querepare (Rondón *et al.*, 2004). In the islands, the most important nesting sites are Isla de Margarita and Isla la Blanquilla. The nesting figures for Isla de Margarita may be similar to those recorded for the Paria Peninsula. The total nesting population of Leatherbacks in Venezuela, including all nesting sites, may range between 235 and 300 females per year (Guada, 2004).



Credit: WWF-Canon/Ronald Pelocz

Leatherbacks, usually females coming to nest, are observed throughout the year in Venezuela

In general, there is little specific information on the size of marine turtle populations living in or nesting on the coasts and islands of Venezuela. In the case of Aves Island, reports of various authors point to a dramatic decline in Green Turtle nesting populations: although Peñaloza (2000) estimated a population of 344 to 1439 females, personnel with the *Ministerio del Ambiente y de los Recursos Naturales* (MARN—the Ministry of the Environment and Natural Resources) estimate 500 to 700 females per year (Vera, 2004). On other islands and along the continental coast, nesting beaches that were documented to have once been important have disappeared completely, having been replaced by urban centres (Pritchard and Trebbau, 1984, cited in Guada and Solé, 2000).

Data exist from a number of studies and projects on international movements of marine turtles to and from Venezuela. Although no satellite-tracking has yet been undertaken of turtles in Venezuela, two Hawksbill Turtles fitted with transmitters by Dr Julia Horrocks at the University of the West Indies in Barbados travelled to north-eastern Venezuela (Isla de Margarita and Los Testigos Archipelago). From the more than 14 000 marine turtles headstarted by the marine turtle programme in Los Roques Archipelago National Park, tag returns have been reported from Panama, Costa Rica, Brazil, Belize, Colombia, Jamaica, and Bonaire (CICTMAR, 2002). In addition, tagging of Green Turtles in the context of the Green Turtle research and conservation project on Aves Island, which was run by the NGO FUDENA during the period 1979–1997, and restarted in 2001 by the wildlife

department (formerly the *Dirección General de Fauna* (DGF) and now the *Oficina Nacional de Diversidad Biológica* (ONDB), *Dirección de Fauna*) of MARN, has provided evidence of movements of these animals to numerous countries. Tags from this programme have been returned from: Barbados, Bonaire, Brazil, Colombia, Cuba, Dominica, the Dominican Republic, Grenada, Guadeloupe, Guyana, Haiti, Martinique, Mexico, Nicaragua, Puerto Rico, Saint Kitts, Saint Lucia, Saint Vincent and Venezuela (Vera, 2004). Preliminary data from tagging of marine turtles in the Paria Peninsula and Isla de Margarita that has recently begun indicate migrations of these nesting animals back and forth between Venezuela and Trinidad, as has been recorded in 1999 and the years from 2001 to 2004 (CICTMAR, 2002; J. Horrocks, pers. comm., cited in H. Guada, *in litt.*, 19 September 2004; Rondón *et al.*, 2004).

Overview of the legal framework for marine turtle management

Membership in international and regional treaties

Venezuela is party to several of the most important agreements relating to marine turtles in the Caribbean, including the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, or Cartagena Convention, and its Protocol Concerning Specially Protected Areas and Wildlife (SPAW Protocol) and the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC) (see table below). Venezuela has also been a Party to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) since 1977 and, in May 2002, ratified International Labour Organization (ILO) Convention N° 169 Concerning Indigenous and Tribal Peoples in Independent Countries, which, *inter alia*, protects and regulates the rights of the peoples concerned to use the natural resources in the areas in which they live.

Membership of Venezuela in multilateral agreements relating to marine turtles

Convention	Venezuela
Cartagena Convention	18.12.1986 (R)
Protocol Concerning Specially Protected Areas and Wildlife (SPAW)	28.01.1997 (R)
Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region	18.12.1986 (R)
Protocol Concerning Pollution from Land-based Sources and Activities	No
Convention on Biological Diversity (CBD)	13.09.1994 (R)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	22.01.1978 (E)
Convention on Migratory Species (CMS)	No
Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC)	20.08.1998 (R)
MARPOL 73/78 (Annex I/II)	29.10.1994 (Ac)
MARPOL 73/78 (Annex III)	29.10.1994 (Ac)
MARPOL 73/78 (Annex IV)	29.10.1994 (Ac)
MARPOL 73/78 (Annex V)	29.10.1994 (Ac)
Convention on Wetlands of International Importance (Ramsar)	23.11.1988 (E)
UN Convention on Law of the Sea (UNCLOS)	No
Western Hemisphere Convention	11.03.1941 (R)
World Heritage Convention	30.10.1990 (A)

Key: Date of: Ratification (R); Accession (A); Entry into force (E); Acceptance (Ac).

Laws and regulations relating to marine turtles

Since Venezuela's accession to CITES and the subsequent inclusion of all marine turtle species on the list of species subject to a national prohibition on hunting and capture, in 1979, marine turtles have been afforded complete legal protection across the entire country. The CITES National Legislation Project assessed Venezuela's legislation as "believed generally not to meet all requirements for the implementation of CITES" (Anon., 2005a). The CITES Secretariat is working with Venezuela to review more thoroughly and strengthen its legislation (S. Nash, Chief, Capacity Building Unit, CITES Secretariat, *in litt.* to J. Gray, TRAFFIC International, 21 September 2005). The CITES Standing Committee will review legislative progress at its 54th meeting, in October 2006 (Anon., 2005b).

There is an extensive body of legislation in Venezuela that directly or indirectly relates to marine turtles; in order of hierarchy, these are laws ratifying international treaties, framework laws (*leyes orgánicas*), specific laws and regulations, and decrees and resolutions (Babarro, 2004). Particularly relevant as regards the exploitation and trade of marine turtles are the following (CICTMAR, 2002; H. Guada, *in litt.*, 16 March 2004; Babarro, 2004):

- *Ley de Protección a la Fauna Silvestre* (*Gaceta Oficial* N° 29.289 of 11 August 1970) and its Regulations (*Reglamento de la Ley de Protección de Fauna Silvestre* *Gaceta Oficial* 5.302 Ext. of 29 January 1999). The five species of marine turtle occurring in Venezuela were included in the *Lista Oficial de Animales de Caza* (Official List of Game Species) in a Resolution issued under this law on 13 November 1970. However, a subsequent Resolution, dated 28 November 1979, prohibited the capture and hunting of these five marine turtle species. The only permits to be authorized under this regulation are for scientific and wildlife management purposes.
- *Ley de Pesca y Acuicultura* (*Gaceta Oficial* N° 37.727 of 8 July 2003), which, *inter alia*, defines the term "responsible fishing", sets forth measures for conservation and protection of fisheries resources and associated ecosystems and mandates the *Instituto Nacional de Pesca y Acuicultura* (INAPESCA—the National Institute of Fisheries and Aquaculture) to adopt available and emerging technologies to reduce the effect of fishing on associated species, such as through incidental capture of non-target species and other living resources.
- *Ley Aprobatoria de la Convención sobre el Comercio Internacional de Especies Amenazadas de Flora y Fauna Silvestre* (*Gaceta Oficial* N° 2.053 Ext. of 29 June 1977), through which CITES was ratified.
- *Ley Penal del Ambiente* (*Gaceta Oficial* N° 4358 Ext. of 3 January 1992) establishes penalties for violations of environmental legislation.
- *Resolución del Ministerio de Agricultura y Cría sobre el Uso Obligatorio de los Dispositivos Excluyentes de Tortugas Marinas* (*Providencia Administrativa* N° 1, *Gaceta Oficial* N° 35.678 of 23 March 1995) requires the use of TEDs.
- *Resolución declarando una veda total de las especies incluidas en la lista de especies en peligro de extinción* (declaring a ban on species included in the list of endangered species) (*Decreto* N° 1.485, *Gaceta Oficial* N° 36.059, 11 September 1996) and *Lista Oficial de Especies en Peligro de Extinción* (*Decreto* N° 1.486, *Gaceta Oficial* N° 36.062 of 11 September 1996). All species of marine turtle are included on this list.

- *Ley Aprobatoria de la Convención Interamericana para la Protección y Conservación de las Tortugas Marinas* (*Gaceta Oficial* N° 5.247 Ext. of 5 August 1998), through which Venezuela ratified IAC.
- *Ley de Diversidad Biológica* (*Gaceta Oficial* N° 5.468 Ext. of 24 May 2000).

In addition, the *Ley Orgánica de Espacios Acuáticos e Insulares* (*Gaceta Oficial* N° 37.330, 22 November 2001) and the *Decreto con Fuerza de Ley de Zonas Costeras* (*Gaceta Oficial* N° 37.319, 7 November 2001) provide for management measures for marine species and marine and coastal environments, including areas and periods closed to fishing (Guada and Solé, 2000; H. Guada, *in litt.*, 16 March 2004). Finally, the *Reglamento de Guardería Ambiental* (*Gaceta Oficial* N° 34.678 of 19 March 1991), provides for environmental law enforcement. Special note must be given to the *Reglamento Parcial de la Ley Orgánica para la Ordenación del Territorio, sobre Administración y Manejo de Parques Nacionales y Monumentos Naturales* (*Gaceta Oficial* N° 4.106 Ext. of 9 June 1989), which provides the basis for the establishment of protected areas within the zoning plans of the National Parks and Natural Monuments, and the *Decreto que declara Zona Protectora el espacio territorio próximo a la costa en una franja de 80 metros* (*Decreto* N° 623, *Gaceta Oficial* N° 4.158 Ext. of 25 January 1989), which prohibits, without authorization, the use of the zone used for nesting by marine turtles and sets standards for environmental assessment of proposed activities in the zone (Babarro, 2004).

Buitrago and Guada (2002) note the need for the promulgation of specific regulations for the protection of marine turtles and their habitats. Further, they note that although the *Ley Penal del Ambiente* specifies penalties, such as fines or prison terms, for infractions of laws protecting marine turtles, including illegal fishing and illegal take of endangered species in protected areas (Guada and Solé, 2000), enforcement of the law is not adequate and few cases of prison terms are known to have been imposed; finally, most of the fines that have been imposed have been for fishing vessels that were not deploying TEDs (Buitrago and Guada, 2002).

Babarro (2004) notes that, for this legislation to be effective in achieving its purpose, it is necessary for the government, through its executive agencies, to develop and maintain the capacity to finance compliance with these laws, such as through preventive controls on illegal actions using administrative and penal measures and an integrated policy of awareness-building and environmental education at all academic levels.

Responsible authorities

Numerous government agencies have responsibility for aspects of marine turtle management and conservation and law enforcement (CICTMAR, 2002; H. Guada, *in litt.*, 16 March 2004; Babarro, 2004), namely:

- ONDB, formerly the DGF of MARN;
- the *Dirección de Vigilancia y Control* of MARN;
- the *Dirección de Guardería Ambiental de la Guardia Nacional* (Environmental Enforcement Division of the National Guard);
- *Instituto Nacional de Parques* (INPARQUES—National Parks Institute), an autonomous agency attached to MARN;
- *Comandos, Destacamentos y Estaciones de Vigilancia Costera de la Guardia Nacional* (National Guard);
- *Comando y Estaciones de Guarda Costas de la Armada de la República* (Coast Guard);
- INAPESCA;

- *Instituto Nacional de los Espacios Acuáticos* (National Wetlands Institute); and
- others specifically mentioned in the *Reglamento de Guardería Ambiental* (Regulations for Environmental Enforcement).

Exploitation and trade of marine turtles

Exploitation and use at the national level

Historical perspective

Guada and Solé (2000) cite several authors in documenting evidence of the exploitation of marine turtles by indigenous communities along the Venezuelan coast and in the Los Roques Archipelago that is consistent with what is known of these communities' activities thousands of years ago. This exploitation included the take of turtles for consumption of meat, for rendering of the oil, for the bones, which were fashioned into tools, and for eggs. In some instances, it included the trade and exchange in some of these products between the islands and the mainland.

The consumption of meat and eggs, use of carapaces for decoration and production and consumption of other products derived from marine turtles are a deeply rooted tradition in most of the coastal communities of the country. Documentation of exploitation of marine turtles in Venezuela dates back to the writings of Père Labat in 1725, cited by Parsons (1962). There has been little long-term, systematic collection of data, however, from which to assess overall volumes and trends. Information on the capture of Green Turtles, Hawksbill Turtles and Loggerheads in Los Roques has been available for certain periods, when, according to Rebel (1974), fishing vessels carrying commercial catches of turtles reported to the Fishery Inspection Office of El Gran Roque and provided the overall weight of their catches (but not individual sizes and weights). Data for the years 1948 to 1971 are presented by Rebel (1974); during this period, the weight of turtles taken annually varied between a low of 3780 kg (1962) and a high of 55 975 kg (1968). Hawksbill Turtles and Loggerheads were reported to be caught for local consumption only and eggs were extracted and sold or used for personal consumption. Until 1973, the year that Los Roques Archipelago National Park was declared, it was estimated that landings of marine turtles totalled ca. 50 t per year and comprised primarily Hawksbill Turtles (Buitrago, 1980, cited in Guada and Solé, 2002). Pritchard (1984), in expressing his judgment that the prospects for the survival of Venezuela's nesting Hawksbill Turtles was poor, noted that, even in Los Roques National Park, "virtually all nests" were raided by local fishers unless personnel from the NGO FUDENA reached them first.

The Green Turtles nesting on Aves Island have long been exploited by fishers from other Caribbean islands. Parsons (1962) reported that around 1960, two Saint Lucian sailing vessels took 50–60 turtles per trip from the island to Dominica, making about six trips per season. The total number of Green Turtles passing along this route was estimated at 400 per year. Other turtles were taken directly to Saint Lucia, some of them for onward shipment to Europe. In the 1970s, boats from Saint Lucia, Dominica and Martinique continued to make visits to Aves Island and, despite the decline in the number of nesting females in the 1960s to 1970s, the high price paid for turtles (75 US dollars [USD75]) made it profitable to continue this trade (Rainey and Pritchard, 1972, cited in Guada and Solé, 2000). It was not until the area was established as a wildlife refuge in 1973 and a permanent garrison—*la Base Científico Naval Simón Bolívar*—was subsequently established on the island that this intensive exploitation ceased (Guada and Solé, 2000). Parsons (1962) also reported that the island of Blanquilla was the site of a turtle-curing station that sent jars of meat to the mainland at the turn of the century.

Although marine turtles were conferred complete protection by law in 1979, exploitation continued in the form of both incidental and intentional capture for subsistence and for commercial trade. Medina (1987) presented information on exploitation and use of marine turtles in different regions but noted that there was insufficient information with which to quantify the levels of exploitation; data from certain areas nevertheless suggested that the level of human depredation was “considerable” when compared with estimates of nesting populations. Research undertaken in the late 1980s aimed at assessing the status of marine turtles of the Caribbean coast of Venezuela revealed that many turtles were taken in foraging grounds and that the killing of nesting females and collection of nests were intensive, fuelled by a high demand on the internal market for meat and other products for consumption and ornamental use (Guada and Solé, 2000). This use involved: meat, of both Green and Hawksbill Turtles and less so of Leatherbacks; eggs, highly prized and widely consumed; bones and plastron, both consumed and marketed; oil, widely used for medicinal purposes, as a curative agent for respiratory ailments, and for the manufacture of cosmetics, such as facial creams; carapaces, used for decoration and as receptacles. Hawksbill scutes were fashioned into various objects, in particular spurs for cockfighting, and large quantities of these and other products were handcrafted, principally on Isla de Margarita and in a few other cities along the coast. In the Golfo de Paria, marine turtles were captured intentionally in a number of places, but this capture was found to be particularly intensive in Soro and Irapa; and an estimated 100 marine turtles, principally Green Turtle juveniles and sub-adults, were captured there every month in 1998 (Guada and Vernet, 1988b, cited in Guada and Solé, 2000).

Recent (since 1992) exploitation

Few statistics exist on the number of turtles estimated to be taken (illegally) in Venezuela. The *Centro de Investigación y Conservación de Tortugas Marinas* (CICTMAR) reports that available information on exploitation—captures, consumption and sale—of marine turtles and products within Venezuela derives from reports from and observations of fishers, coastal inhabitants and tourists (CICTMAR, 2002). Based on surveys and interviews with fishers that he conducted in the Golfo de Venezuela during 1998 and 1999, Parra Montes de Oca (2002) reported “intense exploitation” of marine turtles, particularly in the Alta Guajira region, in particular by the indigenous Wayúu. He recorded 244 turtles, primarily Green Turtles but also a significant number of Hawksbill Turtles, as having been caught for subsistence and sale, including animals targeted by fishers using turtle nets and turtles caught incidentally in fishing for other species. He indicated that, although the fishers knew that turtles were legally protected, the scarcity of other marketable resources and opportunities for employment made it difficult for them not to hunt turtles. He added that the recognized decline and rarity of these animals had resulted in an increase in value, prompting an increase in turtle capture effort. Towards the inner area of the Gulf, the Loggerhead may also be frequently caught (H. Guada, pers. obs. and GTTM (Golfo de Venezuela branch), pers. obs., cited by H. Guada, *in litt.*, 19 September 2004).

CICTMAR (2002) reports that the main areas of intentional illegal take and trade of marine turtles are the Golfo de Venezuela, Paraguaná Peninsula, eastern coast of Falcón State, Isla de Margarita and the Golfo de Paria, where these activities are believed to be an important source of income. Frequent comments from visitors to the Paraguaná Peninsula and nearby areas in Falcón State indicate that meat and turtle soup are currently sold in that area (H. Guada, *in litt.*, 16 March 2004). Guada and Solé (2000) reported that the highest level of take was in the north and north-east of the Paraguaná Peninsula and Sucre State. Hidalgo (*in litt.* to GTTM, 8 August 2004) estimated, based on survey work undertaken in 2003, that as many as five to 10 turtles (primarily Green and Hawksbill Turtles) were taken monthly by artisanal fishers along the coast of the Paraguaná Peninsula. In the

Golfo de Venezuela, fishers taking turtles are largely indigenous Wayúu from Venezuela and Colombia, although there are many that are not Wayúu. In the other areas, the fishers taking turtles are largely Venezuelan. For some, turtle fishing may be the primary fishing activity (CICTMAR, 2002). Further, CICTMAR (2002) reports that the Hawksbill Turtle is the most highly sought-after species of marine turtle, for its meat and shell, the latter of which is particularly in demand for making spurs for cockfighting, which continues to be a widespread form of entertainment in the country; whenever found, on a nesting beach or captured incidentally in a fishing net, Hawksbill Turtles are killed.

According to CICTMAR (2002), whether and how marine turtles are marketed depends on the species and the proximity of the animal's site of capture to either a point of sale or a potential buyer. When a nesting female is taken on the beach or on a fishing ground, the meat is often consumed by the fishers, their families and friends. Parts, such as carapaces or Hawksbill scutes, are sold in accordance with demand, i.e. when someone expresses an interest in buying them. In 1997 and 1998, Guada and colleagues recorded a price equivalent to USD1000/kg of Hawksbill scutes at one site along the Gulf of Paria (Irapa). There is also a demand for marine turtle carapaces, which are decorated for sale around the country. Although it is often the fisher who makes the final sale of a marine turtle, in the proximity of cities, turtles and products, including eggs, are sold to middlemen who sell them on to local markets. In cities visited by tourists, marine turtle products are sold through restaurants, handicraft shops or alongside other marine objects, such as conch shells, shark jaws and starfish Asteroidea.

In 1992, the illegal take of marine turtles (Green and Hawksbill Turtles primarily) by artisanal fishers in Los Roques National Park was estimated at 500 animals per year (assuming one turtle per day with an increase at certain times, such as *Carnaval*, Holy Week, etc.), not including nesting females and nests. Increased patrols and controls since then by INPARQUES, enabled by more staff and equipment, may have reduced this number (CICTMAR, 2002). De los Llanos (2002) reported that 27% of the total nests of all four species nesting in the park were dug up during the period of his observation (August to December, 2001).

Elsewhere on the continental coast and in the islands, there is extensive collection of eggs by humans, which, in many instances, compounds losses to predation by foxes and other animals. According to CICTMAR (2002), unless the nesting area occurs in a national park or wildlife refuge, where patrols are undertaken, there are important losses of nests. Outside protected areas, poaching of nests has been reduced through the establishment of volunteer networks who monitor daily the arrival of nesting females (e.g. Isla de Margarita) and through projects that provide a permanent presence on the nesting beach (such as Paria Peninsula) or daily or otherwise quite regular nesting beach surveys, as are being conducted in some areas in Miranda State (H. Guada, *in litt.*, 16 March 2004).

Guada (2002) considers illegal exploitation of marine turtles to be a serious problem in the west (Golfo de Venezuela, Paraguaná Peninsula, eastern coast of Falcón) and north-east (Nueva Esparta and Sucre States) of the country. In her judgement, the severity of the problem is not sufficiently appreciated and, thus, the necessary actions to reduce this exploitation are not being taken. She notes that there have been seizures of marine turtle products, but these are not thought to have involved very large quantities.

International trade

Historical perspective

As indicated above, there is a centuries-long tradition of capture of marine turtles at Aves Island by foreign fishers who would then trade these animals elsewhere in the Caribbean and in some instances beyond. Groombridge and Luxmoore (1989) cited Mast (1986) and Medina *et al.* (1987) in asserting that most of the international trade in marine turtle products from Venezuela involved turtles removed from this and other offshore islands by visiting foreign ships, in particular from Dominica, Saint Lucia, Martinique and the Netherlands Antilles, and tortoiseshell purchased in Isla de Margarita by traders supplying the Colombian Hawksbill shell carving market. In addition, turtles killed by Venezuelan fishers have traditionally been used to supply the market in the Netherlands Antilles, and this trade still continued in Curaçao in 1986 (Sybesma, 1986, cited in Groombridge and Luxmoore, 1989).

All international trade in marine turtles has been illegal in Venezuela since the country's accession to CITES in 1977. There is very little international trade in marine turtles and turtle products involving Venezuela reported in CITES trade statistics derived from the UNEP-WCMC CITES Trade Database for the years 1975 to 1993. No such trade was reported between 1975 and 1979, the year that marine turtles were afforded complete protection in the country, and for subsequent years there are records of only sporadic exports from Venezuela, primarily to the USA but also to a few other countries, namely Switzerland, the Netherlands, Italy and Canada. Most of the shipments were of small quantities (e.g. single carapaces) and half of these were recorded as seized on entry, but one shipment was recorded as two live Hawksbill Turtles imported into Canada for zoological purposes. Venezuela's annual reports to CITES for the years 1981 to 1993 record the export of only two marine turtle shipments: 30 eggs exported to the USA in 1987 and two live Hawksbill Turtles exported to Canada in 1991 for zoological purposes.

According to CICTMAR (2002), CITES-reported international trade figures are “with absolute certainty” underestimates of the true volume of marine turtle items exported illegally during those years. For example, in 1988, information was obtained that could not be confirmed regarding the export of 22 marine turtle carapaces (probably of Green and/or Hawksbill Turtles) to Spain (Guada and Vernet, 1988, cited in CICTMAR, 2002).

Japanese Customs statistics on imports of Hawksbill shell into Japan from Venezuela have been reviewed for different periods by several authors (Groombridge and Luxmoore, 1989; Milliken and Tokunaga, 1987; H. Kiyono, TRAFFIC East Asia-Japan Office, *in litt.* to TRAFFIC International, 29 July 2002) and, together, cover the period 1950–1992. During these more than 40 years, a total of 3148 kg of Hawksbill shell were recorded in these statistics as imported into Japan from Venezuela in only five years: 453 kg in 1957; 68 kg in 1958; 2447 kg in 1959; 171 kg in 1973 and nine kilogrammes in 1986.

Recent (since 1992) international trade

It is not surprising, given Venezuela's long-standing CITES membership, that there are few official statistics on trade in marine turtles or turtle products involving the country in recent decades. CITES-reported international trade in marine turtle products from Venezuela for the period 1993–2004, inclusive, comprised imports of generally single items reported by Luxembourg, the USA, Spain and Portugal. Half of these—four Hawksbill

carvings; eight carapaces (four Hawksbill, two Loggerhead, one Green Turtle and one unspecified, two of them reported in 2004); one “large leather product”; and nine kilogrammes of meat—were seized on entry. Exports reported by Venezuela comprised three shipments of scientific specimens, all believed to be for genetic analysis (e.g. for the University of Florida—H. Guada, *in litt.*, 16 March 2004).

According to CICTMAR (2002), there are no reliable figures on which to estimate the extent of illegal trade in marine turtles to and from Venezuela. However, based on information that CICTMAR has accumulated over the years, the principal species and products exported, as well as the countries to which these products are exported, are:

Colombia: meat and carapaces of Green and Hawksbill Turtles and Loggerheads taken in the Golfo de Venezuela (no confirmed reports of Leatherbacks);

Aruba, Curaçao: meat and carapaces of Green and Hawksbill Turtles taken in the Paraguaná Peninsula (no confirmed reports of Loggerheads);

Bonaire: Hawksbill shells from the Los Roques Archipelago (de los Llanos, 2002);

Trinidad: probably meat and/or carapaces of Green and Hawksbill Turtles from the Golfo de Paria;

Barbados and other parts of the Lesser Antilles, including Martinique and Dominica: probably meat and/or carapaces of various species. This supposition is based on the existence of a large drug traffic to these islands, which is also occurring on the Paria Peninsula and may also involve marine turtles.

According to CICTMAR (2002), in general, and based on available information, the most important destinations for illegal marine turtle exports from Venezuela are Colombia, Aruba and Curaçao, and these largely involve turtles taken from foraging areas in proximity to these countries. A large proportion of the illegal trade between Venezuela and Colombia is carried out by ethnic Wayúu or Guajiros (H. Guada, *in litt.*, 19 September 2004).

There was an unconfirmed report of the export, 1995–1996, of 40 carapaces (probably Green Turtles and/or Hawksbill Turtles) to Miami (Guada and Vera, unpublished data, cited in CICTMAR, 2002).

Although there is no estimate of the value or volume of Hawksbill products illegally imported into Venezuela, CICTMAR (2002) reports that these typically include small jewellery boxes, hair ornaments, earrings, necklaces and kitchen utensils, which are sold by travelling vendors (*buhoneros*) or in handicraft shops in the main cities of the country (Caracas and Isla de Margarita, for example). Information received from these vendors since 1987 points to Colombia as the primary country of origin, with Cartagena as the site of manufacture (H. Guada, *in litt.*, 16 March 2004). She has no information on re-exports and believes that any imports are for the domestic market. The persistence on the market of marine turtle products, including from abroad, perpetuates consumers' expectations, which she believes is putting additional pressure on local marine turtle populations.

Incidental take in fisheries

Incidental take in fisheries is an important factor for the conservation of marine turtles in Venezuela (Guada and Solé, 2000; CICTMAR, 2002; Balladares, 2004). Incidental take of marine turtles in the industrial trawl fisheries was evaluated in the early 1990s, but there has never been an assessment of incidental take in the artisanal fisheries that operate throughout the country. However, some of the data collected thus far suggest that incidental take in artisanal fisheries may be quite a bit more significant than the mortalities recorded in the industrial trawl

fishery. Guada (CICTMAR, 2000) considers the use of gill nets (*redes agalleras* or *de ahorque*) in these artisanal fisheries to be the most negative factor for the survival of marine turtles in Venezuela. Marine turtles captured in these gill nets are generally not released and, instead, are landed for consumption in local communities or for illegal sale of meat, oil, carapaces and other products. In some instances, turtles are removed from nets (thus preserving the nets) by cutting their flippers, such that flippers and turtles (mainly females) without flippers are sometimes washed up on beaches.

In a study undertaken in the Paria Peninsula (Guada, 2000, cited in Guada and Solé, 2000), estimates were made (based on the number of recorded fishing trips) of the number of turtles taken incidentally in the artisanal fisheries. For the northern shore, an estimate was derived of 490 turtles taken incidentally per year, principally Green Turtles, except during the nesting season, when Leatherbacks, the major nesting species in this area, are more likely to be taken. Using the same methodology, an estimate was derived of 1056 turtles taken incidentally per year along the southern coast.

As reported by Balladares (2004), the *Dirección de Fauna* of the ONDB began in October 1999 to record reports of stranded turtles along the Venezuelan coast and, when these increased dramatically in 2001, began monitoring these closely. A total of 63 marine turtle stranding reports involving 93 turtles were made up to and including September 2004, averaging eight turtles per month between 2001 and 2002, but falling to four turtles per month in 2003 and 2004. Approximately half of the strandings were along the western coast, in Zulia State, with the next largest proportion in Nueva Esparta State. Leatherbacks were the most frequently caught, followed “unusually” by Olive Ridentles, which do not nest in Venezuela. Only two of the 93 turtles recorded were stranded alive and successfully released.

Enforcement issues

Although they have not been and may never be credibly quantified, there is no question that the extent and levels of continued, illegal exploitation of marine turtles in Venezuela are a major shortcoming in the management of marine turtles in the country. Guada and Solé (2000) note that compliance with laws protecting marine turtles is impossible so long as there is ignorance of them and lack of public support in complying with them. They point, in particular, to the need to engage individual fishers, as well as the fishing co-operatives and the fishing inspectors (*Inspectorías de Pesca*) in discussions about the legal provisions in effect and any revisions that may come under consideration in relation to marine turtles.

Hidalgo (*in litt.* to GTTM, 8 August 2004) noted that fishers encountered in the context of marine turtle surveys undertaken in the Peninsula de Paraguaná in 2003 indicated that they knew of the legal prohibition of the capture of turtles but that this did not prevent them from taking turtles and selling them. He bemoaned the lack of interest of the competent authorities, such as MARN, in the problem.

While Parra Montes de Oca (2002) and other investigators recommend further efforts to quantify and characterize this exploitation and its value from both subsistence and commercial uses, they also recognize a need to address the factors underlying much of this exploitation, which, in the case of indigenous coastal communities, derives from cultural traditions and socio-economic circumstances. Although much more vigorous public awareness campaigning and enforcement effort by the relevant authorities is clearly called for (Guada and Solé, 2000), Parra Montes de Oca (2002) notes the need to identify and support the development of economic alternatives to the

turtle resource, in conjunction with coastal communities, particularly given the role of the local economic situation in driving this illegal exploitation. Guada (*in litt.*, 19 September 2003) adds that one of the complicating factors for enforcement is the fact that a large proportion of the illegal trade between Venezuela and Colombia is carried out by ethnic Wayúu or Guajiros, who have less interest in complying with the law. That this exploitation may be unenforced owing to Venezuela's membership in ILO Convention N° 169 warrants clarification.

The extent of the Venezuelan coastline, including the islands off the coast, and apparent level of fishing activity over such a large area of EEZ presents a huge enforcement challenge. Apparently in an effort to address this, auxiliary navy groups (*Grupos Auxiliares de la Armada*), comprising fishing or sport boating operators, have been established, at least in part to inform the coast guard stations of infractions (and assist with rescue operations). Whether these groups are involved or not, there is clearly a need to step up enforcement efforts, both on nesting beaches and at sea, and in the coastal communities and markets where these products are sold. Guada (*in litt.*, 19 September 2004) argues that some of the illegal trade could be reduced through more effective surveillance and control measures along national borders, such as the border with Colombia and the maritime border between Venezuela, Aruba and the Netherlands Antilles and Lesser Antilles. She further suggests that measures that are being taken at national and international levels to stem the drug trade, for example, may assist in reducing this illegal trade.

Guada and Solé (2000) note that, although there have been seizures of marine turtle products in Venezuela, records of which are held by MARN and the armed forces, there is no information as to the size of any held by these government agencies. There do not appear to be any laws relating to stockpiles or the movement of items from these stockpiles (CICTMAR, 2002).

Marine turtle management

Although there is a relatively high level of achievement in marine turtle research and conservation in Venezuela from projects that have been undertaken over the past 30 years, continued high levels of illegal exploitation suggest a need for greatly enhanced efforts on these species' behalf. The STRAP for Venezuela, the *Plan de Acción para la Recuperación de las Tortugas Marinas de Venezuela* (Sea Turtle Recovery Action Plan for Venezuela)—Guada and Solé, 2000—sets forth a series of recommendations for enhancing the management of marine turtles in the country and many of them have been taken forward. The STRAP has been distributed widely, to universities, government agencies and NGOs involved in marine turtle conservation, and to regional government agencies along the continental and insular coasts of the country, and has stimulated at least one regional conservation and research plan, for the Paria Peninsula.

The nationwide marine turtle working group, GTTM, has been co-ordinating marine turtle conservation efforts in Venezuela since 1987 and is working actively to promote the implementation of the STRAP. In addition, MARN was expected to establish a national committee for the IAC that could also assist in collaboration and co-ordination. Although the STRAP is guiding research and conservation, its effective implementation depends on sufficient funding and inter-institutional co-ordination and greater support from the ONDB and other government agencies, which, despite their participation in its development during the period 1992–2000, do not consider it an official government plan (CICTMAR, 2002).

According to CICTMAR (2002), of particular importance for any regional management plan would be the enhancement of national standards for research and conservation.

Management of exploitation

Marine turtles have been completely protected in Venezuela since 1979, but available evidence suggests that these measures may not have reduced—or reduced significantly—actual exploitation levels. The apparent pervasive, persistent illegal exploitation of marine turtles in Venezuela presents a challenge for management and suggests a need for government to articulate much more clearly national policy as regards marine turtle exploitation by indigenous communities or for subsistence purposes, particularly in the light of Venezuela's membership in ILO Convention N° 169. That this exploitation is largely unquantified and not characterized in detail precludes a definitive assessment of its impact on marine turtle populations. However, information presented by Guada and Solé (2000) and provided by Guada (CICTMAR, 2002) from her own research and that of colleagues regarding the depleted status of these species in the country gives cause for concern that numbers are continuing to decline, perhaps precipitously.

Clearly, measures must be found and implemented to reduce exploitation levels and to monitor these levels so as to assess the effectiveness of management measures and, if possible, infer population trends. Further, through market surveys and other means, efforts should be made to assess levels of trade and the value of that trade so that this may inform how best to affect these markets. Whether these efforts could be funded to employ local residents and fishers in these data collection efforts may be a question to consider. Parra's (2002) inclusion on his research team of an anthropologist to assist with assessments of cultural attitudes towards marine turtles and their use in the areas that he surveyed may serve as an example of what future projects on marine turtles should incorporate in trying to provide the basis for feasible solutions to this very complex problem.

That incidental mortality in fishing operations is believed to be one of the causal factors behind these declines points to a need for greater effort to address this pressure on marine turtle populations. In addition to establishing the importance of incidental mortality in fisheries, e.g. in the industrial trawl fishery and artisanal fisheries, there is a need to review the relationship between incidental take and the high levels of commercial trade. There is clearly a need for efforts to discourage landings of marine turtles captured incidentally and to promote their release; such efforts should be focused on incentives to do so and to report truthfully on such incidents, rather than on punitive measures that are likely to result in landings that are unreported and undocumented.

According to Guada (*in litt.*, 19 September 2004), discussions have been under way to secure funding for a project to document the incidental capture of wildlife, including marine turtles, associated with the shrimp fishery. Along similar lines, the ONDB is collecting and developing a database of marine turtle strandings for the entire country through agreement within the GTTM (H. Guada, *in litt.*, 16 March 2004; Balladares, 2004).

Species research and conservation

In Venezuela, research and conservation efforts on behalf of marine turtles have been underway since the mid-1970s, carried out primarily by NGOs. These efforts have included tagging programmes, nesting beach monitoring and nest protection, education and public awareness and technical training and capacity-building.

Numerous studies have been undertaken and are underway aimed at establishing and monitoring marine turtle population trends in Venezuela. Guada (CICTMAR, 2002 and *in litt.*, 16 March 2004) has provided the following information on relevant projects:

- On the Aves Island Wildlife Refuge, the ONDB of MARN reinstated, in 2001, the Green Turtle tagging programme implemented by the NGO FUDENA from 1979 to 1997. However, in 2001, it was possible to conduct these activities over only one month and in 2002 over only two and a half months and, in 2003, there was no monitoring at all, owing to the reconstruction of the *Base Científico Naval Simón Bolívar* in the refuge. These new and expanded facilities became operational in 2004, thus providing a better infrastructure for the marine turtle monitoring activities that will be re-initiated in mid-2005 (H. Guada, *in litt.*, 19 September 2004; Vera, 2004).
- The *Fundación Científica Los Roques* (FCLR) has tagged turtles headstarted from the captive breeding programme that they are running in Los Roques National Park, but these activities have been marked by interruptions. Rangers in the National Park have continued protecting nests when boat transport and other logistical support have been available.
- Along the central coast, in the Laguna de Tacarigua National Park (Miranda State), staff of the national parks agency, INPARQUES, have undertaken, since 1990, relatively regular surveys of the sandbar and recorded primarily Leatherbacks, Loggerheads and Hawksbill Turtles.
- Since 1992, the *Fundación Ecológica Oscar Ochoa Palacios* has undertaken regular surveys along various nesting beaches along the central coast (El Banquito, one of the principal beaches, Chirere, Máspero, and all those in Miranda State). Since 1999, the monitoring has been carried out through the *Programa ProCosta* of the NGO Provita. The nests that are found are relocated to pens or hatcheries or are camouflaged *in situ*. The principal species benefiting from these efforts are the Leatherback and the Loggerhead.
- In 1999, a marine turtle monitoring project was initiated in Cipara (Paria Peninsula, Sucre State), on one of the two most important nesting beaches for Leatherbacks on the continental coast. In 2002, the project was extended to include Querepare beach, with the result that there is now monitoring and protection of females and nests on the two most important nesting beaches of the Peninsula. In the years with the most females, over 85 females have been tagged; with complete coverage, as many as 100 females might have been tagged. Over 30 000 hatchling Leatherbacks have been released thus far. This project is carried out by the non-governmental organization, CICTMAR, in collaboration with WIDECAS and under the auspices of several national and international institutions.
- Since the late 1990s, tagging of Leatherbacks has been undertaken sporadically on various important nesting beaches of Isla de Margarita. These activities were stimulated by reports of sightings by tourists and volunteers, primarily on El Agua and Parguito beaches. Approximately 25 females were tagged, on Parguito primarily, during the 2001 nesting season, largely as a result of the efforts of a thesis student working in the area (Hernández, 2002). This project is being carried out by the marine turtle working group of Nueva Esparta State, *Grupo de Trabajo de Tortugas Marinas del Estado Nueva Esparta* (GTTM-NE) and currently includes surveys on more than 30 beaches. During 2001, the GTTM-NE reported having protected 222 relocated or *in situ* Leatherback nests (staff from GTTM-NE, pers. comm., cited in H. Guada, *in litt.*, 19 September 2004).

- Parra Montes de Oca's (2002) undergraduate thesis presented findings of surveys undertaken in the Golfo de Venezuela on marine turtle species occurring in the area and levels and types of exploitation and presented some conservation recommendations. Other students and professors at La Universidad de Zulia have collected numerous observations, including information on illegal trade in marine turtles, in this same area.
- In 2001, the ONDB of MARN began assessments of marine turtles in two areas of the continental coast and, in 2002, they initiated surveys at the nesting beaches of the south-eastern Peninsula de Paria National Park, in the Golfo de Paria (C. Balladares, ONDB, pers. comm., cited in H. Guada, *in litt.*, 19 September 2004). This project tagged a total of 20 marine turtles during the nesting seasons in 2003 and 2004 on the most important nesting beach, Playa los Garzos, and, based on re-captures, has estimated the nesting population to be ca. 40 animals per season, although the number of nests observed was only 40 in 2003 and 45 in 2004 (Quijada and Balladares, 2004).

Guada and Solé (2000) recommend further field studies and associated work, including verification of nesting beaches and designation of Index beaches for long-term monitoring and conservation efforts, in conjunction with local communities. At least one Index beach was established by 2002, Querepare on the Paria Peninsula (Sucre State) (CICTMAR, 2002).

Marine turtle headstarting projects have been underway in Los Roques Archipelago National Park (for Green and Hawksbill Turtles) and Mochima National Park (for Hawksbill Turtles and Loggerheads) since 1975 and 1984, respectively. These operations used eggs collected on nearby beaches, which were raised for six to seven months before being released (Groombridge and Luxmoore, 1989). However, Guada and Solé (2000), citing the various questions and concerns that have been raised regarding the role of headstarting in marine turtle conservation, note that it is being completely discarded as a marine turtle conservation strategy in Venezuela.

Habitat conservation



Credit: WWF-Canon/Roger LeGuen

Cuare Wildlife Refuge, a wetland of international importance, provides foraging habitat for two species of marine turtle in Venezuela.

In Venezuela, 11 national parks, two natural monuments, and three wildlife refuges incorporate coastal marine zones of relevance to marine turtles. Four of these are marine protected areas: Laguna de Tacarigua, Laguna de La Restinga, Morrocoy National Park along the continental coast, and Los Roques National Park (Garzón-Ferreira *et al.*, 2002). These marine protected areas and two of the wildlife refuges, Ciénaga de los Olivitos and Cuare (foraging area for two marine turtle species), cover ca. 450 000 ha (Buitrago and Guada, 2002). The Aves Island Wildlife Refuge was established in 1972 with a primary purpose of protecting the important marine turtle populations nesting there (Vera, 2004).



Credit: WWF-Canon/Bruno Pambour

Morrocoy National Park is one of Venezuela's principal coastal tourist destinations and incorporates habitats of importance for marine turtles.

Education and public awareness

Numerous activities have been undertaken in recent years by government agencies, NGOs and others aimed at enhancing understanding of and appreciation for marine turtles in Venezuela. According to Guada (CICTMAR, 2002 and *in litt.* 19 March and 19 September 2004), these include the following:

- lectures in schools and for the general public, as well as enforcement personnel, primarily along the western border (Zulia State), the central coast (Miranda State), Paria Peninsula (Sucre State) and Isla de Margarita (Nueva Esparta State);
- a poster completed in early 2003 on the problem of incidental take of marine turtles in fisheries, to be produced in the Wayúu language in 2005;
- an exhibition including marine turtles organized by the *Museo de Ciencias* (National Science Museum) in August 2002;
- a new poster on the marine turtles of Venezuela, completed in June 2004, and distributed (6000 copies) across the country and a brochure in Spanish and English (for tourists) about the marine turtles of the Paria Peninsula, produced in 2004. These materials were distributed during an exhibition on the marine turtles of the Paria Peninsula, which included photographs, text information, turtle exhibits, artistic materials and handicrafts, and ran from June to the end of August 2004.

In the course of their project on marine turtle conservation in the Golfo de Paria, which commenced in 2001 and continued through 2004, staff of the ONDB undertook a number of lectures in schools and community centres in order to increase awareness amongst fishers, farmers and other community members of the importance of marine turtle conservation (Quijada and Balladares, 2004).

In addition to education and outreach, there have been quite a number of activities aimed at technical capacity-building, including the following (CICTMAR, 2002; H. Guada, *in litt.*, 16 March and 19 September 2004):

- Since 2000, four new courses have been held on the biology and conservation of marine turtles and two short courses on biology and research techniques for marine turtles in nesting and foraging areas, in 2001 and 2002, respectively. In an effort to promote standardized data collection, two workshops on the standardization of monitoring techniques for marine turtle nesting were held in March 2002 and November 2003.
- Four academic theses on marine turtles in Zulia State, Miranda State, Isla de Margarita (Nueva Esparta State) and Los Roques Archipelago National Park, respectively, were presented in 2002 and one more was presented in mid-2004. Additional thesis projects are underway in Querepare (Sucre State) and in the Golfo de Venezuela (one in each area, respectively).
- Between 2001 and 2003, technical materials on marine turtles have been distributed through WIDECAST and CICTMAR to universities, including the *Universidad Central de Venezuela*, *Universidad Simón Bolívar*, *Universidad de Oriente*, *Universidad Nacional Experimental Francisco de Miranda* and *Universidad de Zulia*. In particular, these have included copies of the techniques manual developed by the IUCN/SSC Marine Turtle Specialist Group, *Técnicas de Investigación y Conservación de Tortugas Marinas* (Eckert *et al.*, 2001); *Proceedings of the Reunión de Diálogo en República Dominicana* (Eckert and Abreu Grobois, 2001); *The Biology of Sea Turtles* (Lutz y Musick, 1997) and the *Plan de Acción para la Recuperación de las Tortugas Marinas de Venezuela* (Guada and Solé, 2000). These efforts are aimed at strengthening the technical basis for marine turtle research in all the academic centres of the Venezuelan coast.
- CICTMAR and WIDECAST have also distributed other materials to government agencies and NGOs, including *Understanding, assessing, and resolving light-pollution problems on sea turtle nesting beaches* (Witherington and Martin, 2003); *Diagnóstico sobre el comercio de las tortugas marinas y sus derivados en el istmo centroamericano* (Chacón, 2002); *Manual para mejores prácticas de conservación de las tortugas marinas en Centroamérica* (Chacón *et al.*, 2000); documents relating to IAC, for example the *Final Report of the First Conference of the Parties* (IAC Secretariat, 2003); and information brochures.
- In 2002, two workshops were held on the veterinary aspects of marine turtle conservation, one on medical treatment for turtles, including caring for injured turtles and necropsies, and the second to train veterinarians and students of veterinary medicine specifically in performing necropsies.
- Participation by Venezuelans in the annual international symposia on marine turtle biology and conservation involves usually no fewer than six to eight people.

Constraints to marine turtle conservation and management

According to CICTMAR (2002), the major constraints to improving the management and conservation of marine turtles in Venezuela, in order of priority are:

- insufficient capacity (staff, equipment, and training) to promote compliance and enforce the law;
- lack of communication/sensitization on the principal problems facing marine turtles, i.e. intentional capture, incidental take, looting of nests, illegal trade;
- lack of public support for marine turtle conservation and management;
- lack of information on the principal foraging and nesting areas and on the numbers and trends of species in these areas;
- low political support within government agencies for marine turtle research and conservation efforts, which have, since the mid-1970s until quite recently, been conducted mainly by NGOs; and

- lack of inter-institutional efforts in research and protection of marine and coastal habitats (H. Guada, *in litt.*, 19 September 2004).

The entry into force of IAC may be a determining factor in generating political—and financial—support for marine turtle conservation, but the political and economic difficulties that Venezuela is currently experiencing do not augur well that these problems will be adequately addressed in the near term (CICTMAR, 2002).

CICTMAR (2002) reports that part of the problem with illegal trade in marine turtles lies with the decrease in surveillance and control. In Venezuela, in the mid-1990s, the structure for surveillance and control that had been established by the *Servicio Autónomo de Fauna* (PROFAUNA), currently the ONDB, began to be weakened, with the effect that infractions of environmental laws have become more frequent. The ONDB currently does not respond directly to reports of violations but refers these to the *Dirección General de Vigilancia y Control* and the *Direcciones Estadales Ambientales* (State environment directorates) of MARN, as well as to the national armed forces (the Coast Guard and the National Guard), for whom wildlife conservation is not the most important priority.

Summary and recommendations

Continued, largely illegal, exploitation of marine turtles in Venezuela through directed fishing and landing of turtles taken incidentally in fishing operations presents a problem for the management and conservation of marine turtles in the country. However, the scale and complexity of the geographic, socio-economic and other dimensions of the issue are difficult to address. Increased investments of research, enforcement and public awareness efforts are clearly needed, along with an increased capacity in both government and non-government sectors to support these. A number of recommendations to take these efforts forward are presented below.

1. In recognition of high levels of targeted exploitation of marine turtles in Venezuela and their recognized depleted status, a comprehensive frame survey should be undertaken to quantify and characterize exploitation and use of marine turtles, if not at the national level, in certain key areas in the west and the east of the country (Zulia, Falcón, Nueva Esparta, Anzoátegui and Sucre States), including:
 - the collection of eggs, hunting of turtles on nesting beaches, and take of turtles at sea;
 - numbers of individuals (fishers and others) actively involved in taking turtles or collecting eggs;
 - the types of gears involved in landing marine turtles, including the extent to which landings result from incidental or opportunistic take in other fishing operations or from a targeted fishery;
 - exchange, processing and marketing of turtles, turtle eggs, and turtle products; and
 - the importance of marine turtle exploitation for the livelihoods, i.e. as a source of protein or cash income, of individuals and communities.
- . In addition, this investigation should aim to assess:
 - the extent to which this exploitation involves indigenous communities; and
 - the nature and extent of illegal exploitation and trade of marine turtles and eggs and marine turtle products, including the degree to which exploitation is understood to be illegal.
2. Existing efforts should be expanded to document the nature and extent and reduce levels of incidental mortality of marine turtles in both artisanal and industrial fishing operations, through more vigorous

monitoring and enforcement of the requirements for shrimp trawls to use TEDs, as well as stiffer penalties for infractions by fishing vessels and their owners. Efforts to reduce incidental capture of marine turtles in artisanal fisheries should discourage fishers from landing turtles that are taken in this manner. Specific outreach efforts to heighten awareness and promote compliance amongst fishers should be implemented along with more vigorous monitoring and enforcement effort.

3. Government should address the lack of clarity regarding the legality of marine turtle exploitation by indigenous communities by articulating national policy regarding marine turtle conservation and management.
4. A vigorous programme of awareness-creation and publicity should incorporate mechanisms for citizens to contribute to drawing attention to various impacts on marine turtles and their habitats and for them to report on infractions of legal protections. Consideration should be given to establishing—and widely publicizing—a regional hotline to enable citizens to report directly to the authorities on poaching and other illegal activities involving marine turtles. The development of materials and other means to reach different sectors, such as the handicraft industry, retailers and personnel at designated entry points into the country, should also be considered. The regional nodes of the GTTM should be considered instrumental in implementing these actions.
5. There is a need to enhance the capacity for response by authorities concerned with the environment (e.g. MARN, the *Guardia Nacional* and other armed forces) to implement and enforce the legal regulations and prosecute infractions. This involves constant, sustained capacity-building for wildlife officers, fisheries personnel, armed forces staff, as well as the judiciary).
6. Although much more vigorous public awareness campaigns and enforcement efforts by the relevant authorities are clearly called for, the socio-economic drivers for illegal marine turtle exploitation should be addressed, including through efforts to engage coastal communities in developing economic alternatives to the turtle resource.
7. A large proportion of the illegal trade in marine turtles that occurs between Venezuela and Colombia is carried out by ethnic Wayúu or Guajiros, who may benefit from certain exemptions to the law. This factor, along with cultural traditions, introduces complex considerations that should be taken into account in developing strategies to reduce illegal exploitation and trade in marine turtles. These should be developed bilaterally between Venezuela and Colombia and with multi-disciplinary input, e.g. involving social scientists and rural development specialists.
8. There is a need for expanded, multi-lateral efforts to address illegal wildlife trade, including marine turtle trade, in the Wider Caribbean Region through initiatives under existing regional and international agreements. Along these lines, measures that are being taken at national and international levels to stem the drug trade should have a beneficial effect on reducing illegal trade in live turtles, dead turtles and their products.
9. Existing efforts to document the status of marine turtles should be expanded to:
 - document distribution and abundance of local populations;
 - identify major nesting grounds and foraging areas;

- designate Index nesting beaches and Index foraging grounds, and document the numbers of marine turtles occurring in these over time;
- manage data records such that statistically significant trends in abundance can be identified and inform management; and
- identify and monitor threats and other factors influencing marine turtle survival.

References

- Anon. (2005a). CITES Document SC53 Doc. 31. Working document of the 53rd meeting of the CITES Standing Committee. Accessible at www.cites.org. Viewed 12 December 2005.
- Anon. (2005b). SC53 Summary Record. Official report of the 53rd meeting of the CITES Standing Committee. Accessible at www.cites.org. Viewed 12 December 2005.
- Babarro, R. (2004). Marco legal relativo a la conservación de las tortugas marinas en Venezuela. Pp. 27–45. In: *Tortugas Marinas en Venezuela: Acciones para su Conservación*. Oficina Nacional de Diversidad Biológica, Dirección de Fauna, Ministerio del Ambiente y de los Recursos Naturales (MARN).
- Balladares, C. (2004). Varamientos de tortugas marinas en Venezuela. Pp. 67–70. In: *Tortugas Marinas en Venezuela: Acciones para su Conservación*. Oficina Nacional de Diversidad Biológica, Dirección de Fauna, Ministerio del Ambiente y de los Recursos Naturales (MARN).
- Buitrago, B., J. (1980). Attempts to protect hawksbills in a Venezuelan National Park. *Marine Turtle Newsletter* 14: 4–5.
- Buitrago, J. and H.J. Guada. (2002). La tortuga carey (*Eretmochelys imbricata*) en Venezuela. *INTERCIENCIA* 27(8):392–399.
- Chacon, D. (2002). *Diagnóstico sobre el comercio de las tortugas marinas y sus derivados en el istmo centroamericano*. Red Regional para la Conservación de las Tortugas Marinas en Centroamérica (RCA). San José, Costa Rica.
- Chacón, D.N. Valerín, M.V. Cajiao, H. Gamboa y G. Marín. (2000). *Manual para mejores prácticas de conservación de las tortugas marinas en Centroamérica*. Asociación ANAI, con el financiamiento de PROARCA/CAPAS, CCAD-USAID. San José, Costa Rica. 139pp.
- CICTMAR (Centro de Investigación y Conservación de Tortugas Marinas). (2002). Response to TRAFFIC International Questionnaire, CITES Review of Exploitation, Trade and Management of the Marine Turtles of the Lesser Antilles, Central America, Colombia and Venezuela. Completed by Hedelvy J. Guada, Directora Ejecutiva. Dated 17 August 2002.
- Eckert, K.L., K.A. Bjorndal, F.A. Abreu-Grobois y M. Donnelly (Eds). (1999). Técnicas de investigación y manejo para la conservación de las tortugas marinas. UICN/CSE Grupo de Especialistas en Tortugas Marinas Publicación No. 4. <http://www.iucn-mtsg.org/publications/>
- Eckert, K.L. and F.A. Abreu Grobois (Eds). (2001). *Memorias del Taller “Conservación de Tortugas Marinas en la Región del Gran Caribe: Un Diálogo para el Manejo Regional Efectivo”*, Santo Domingo, República Dominicana, 16-18 Noviembre de 1999. WIDECAS, UICN/MTSG, WWF y PNUE-CEP. xx + 154pp. www.iucn-mtsg.org/publications/Memorias_RD/ContenidoRD.htm
- Garzón-Ferreira, J., J. Cortés, A. Croquer, H. Gúzman, Z. Leao and A. Rodríguez-Ramírez. (2002). Status of coral reefs in southern tropical America in 2000–2002: Brazil, Colombia, Costa Rica, Panama and Venezuela. Pp. 343–356. In: C. Wilkinson (Ed.). *Status of Coral Reefs of the World: 2002*. Global Coral Reef Monitoring Network. Australian Institute of Marine Science, Townsville, Australia.

- Groombridge, B. and R. Luxmoore. (1989). *The Green Turtle and Hawksbill (Reptilia: Cheloniidae): World Status, Exploitation and Trade*. Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Lausanne, Switzerland. 601 pp.
- Guada, H.J. (2000). Areas de Anidación e Impactos Hacia las Tortugas Marinas en la Península de Paria y Lineamientos de Protección. Trabajo especial de grado de la Maestría en Ciencias Biológicas (MSc.). Universidad Simón Bolívar. Sartenejas. 228 pp. Unpublished.
- Guada, H.J. (2004). Informe preliminar: situación de la tortuga cardón (*Dermochelys coriacea*) al año 2004. CICTMAR-WIDECAS for Asociación ANAI. 4 pp. Unpublished.
- Guada, H.J. and G. Solé Sempere. (2000). *Plan de Acción para la Recuperación de las Tortugas Marinas de Venezuela* (Alexis Suárez, Ed.). WIDECAS. Informe Técnico del PAC No. 39. UNEP Caribbean Environment Programme, Kingston, Jamaica. xiv + 112 pp.
- Guada, H.J. and P. Vernet. (1988). Situación Actual de las Tortugas Marinas en la Costa Caribeña de Venezuela. Estados Anzoátegui y Sucre. Informe interno de FUDENA. 24 pp. + mapas.
- Hernández S., R.A. (2002). Evaluación de la Anidación de la Tortuga Cardón, *Dermochelys coriacea* (Vandelli, 1761) (Reptilia: Dermochelyidae) en Playa Parguito, Isla de Margarita, durante la Temporada 2001. Trabajo presentado para optar al Título de Técnico Superior en Acuicultura y Oceanografía. Instituto Universitario de Tecnología del Mar. 117 pp. + anexos. Unpublished.
- IAC Secretariat. (2003). Inter-American Convention for the Protection and Conservation of Sea Turtles—First Meeting of the Parties, Final Report. November 2003. Secretariat Pro Tempore, Inter-American Convention for the Protection and Conservation of Sea Turtles, San José, Costa Rica.
- Lutz, P.L. and J.A. Musick, (Eds). (1997). *The Biology of Sea Turtles*. CRC Press, Boca Raton, Florida.
- de los Llanos, V. (2002). Evaluación de la Situación de las Poblaciones de Tortugas Marinas en el Parque Nacional Archipiélago Los Roques. Trabajo Especial de Grado para optar al título de Licenciado en Biología. Universidad Central de Venezuela. 77 pp. Unpublished.
- Mast, R.H. (1986). Preliminary report on findings of WATS II sea turtle research survey of Colombia's Caribbean coast. Unpublished.
- Medina, G. (1987). National Report for Venezuela. 13 October 1987. Prepared for the Second Western Atlantic Turtle Symposium, 12–16 October 1987, Mayagüez, Puerto Rico. WATS2 056. 33 pp. + annexes. Unpublished.
- Milliken, T. and H. Tokunaga. (1987). *The Japanese Sea Turtle Trade 1970–1986*. A special report prepared by TRAFFIC (Japan). Center for Environmental Education, Washington, DC. 171 pp.
- Parra Montes de Oca, L.I. (2002). Diagnóstico de la Situación Actual de las Poblaciones de Tortugas Marinas en la Costa Occidental del Golfo de Venezuela, Estado Zulia. Trabajo Especial de Grado para optar al título de Licenciado en Biología. Facultad Experimental de Ciencias, Universidad del Zulia. xxiv + 154 pp. Unpublished.
- Parsons, J. (1962). *The Green Turtle and Man*. University of Florida Press, Gainesville. 121 pp.
- Peñaloza, C. (2000). Demografía y Viabilidad de la Población de Tortuga Verde, *Chelonia mydas*, en Isla de Aves. Informe Final del Proyecto de Grado para optar al título de Licenciado en Biología. Universidad Simón Bolívar. 88 pp. + anexos.
- Pritchard, P.C.H. (1984). National Report for Venezuela. Submitted 17 July 1983. Pp. 500–514. In: P. Bacon *et al.* (Eds). *Proceedings of the Western Atlantic Turtle Symposium, 17–22 July 1983, San José, Costa Rica*, III. Appendix 7. University of Miami Press, Florida.
- Pritchard, P.C.H. and P. Trebbau. (1984). *The Turtles of Venezuela*. Contributions to Herpetology No. 2. Society for the Study of Amphibians and Reptiles, New York.

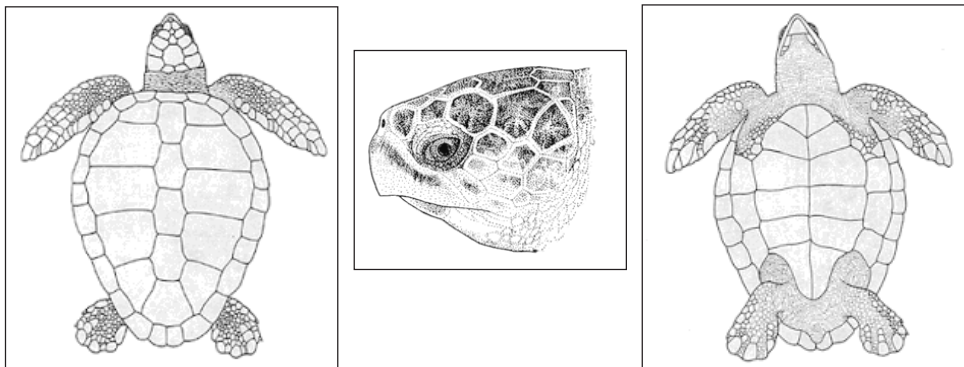
- Quijada, A. and C. Balladares. (2004). Conservación de las tortugas marinas en el Golfo de Paria. Pp. 47–53. In: *Tortugas Marinas en Venezuela: Acciones para su Conservación*. Oficina Nacional de Diversidad Biológica, Dirección de Fauna, Ministerio del Ambiente y de los Recursos Naturales (MARN).
- Rainey, W.E. and P.C.H. Pritchard. (1972). *Distribution and Management of Caribbean sea Turtles*. Contribution No. 105. Virgin Islands Ecological Research Station. Caribbean Research Institute, College of Virgin Islands, St. Thomas. 22 pp.
- Rebel, T.P. (1974). *Sea Turtles and the Turtle Industry of the West Indies, Florida, and the Gulf of Mexico*, revised edn. University of Miami Press, Coral Gables. 250 pp.
- Rondón M., M.A., H.J. Guada and R.A. Hernández S. (2004). Research and conservation of sea turtles in the Paria Peninsula, Venezuela: results of the 2003 nesting season. Poster presented at the 24th Annual Symposium on Sea Turtle Biology and Conservation, San José, Costa Rica, February 2004.
- Sybesma, J. (1986). Netherlands Antilles Sea Turtle Research Programme. Interim Report for Second Western Atlantic Sea Turtle Symposium (WATS II). Unpublished.
- Vera, V. (2004). Proyecto de seguimiento y conservación de la población de tortuga verde (*Chelonia mydas*) en el Refugio de Fauna Silvestre Isla Aves (Dependencias federales). Pp. 55–61. In: *Tortugas Marinas en Venezuela: Acciones para su Conservación*. Oficina Nacional de Diversidad Biológica, Dirección de Fauna, Ministerio del Ambiente y de los Recursos Naturales (MARN).
- Witherington, B.E. and R.E. Martin. (2000). *Understanding, Assessing, and Resolving Light-Pollution Problems on Sea Turtle Nesting Beaches*, revised edn. Florida Fish and Wildlife Conservation Commission, FMRI Technical Report TR-2. Tallahassee, Florida. 73pp. <http://www.nests-certified.org/pdf/LightingTechReport.pdf>

APPENDIX I

CARIBBEAN MARINE TURTLES: SPECIES SUMMARY

Loggerhead *Caretta caretta*

General description: The Loggerhead has a bony, slightly tapered, reddish-brown carapace covered with non-overlapping scutes. The carapace has five pairs of lateral scutes and is often encrusted by a heavy growth of invertebrate fauna, such as barnacles. The plastron is cream-yellow in colour. The triangular-shaped head is disproportionately large for the body size and may grow to 25 cm (10 inches) in width in adults. A variable number of prefrontal scales are located between the eyes. Each front and back flipper has two claws. While hatchlings typically range from 44–48 mm (1.7–1.8 inches) in carapace length, adults may grow to 120 cm (47 inches) in carapace length and 200 kg (440 lb) in weight. Hatchlings are uniform in colour, usually above and below red-brown or grey-black.



Drawings by Tom McFarland, reprinted with permission.

Nesting distribution and behaviour: Loggerheads prefer to nest on sub-tropical and temperate beaches. The largest concentration of nesting females in the Wider Caribbean Region (WCR) is found on the south-eastern Atlantic coast of the USA. Lower-density nesting is documented on beaches along the Gulf and Caribbean coasts of Mexico, Belize, Honduras, Colombia and Venezuela; the primary nesting season is from May to August. Loggerheads prefer to nest on continental beaches, and mating is believed to occur off nesting beaches. A typical nesting beach is backed by a low, vegetated dune. Nesting Loggerheads create asymmetrical tracks measuring 90–100 cm (35–39 inches) across. Females typically nest every two to three years, depositing an average of four nests (at 13–15-day intervals) per breeding season. The female excavates a nesting cavity 43–80 cm (17–31 inches) deep where she deposits ca. 100–120 golf ball-sized eggs. The nests are dug well above the high-tide line to prevent inundation by sea water over the incubation period, which lasts seven to 11 weeks.

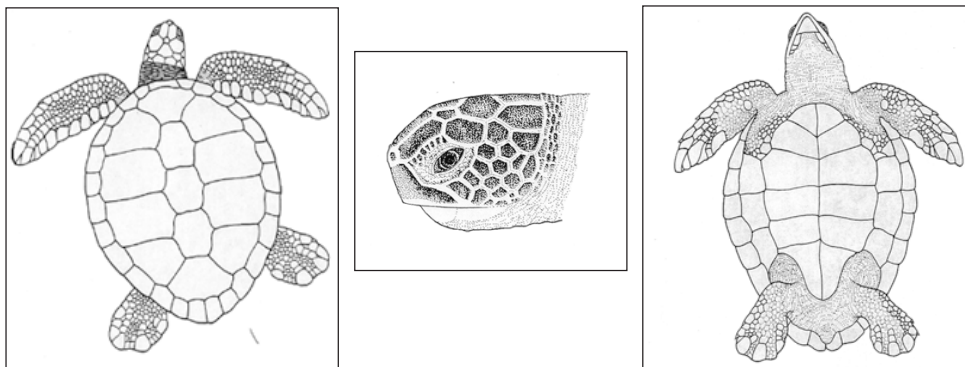
Diet: Adult Loggerheads are benthic feeders on the continental shelf. A large head and powerful jaws are well suited to their omnivorous diet. They eat a variety of hard-shelled molluscs (such as conches and whelks) and crustaceans (such as crabs) and also feed on fish, jellyfish, and seaweeds.

Conservation status: Classified as Endangered by IUCN (2004).

Legal status: Annex II (full protection) of the Protocol Concerning Specially Protected Areas and Wildlife (SPAW Protocol) of the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, or Cartagena Convention; Appendix I (full protection) of the Convention on Migratory Species (CMS); Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (no reservations are currently entered with respect to this species); included in the annexes to the Convention on Nature Protection and Wild Life Preservation in the Western Hemisphere, or Western Hemisphere Convention, a designation intended to convey that their protection is of “special urgency and importance”.

Green Turtle *Chelonia mydas*

General description: The Green Turtle, or Green-back, has an oval, bony carapace covered with smooth, non-overlapping scutes. Like the Hawksbill Turtle, the Green Turtle has four pairs of lateral scutes. The carapace of the adult varies from light to dark greenish-brown in colour with patterns of radiating wavy or mottled markings, while the plastron (bottom shell) is white to yellowish in colour. From an average hatchling length of 49 mm (two inches), adults are generally 95–120 cm (36–40 inches) in carapace length and weigh up to 230 kg (500 lb). Green Turtles are herbivorous and the biting edge of the lower jaw is serrated. Between the eyes there is one pair of enlarged prefrontal scales, a feature unique to Green Turtles. Each front and back flipper has a single claw. Hatchlings are “counter-shaded”—black above, white below.



Nesting distribution and behaviour: Major nesting colonies are found at Tortuguero (Costa Rica) and Aves Island (Isla de Aves, Venezuela). Smaller numbers of Green Turtles nest on the majority of islands and mainland territories of the WCR. The peak breeding season occurs between July and September. The nest site is characterized by a deep body pit, well above the high water mark. Symmetrical tracks in the sand 100–130 cm across (40–52 inches) indicate that a turtle has come ashore to deposit her eggs. A female will nest two to six times per breeding season, typically depositing 110–115 golf ball-sized eggs per egg clutch. The incubation period is approximately eight to nine weeks. After breeding, two to three years will elapse before the female breeds again. Like all marine turtles, Green Turtles have remarkable navigational skills which enable them to travel great

distances between preferred nesting and non-nesting (foraging) grounds. Juveniles spend the first several years in the open sea, before returning to shallow coastal waters to complete their development stages. Age at maturity is estimated at 25–40 years.

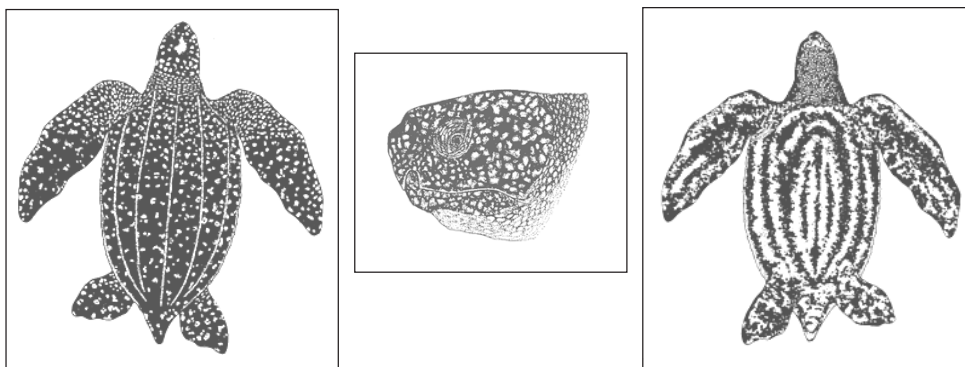
Diet: Adult Green Turtles are herbivores and eat seagrasses, especially Turtle Grass *Thalassia testudium* and algae. Green Turtles typically forage in shallow, nearshore waters throughout the Caribbean Sea. Their herbivorous habits result in a mild-tasting meat that is savoured in the Caribbean region and beyond and that was the impetus for a centuries-long, unsustainable trade that severely depleted some of the largest nesting colonies known to science and all but extirpated the rookeries of the Cayman Islands.

Conservation status: Classified as Endangered by IUCN (2004).

Legal status: Annex II (full protection) of the SPAW Protocol of the Cartagena Convention; Appendix I (full protection) of the CMS; Appendix I of CITES (within the wider Caribbean, Cuba and Suriname maintain a reservation with respect to this species); included in the annexes to the Western Hemisphere Convention, a designation intended to convey that their protection is of “special urgency and importance”.

Leatherback *Dermochelys coriacea*

General description: The Leatherback, also known as the Leathery Turtle or Trunkback, is the largest and most distinctive turtle. The Leatherback is the only marine turtle that lacks a hard, bony carapace, scutes and claws. Instead, the Leatherback has a rubbery “shell” that is strongly tapered and characterized by seven prominent (streamlining) ridges. The back, head and flippers are often marked by irregular blotches of white or pale blue. The plastron ranges from white to grey/black. The dark upper and lighter lower surfaces, in combination with the mottled coloration, are effective camouflage for this open-ocean inhabitant. While hatchlings are ca. 60–65 mm (2.4–2.6 inches) in carapace length, adult females grow to 130–165 cm (55–71 inches) and weigh 260–500 kg (573–1102 lb); males can weigh 916 kg (2015 lb). The Leatherback has a deeply notched upper jaw. Its bones and “shell” contain large quantities of oil which was used, historically, in the Caribbean for engine lubrication and is still used for medicinal and other applications.



Nesting distribution and behaviour: Leatherbacks are the most migratory of all marine turtles. They are globally distributed, feed in temperate waters and nest on tropical shores. The major nesting beaches in the WCR are in Trinidad and French Guiana/Suriname. Other important nesting beaches are in Costa Rica/Panama, the Dominican Republic, Puerto Rico, and the US Virgin Islands; the primary nesting season is from March to July. Leatherbacks prefer beaches with deep, unobstructed access and avoid abrasive rock or coral. The nesting track width is 150–230 cm (60–92 inches). Leatherbacks nest every two to three years or more, laying an average of five to seven egg clutches per nesting season at 9–10 day intervals. Typically, 70–90 fertile (yolked) eggs are laid, as well as a variable number of smaller, infertile (yolkless) eggs. After about nine weeks of incubation, the hatchlings emerge and crawl to the sea. The carapace is mostly black and the ridges along its surface are visible even at this young stage. Very little is known about the juvenile stages of this species; age at maturity is unknown.

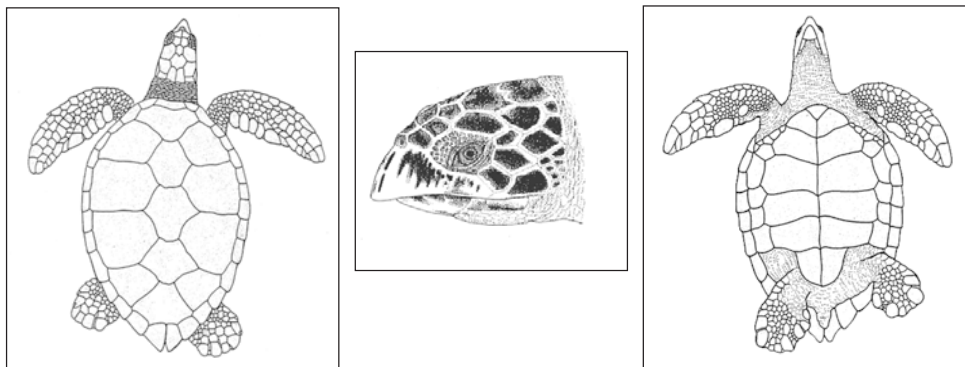
Diet: Leatherbacks forage in temperate waters and sometimes venture into sub-arctic latitudes. The mouth and throat of Leatherbacks are lined with backward-facing spines that help keep their primary food, jellyfish and other soft-bodied invertebrates, from escaping. Highly venomous jellyfish, including the Portuguese Man-O-War *Physalia physalis*, are considered a delicacy.

Conservation status: Classified as Critically Endangered by IUCN (2004).

Legal status: Annex II (full protection) of the SPAW Protocol of the Cartagena Convention; Appendix I (full protection) of the CMS; Appendix I of CITES (Suriname maintains a reservation with respect to this species); included in the annexes to the Western Hemisphere Convention, a designation intended to convey that their protection is of “special urgency and importance”.

Hawksbill Turtle *Eretmochelys imbricata*

General description: The Hawksbill Turtle is easily identified by its strikingly beautiful carapace—a mosaic of brown, gold, orange and red-speckled scutes that overlap each other like shingles on a roof. The oval carapace is posteriorly serrated. There are two pairs of scales, called prefrontal scales, between the eyes and two claws on each front flipper. Hatchlings are 40–45 mm (1.6–1.8 inches) in carapace length; adult Hawksbill Turtles grow to 70–95 cm (27.5–37.5 inches) and weigh 60–80 kg (132–176 lb). Hatchlings are uniform in colour, usually grey or brown, above and below.



Nesting distribution and behaviour: Hawksbill Turtles nest in generally low densities throughout the wider Caribbean, with the largest nesting populations found on the shores of the Yucatán Peninsula, Mexico. Important nesting colonies are also located in Antigua and Barbuda, Barbados, Belize, Cuba, Panama, Puerto Rico, Saint Vincent and the Grenadines, and the US Virgin Islands. Hawksbill Turtles nest at night, often on beaches flanked by coral reefs and rocks, and mainly between June and October. Females breed every two to three years or more, and typically nest four to five times at 14–15 day intervals. An egg clutch generally consists of ca. 150 golf ball-sized, white eggs. The female Hawksbill Turtle carefully selects her nesting site well above the high water mark where the eggs will remain dry for the next eight to nine weeks until they hatch. The asymmetrical track that the female leaves behind is 70–85 cm across. Hawksbill Turtles often nest amongst vegetation; the nest is quite shallow, and vegetation may assist in moderating the tropical sun (shallow nests are also more vulnerable to predators, such as the mongoose). As is the case with other marine turtles, hatchlings emerge at night and use natural light to find their way to the sea.

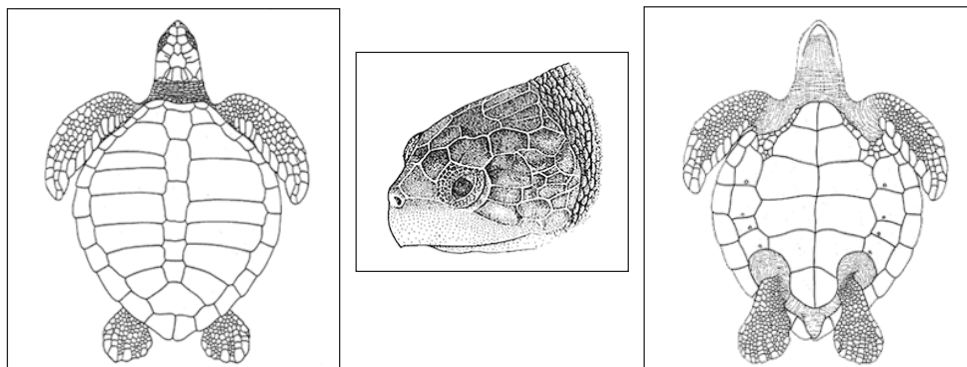
Diet: As their name suggests, Hawksbill Turtles have a narrow, pointed head and a “beak”, which is used to pry prey from reef crevices. They specialize on sponges in the wider Caribbean and, to a much lesser degree, will also eat hydrozoans, crabs, clams, gastropods, tunicates, and plants.

Conservation status: Classified as Critically Endangered by IUCN (2004).

Legal status: Annex II (full protection) of the SPAW Protocol of the Cartagena Convention; Appendix I (full protection) of the CMS; Appendix I of CITES (within the wider Caribbean, Cuba and Saint Vincent and the Grenadines maintain a reservation with respect to this species); included in the annexes to the Western Hemisphere Convention, a designation intended to convey that their protection is of “special urgency and importance”.

Olive Ridley *Lepidochelys olivacea*

General description: The Olive Ridley, one of the smallest of the marine turtles, may have been named for the olive-green colour of its carapace. Olive Ridleys can grow to 64–72 cm (25.6–28.8 inches) in carapace length and weigh up to 45 kg (100 lb). The carapace is nearly circular, with six to nine pairs of lateral scutes. The plastron is yellowish-white in colour and has small pores around the edges. The Olive Ridley has a small, narrow



head and a finely serrated horny beak. Between the eyes there are a variable number of prefrontal scales. There is one claw on each flipper. Hatchlings are uniformly greyish-black in colour.

Nesting distribution and behaviour: In many parts of the world, the Olive Ridley comes to shore to nest in synchronized emergences of large numbers of turtles, an event known as an *arribada* (Spanish for “arrival”). On a global scale, the Olive Ridley is the world’s most abundant marine turtle. However, Atlantic populations are severely depleted (having declined by nearly 95% in Suriname, once the region’s largest nesting colony). Remnant nesting colonies still occur, mainly in Suriname, French Guiana and Brazil. The nesting season is from April to August, peaking in May–July in the Guianas. Females prefer gently inclining beaches and typically emerge from the sea at night to lay their eggs in the warm sand. The female’s track is asymmetrical and ca. 70–80 cm (29–32 inches) in width. Nesting appears to be affected by weather conditions; therefore, there is no predictable inter-nesting interval, although females tend to nest one to three times during a breeding year. Females deposit an average of 100–120 eggs per nest, and the incubation period is approximately eight weeks long. Age at maturity is estimated at 12–15 years.

Diet: Olive Ridleys forage both in shallow coastal waters and open sea, where they have been known to dive to depths greater than 150 m (500 ft). They are primarily carnivorous and feed on a variety of food items, such as shrimp, crabs, sea urchins, jellyfish and gastropods (snails). They are also known to eat algae and seagrasses.

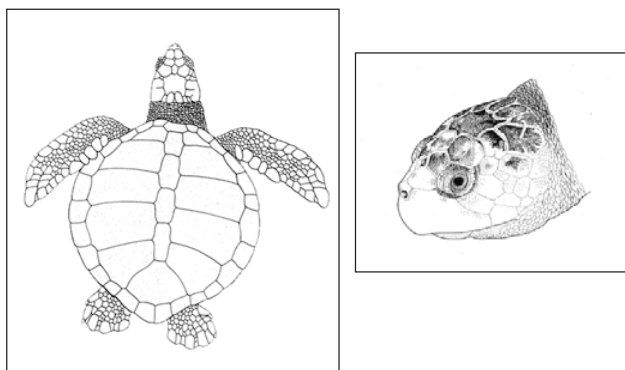
Conservation status: Classified as Endangered by IUCN (2004).

Legal status: Annex II (full protection) of the SPAW Protocol of the Cartagena Convention; Appendix I (full protection) of the CMS; Appendix I of CITES (no nation currently holds a CITES reservation on this species); included in the annexes to the Western Hemisphere Convention, a designation intended to convey that their protection is of “special urgency and importance”.

Kemp’s Ridley *Lepidochelys kempii*

General description: Numbering an estimated 6000 adults, the Kemp’s Ridley is the most endangered marine turtle in the world. It is a small marine turtle, ranging from 58 to 76 cm (23–30 inches) in carapace (top shell) length and from 27–40 kg (60–90 lb) in weight. Kemp’s Ridleys have a bony carapace covered with non-

overlapping scutes, including five pairs of lateral scutes. The carapace is almost round in shape, and dark-green to grey in colour. The plastron (bottom shell) is yellowish in colour and has small pores around the edges. Between the eyes there are a variable number of prefrontal scales. There are two claws on each flipper, although some adults lose the secondary claw on their front flippers. Hatchlings are uniformly greyish-black in colour and typical carapace length is 42–48 mm (1.7–1.9 inches).



Nesting distribution and behaviour: The existence and whereabouts of Kemp's Ridley nesting beaches remained a mystery to the scientific community until 1947, when a Mexican engineer filmed an estimated 40 000 females emerging to nest on an isolated beach at Rancho Nuevo, Mexico. As the breeding season approaches, males and females gather off the nesting beach to mate. Unlike other marine turtle species, Kemp's Ridleys are typically daytime nesters. The Kemp's Ridley crawl is asymmetrical, measuring 70–80 cm (29–32 inches) across. Females nest annually, generally two to three times per season (April–July), depositing ca. 100 eggs per nest. Incubation lasts seven to eight weeks.

Diet: Kemp's Ridleys are carnivorous. Scientists once believed the species to be confined to the Gulf of Mexico, but its range is now known to extend north along the US continental shelf with occasional sightings in European Atlantic waters. Crabs and shrimps are the main food items, but jellyfish, sea urchins, star fish, clams, mussels and fish are also eaten.

Conservation status: Classified as Critically Endangered by IUCN (2004).

Legal status: Annex II (full protection) of the SPAW Protocol of the Cartagena Convention; Appendix I (full protection) of the CMS; Appendix I of CITES (no reservations are currently entered with respect to this species); included in the annexes to the Western Hemisphere Convention, a designation intended to convey that their protection is of "special urgency and importance".

APPENDIX II

MULTILATERAL ENVIRONMENTAL AGREEMENTS RELATING TO MARINE TURTLES OF THE WIDER CARIBBEAN REGION

Global treaties

United Nations Convention on the Law of the Sea (UNCLOS) signed at Montego Bay (Jamaica), 1982; entered into force in 1994

“Prompted by the desire to settle, in a spirit of mutual understanding and co-operation, all issues relating to the law of the sea”, UNCLOS created a new legal regime for the seas and oceans. Its environmental provisions aim to establish rules concerning environmental standards and enforcement of provisions dealing with pollution of the marine environment. It also includes an Annex of highly migratory species, thus providing the possibility that marine turtles could receive some protection under this convention.

Convention on Biological Diversity (CBD) signed at Rio de Janeiro (Brazil), 1992; entered into force in 1993

The CBD has as its objective the conservation, as well as the equitable and sustainable use, of biological diversity for present and future generations. It binds nations to develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity; to identify and monitor the status of components of biological diversity; and to develop and manage protected areas and other areas of importance for biodiversity. It addresses sustainable use, incentives, research and training, public education and awareness, impact assessment and mitigation, access to genetic resources, technology transfer, information exchange, technical and scientific co-operation, and biotechnology, and establishes a funding mechanism, the Global Environment Facility.

Convention on the Conservation of Migratory Species of Wild Animals (CMS) signed at Bonn (Germany) 1979; entered into force in 1983

The Convention on Migratory Species, or Bonn Convention, incorporates two appendices that list migratory species that would benefit from concerted conservation measures. Endangered species, listed in Appendix I, are fully protected. This includes all marine turtles, with the exception of the endemic Australian Flatback *Natator depressus*. Member States with Appendix I species are to endeavour to conserve their habitat, to counteract factors impeding their migration, and to control other factors that might endanger them. In general, Parties are obliged to prohibit the hunting, fishing, capturing, or harassing of these species. Numerous subsidiary agreements have been adopted under the auspices of the treaty, two of which relate directly to marine turtles: **Understanding concerning Conservation Measures for Marine Turtles of the Atlantic Coast of Africa (Abidjan, 1999)** and the **Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats in the Indian Ocean and South East Asia (Manila, 2001)**.

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) signed at Washington, DC (USA), 1972; entered into force in 1975

CITES was established to protect wild species from the threat of over-exploitation by means of a system of import and export controls. The Convention regulates international trade in animals and plants, whether dead or alive, and any recognizable parts or derivatives thereof. Appendix I lists threatened species (including all marine turtle

species), in which international commercial trade is, with few exceptions, prohibited. Appendix II lists species that may become threatened unless trade is controlled. Appendix III lists species that any member State wishes to control in trade and for which that control requires international co-operation. International trade in Appendix I and II species operates by way of permits issued on the basis of a scientific finding that the export (and in the cases of Appendix I species, import) will not be detrimental to the survival of the species. CITES does not regulate or control the exploitation and trade of listed species, including marine turtles, within the borders of individual States; the establishment of such controls are the responsibility of national governments.

Convention on Wetlands of International Importance especially as Waterfowl Habitats signed at Ramsar (Iran), 1971; entered into force in 1975

Commonly referred to as the Convention on Wetlands or Ramsar Convention, this treaty provides for the protection and management of wetland habitats that are inscribed by individual member States on the international “Ramsar List”. A broad approach is taken in determining the definition of the wetlands that fall under the treaty’s aegis, such that they may “incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six meters at low tide lying within the wetlands”. This definition incorporates a range of habitats that are important for nesting and foraging of marine turtles.

Convention Concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention) signed at Paris (France), 1972; entered into force in 1975

The World Heritage Convention is one of the most widely accepted international legal instruments for the protection of cultural and natural heritage. Administered by the United Nations Educational, Scientific and Cultural Organization (UNESCO), the convention provides for member States to nominate specific sites that may be approved for inclusion on the World Heritage List. Inclusion on the list obligates the country concerned to develop a management plan for the site and to provide regular reports on the status of the site and the measures being taken to preserve them. UNESCO maintains a List of World Heritage in Danger, designed to call the world’s attention to sites whose character is threatened by natural or anthropogenic factors.

International Convention for the Prevention of Pollution from Shipping, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78) signed in 1978; entered into force in 1983

MARPOL is an important treaty for the conservation of the marine habitat necessary for the survival of marine turtles. Its objective is “to preserve the marine environment by achieving the complete elimination of international pollution by oil and other harmful substances”. The Convention has five Annexes (for oil, chemicals in bulk, packaged chemicals, liquid sewage, and garbage) to regulate discharge and to minimize accidents. Under Annex V (garbage), the Caribbean Sea has been declared by the International Maritime Organization (IMO) as a “Special Area”. This proposal has been accepted but can only come into force when requisite facilities are installed to receive garbage on shore.

Regional treaties

Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC) signed at Caracas (Venezuela) 1996; entered into force in 2001

The Inter-American Convention, or IAC, seeks “to promote the protection, conservation and recovery of marine turtle populations and of the habitats on which they depend, based on the best available scientific evidence, taking

into account the environmental, socioeconomic and cultural characteristics of the Parties”. Under Article III, the Convention applies to coastal habitat in the Americas, as well as maritime areas for which the Parties exercise sovereignty under the United Nations Convention on the Law of the Sea (i.e. up to 200 miles from shore), thereby covering a significant portion of the ranges of marine turtles in the Western Hemisphere. The treaty requires Parties to protect and conserve marine turtle populations and their habitats; reduce the incidental capture, injury and mortality of marine turtles associated with commercial fisheries; prohibit the intentional take of, and domestic and international trade in, marine turtles, their eggs, parts and products; and foster international co-operation in the research and management of marine turtles. In addition, the treaty specifically obligates Parties to require the use of TEDs by commercial shrimp trawling fleets.

Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region signed at Cartagena (Colombia), 1983; entered into force in 1986

Commonly referred to as the Cartagena Convention, this treaty sets forth a number of responsibilities of Contracting Parties in protecting and managing the Caribbean Sea, including to “prevent, reduce and control” pollution from a variety of sources (i.e. pollution from ships, from at sea dumping of waste, from landbased sources, from seabed activities, and from airborne sources) and to “individually or jointly, take all appropriate measures to protect and preserve rare or fragile ecosystems, as well as the habitat of depleted, threatened or endangered species, in the Convention area”. In 2000, the Convention’s **Protocol Concerning Specially Protected Areas and Wildlife (SPAW Protocol)** came into force, thereby providing a mechanism through which species of wild fauna and flora could be protected on a regional scale. Annex I of SPAW includes species of plants to be protected from all forms of destruction or disturbance. Annex II provides for total protection and recovery to listed species of animals. Specifically, Annex II listing prohibits: (a) the take, possession or killing (including, to the extent possible, the incidental taking, possession or killing) or commercial trade in such species, their eggs, parts or products, and (b) to the extent possible, the disturbance of such species, including all Caribbean marine turtles. Other Convention protocols, including the **Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region** (the Oil Spills Protocol) and, more recently, the **Protocol Concerning Pollution from Land-based Sources and Activities** (the LBS Protocol), provide important safeguards for marine turtle habitat and certain types of crisis response.

Convention on Nature Protection and Wild Life Preservation in the Western Hemisphere signed at Washington, DC (USA), 1940; entered into force in 1942

Commonly known as the Western Hemisphere Convention, this treaty’s stated objective is to preserve all species and genera of native American fauna and flora from extinction, and also preserve areas of wild and human value. Provisions include the establishment of national parks and reserves (article 2), strict wilderness areas to remain inviolate (article 4), protection of species listed in the annexes which are declared to be of “special urgency and importance” (article 8), and controls on trade in protected fauna and flora and any part thereof (article 9). Five species of marine turtle are listed.

Cooperative Agreement for the Conservation of Sea Turtles of the Caribbean Coast of Costa Rica, Nicaragua, and Panama (Tri-Partite Agreement) signed at San José, 1988; not in force

This agreement provides a formal basis for co-operation in the management and conservation of marine turtles and their habitats through a regional management plan.

APPENDIX III

CITES review of exploitation, trade and management of the marine turtles of the Lesser Antilles, Central America, Colombia and Venezuela

**** REQUEST FOR INPUT—PLEASE REPLY BY 1 AUGUST 2002****

TRAFFIC International has been commissioned by the Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) to undertake a review of the current status of exploitation, trade and management of marine turtles in the Lesser Antilles, Central America, Colombia and Venezuela. This review has been initiated by the CITES Secretariat in response to the First Wider Caribbean Hawksbill Turtle Range State Dialogue, which was held in Mexico City in May 2001. The present review complements the TRAFFIC North America marine turtle study, *Swimming Against the Tide: Recent Surveys of Exploitation, Trade and Management of Marine Turtles in the Northern Caribbean*, published in April 2001. For each of the countries and territories covered, this study aims to:

1. document current legislation governing exploitation, trade, and management of marine turtles;
2. document—and quantify where possible—levels of legal and illegal exploitation and trade in marine turtles and their products;
3. document the existence and status of stockpiles of marine turtle products;
4. document management initiatives being undertaken and the constraints to conservation and management of marine turtles; and
5. provide recommendations for improving the management of trade in marine turtles at the local, national and regional levels, in order to assist marine turtle conservation initiatives and law enforcement efforts.

For this study, TRAFFIC International is seeking input and information from CITES Management and Scientific Authorities; fisheries departments; national co-ordinators of the Wider Caribbean Sea Turtle Conservation Network (WIDECAST); local NGOs and other stakeholders.

Please assist us in providing information on these marine turtle management issues in COUNTRY X through completing the questionnaire set forth in the following pages. In order to facilitate your response, including reducing the amount of information that we are requesting, we have enclosed a brief summary of our knowledge of the laws governing marine turtle management in COUNTRY X, as well as tabulated historical trade data from the CITES database held at the UNEP-World Conservation Monitoring Centre in the UK. Please correct and augment, as necessary, this information in order that we may have a current and complete record of the situation in COUNTRY X.

If any of the information that we are requesting is already compiled in a report or reports that you can make available to us, we would be most grateful to receive a copy.

In order to have a summary report available in time for the 12th meeting of the Conference of the Parties to CITES in November, we wish to have a draft available for review by the end of August. We are, therefore, requesting that information be provided to TRAFFIC International by the end of July. We very much regret the tight timeline and hope you will nevertheless be able to assist us on this project. For further information on this project, please contact: Steven Broad, Executive Director, TRAFFIC International, at: traffic@trafficint.org.

PLEASE RETURN YOUR COMPLETED QUESTIONNAIRE—BY EMAIL OR TELEFAX—to:

Ms. Amie Bräutigam, Project Coordinator
email: thomsen.brautigam@prodigy.net
3626 Warren Street, NW
Washington, DC 20008
USA
telefax: 1/202.362.7893

CITES Review of Exploitation, Trade and Management of Marine Turtles in the Lesser Antilles, Central America, Colombia and Venezuela

**

QUESTIONNAIRE

**

Completed by: _____
Position/Title: _____
Agency: _____
Address: _____
Phone: _____ Fax: _____
Email: _____
Date: _____

I BASIC INFORMATION/BACKGROUND

- A. What marine turtle species are known to occur in Country X (check all that apply)? [] Loggerhead *Caretta caretta*
[] Green *Chelonia mydas*
[] Leatherback *Dermochelys coriacea*
[] Hawksbill *Eretmochelys imbricata*
[] Kemp's Ridley *Lepidochelys kempii*
[] Olive Ridley *L. olivacea*
- B. What marine turtle species have been documented to NEST in Country X?
[] Loggerhead *Caretta caretta*
[] Green *Chelonia mydas*
[] Leatherback *Dermochelys coriacea*
[] Hawksbill *Eretmochelys imbricata*
[] Kemp's Ridley *Lepidochelys kempii*
[] Olive Ridley *L. olivacea*
- C. What are the major (highest density) known foraging grounds (by species) in Country X?
- D. What are the major (highest density) known nesting areas (by species) in Country X?
- E. Are data (e.g. from flipper tagging, satellite-tracking, or genetic analysis) available to indicate which range States share marine turtle stocks with Country X?
- F. Are population monitoring studies—facilitated by systematic tagging or regular morning nest counts at Index beach [or Index foraging ground] sites—underway to determine long-term population trends in Country X? ____ YES ____ NO
IF YES, at what sites are these studies ongoing?

II LEGISLATION

According to our information, the legislation governing the exploitation, trade and management of marine turtles in COUNTRY X is:

- A. Please provide (or simply confirm, based on the paragraphs above), the title, date and provisions of the legislation currently in effect that governs the exploitation, trade, and management of marine turtles. Please provide copies for our analysis and file.

Specifically, what are the legal provisions currently in effect in COUNTRY x relating to:

- exploitation of marine turtles (e.g. complete protection, time/area closures, size limits; quotas);
 - trade in marine turtles (e.g. non-commercial vs. commercial, local vs. for export; certain products prohibited from sale; seasonal restrictions; permit requirements);
 - enforcement, including penalties for violations of harvest or trade prohibitions and confiscation of marine turtle products by government agencies;
 - registration of stockpiles and movement of turtle products from such stockpiles;
 - conservation and management, including protection of nesting beaches or other important habitats or other such measures.
- B. Through what legislation are wildlife trade controls, such as those required by CITES, implemented and enforced in COUNTRY X? Does this legislation prohibit the export of marine turtles and turtle products?
- C. Which government agencies have authority for which aspects of the management of marine turtles, such as exploitation, trade, conservation, and enforcement?
- D. What revisions to current legislation relating to the management (specifically exploitation, trade, conservation, and enforcement) of marine turtles are being discussed—or have been proposed — and when is it expected that such changes will be adopted?

III DOMESTIC EXPLOITATION AND USE

- A. Does a legal fishery for marine turtles currently operate in COUNTRY X? ___ YES ___ NO
1. If NO:
- When was the prohibition enacted, and does it apply to all species of marine turtles at all times and sites?
 - Is this prohibition indefinite or for a fixed period? If for a fixed period, when is the moratorium scheduled to end? If indefinite, on what basis may the fishery be reinstated?
 - Are records available for landings prior to the prohibition? If so, could you please provide them or direct us to who can provide them.
2. If YES:
- For which marine turtle species does a legal fishery operate?
 - Are records maintained of where the fishery operates, quantities of turtles landed and products taken? Which agency maintains these records, and how are they compiled (e.g. by actual documentation at landing sites or other means)? If no records are kept, are estimates available, and on what basis are they made?
 - If records do exist, please provide details of the quantities recorded, by species, site and year and products derived from the turtles.
 - Is there an estimate of the number of fishers involved and how often they operate? For any fishers, is this a major source of sustenance or income?
 - Are all species of marine turtles targeted equally, or are some more sought-after than others?
 - What products (and from what species, if known) appear to be more in demand (e.g. eggs, Hawksbill shell, green turtle meat)?
 - What is the market for a legally acquired product? Is it shared among family and friends, or more likely to be commercially sold?
 - If the product is commercially sold, who is most likely to make the final sale (e.g. fisher/fish market, restaurant, tourist shop)?
 - Who is the most likely consumer (e.g. rural resident, urban resident, tourist)?
 - Is the sale of marine turtles or turtle products regulated? Monitored?
 - Are statistics available on the numbers of marine turtles or marine turtle products marketed on an annual basis?

If so, through what agency are they collected?

- If possible, please provide any statistics that may be available on turtle products marketed commercially.
3. How is the legal fishery managed to ensure that it is not reducing population numbers? For example:
 - Are quotas set and reviewed periodically? On what basis are they set and reviewed?
 - Are specific age-groups of marine turtles, such as breeding females, protected in order to conserve the most valuable segment of the population?
 - Are specific nesting or foraging areas set aside as reserves to conserve animals there?
 - Are there monitoring programmes in place to: 1) record turtle landings; 2) ensure compliance with restrictions; and 3) identify trends in turtle numbers that might reflect an effect on populations?
 - Are management and monitoring of the legal fishery sufficient to ensure that the fishery does not result in a reduction of marine turtle numbers? Are any actions currently being taken to review the management program?
 4. What are the constraints to strengthening the framework for marine turtle management (e.g. shortcomings in the legal/regulatory framework, lack of knowledge of marine turtles, limited manpower, lack of trained personnel, insufficient funding, lack of public support)? What are the prospects that these will be resolved in the next few years?

B. Is there illegal exploitation of marine turtles in COUNTRY X?

1. What is the extent of illegal exploitation, and how is it documented?
 - On what basis is this problem believed to exist (e.g. documented evidence, anecdotal evidence, seizures of marine turtle products)?
 - Is it local or foreign fishers pursuing such a fishery? Is there an estimate of the number of fishers involved and how often they operate? For any fishers, is this a major source of sustenance or income?
 - Are all species of marine turtles targeted equally, or are some more sought-after than others?
 - What products (and from what species, if known) appear to be more in demand (e.g. eggs, Hawksbill shell, green turtle meat)?
 - What is the market for these illegally acquired products? Are they shared among family and friends, or more likely to be commercially sold?
 - If the product is commercially sold, who is most likely to make the final sale (e.g. fisher/fish market, restaurant, tourist shop)?
 - Who is the most likely consumer (e.g. rural resident, urban resident, tourist)?
 - Do estimates exist of the number of marine turtles—in total or by individual species—taken illegally per year?
 - Please provide any statistics that may be available on illegal exploitation of marine turtles in COUNTRY X.
2. Is the illegal exploitation of marine turtles in COUNTRY X considered a problem? a severe problem? If so (in either case), is it broadly recognized to be such a problem? What efforts are being made to reduce illegal exploitation?
3. What are the constraints (e.g. shortcomings in the legal/regulatory framework, lack of knowledge of marine turtles, limited manpower, lack of trained personnel, insufficient funding, lack of public support) to effective enforcement to reduce illegal exploitation, and what are the prospects that these will be resolved in the next few years?

IV INTERNATIONAL TRADE

A. Export of marine turtle products from COUNTRY X

The attached tables present imports of marine turtles from COUNTRY X as reported to CITES and as registered by Japanese Customs for imports of hawksbill shell, or *bekko*, into Japan prior to Japan's prohibition on hawksbill shell imports.

1. To your knowledge, how accurately do the attached statistics reflect true levels of exports of marine turtles from COUNTRY X?
 2. If the export of marine turtles or marine turtle products from COUNTRY X is legal or has been until recently:
 - How are these exports regulated?
 - Are statistics available on export levels? If so, can you please provide these statistics.
 3. If the export of marine turtles or marine turtle products is prohibited, are illegal exports being made?
 - Are there any estimates of the extent of illegal export? the quantities and products involved?
 - What is the destination—known or presumed—of illegal exports of marine turtle products?
 4. Is illegal export of marine turtle products considered a problem for the conservation and management of marine turtles in COUNTRY X? If so, what are the constraints to reducing this illegal trade?
- B. Import of marine turtle products into COUNTRY X
1. Is the import of marine turtles or marine turtle products into COUNTRY X legal or illegal?
 2. If the import of marine turtles into Country X is legal or has been until recently:
 - How are these imports regulated?
 - Are statistics available on imports, such as quantities, products, species, and export countries involved? If so, can you please provide these statistics.
 - What is the known or presumed destination (e.g. domestic use or re-export) of marine turtles or marine turtle products imported into Country X?
 3. If the import of marine turtles or marine turtle products into Country X is prohibited, are illegal imports being made?
 - Are there any estimates of the extent of illegal import, such as quantities, products and species involved?
 - What is the origin—known or presumed—of illegal imports of marine turtle products?
 - What is the known or presumed destination (e.g. domestic use or re-export) of marine turtles or marine turtle products imported into Country X?
 4. Is illegal import of marine turtle products considered a problem for the conservation and management of marine turtles in COUNTRY X? If so, what are the constraints to reducing this illegal trade?

V STOCKPILES OF MARINE TURTLE PRODUCTS

- A. Are there stockpiles of marine turtle products in existence in COUNTRY X, and are such stockpiles legal and/or illegal?
- B. Regarding existing legal stockpiles:
1. Are these stockpiles privately owned or owned by government? Are the latter solely from confiscations?
 2. How are the stockpiles regulated? For example:
 - Has an inventory been undertaken of these stockpiles? If so, when, and what were the quantities held?
 - How are the stockpiles monitored? Are inventories undertaken on a periodic basis, or are periodic reports required of holders of stockpiles?
 - What are the limits to the movement or sale from these stockpiles?
 - What is the current status of the stockpiles in terms of quantities of products, derived from what species, and the physical condition of the products held?

3. Are the legal stockpiles being held indefinitely? If not, when and how are they intended to be disposed of?

C. What is known of illegal stockpiles of marine turtle products in COUNTRY X?

VI MARINE TURTLE MANAGEMENT PLANNING

A. What is the status of implementation of your national marine turtle action plan? OR is a national marine turtle action plan currently being developed in your country?

B. What are the constraints to development or implementation of your national marine turtle action plan; for example shortcomings in the legal/regulatory framework, lack of knowledge of marine turtles, limited manpower, lack of trained personnel, insufficient funding, and/or lack of public support?

C. What, in your view, is the most important ingredient/resource for effective marine turtle management at the national level, and is this ingredient/resource available to you?

D. Would the existence of a Caribbean regional marine turtle management plan be useful to you in your national management planning efforts?

VII OTHER COMMENTS

Please provide here any other information or commentary than that requested above regarding the exploitation, trade and management of marine turtles that you believe is of relevance to this study and of which CITES should be aware.

VIII OTHER CONTACTS

We are sending this questionnaire to the following agencies and individuals in COUNTRY X:

If there are other individuals in relevant government agencies or NGOs who may be able to assist TRAFFIC International in the compilation of information on exploitation, trade, and management of marine turtles in COUNTRY X, please provide their names and contact details below.

1. Name: _____
Agency: _____
Address: _____
Phone: _____ Fax: _____
Email: _____

2. Name: _____
Agency: _____
Address: _____
Phone: _____ Fax: _____
Email: _____

THANK YOU FOR YOUR KIND CO-OPERATION AND YOUR VALUABLE CONTRIBUTION TO THIS IMPORTANT ASSESSMENT. AGAIN, PLEASE RETURN YOUR COMPLETED QUESTIONNAIRE—BY EMAIL OR TELEFAX—TO:

Ms. Amie Bräutigam, Project Co-ordinator

email: thomsen.brautigam@prodigy.net

telefax: 1/202.362.7893

3626 Warren Street, NW, Washington, DC 20008, USA

TRAFFIC, the wildlife trade monitoring network, works to ensure that trade in wild plants and animals is not a threat to the conservation of nature. It has offices covering most parts of the world and works in close co-operation with the Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

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