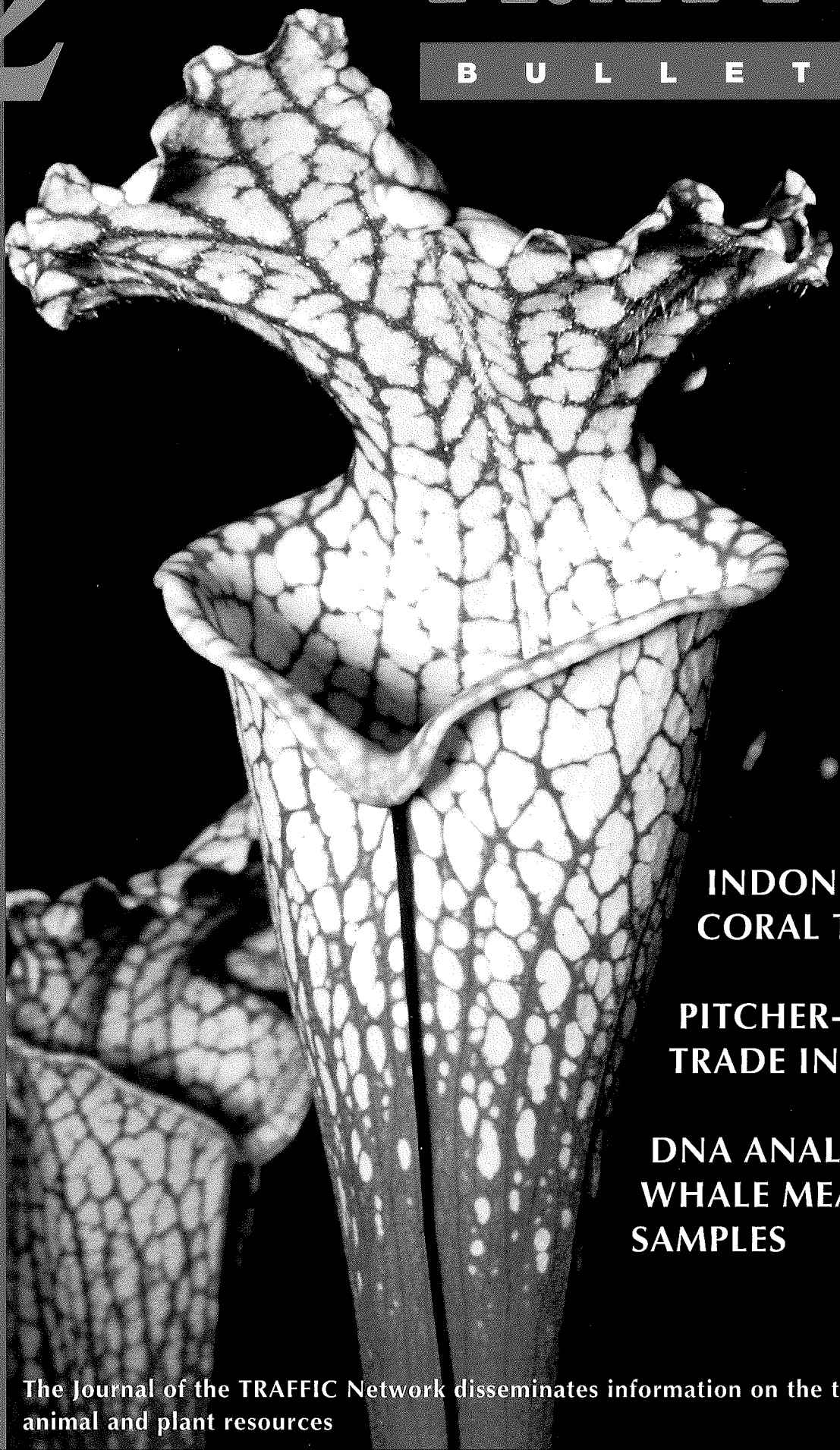
VOL. 17 NO. 2

TRAFFIC

BULLETIN



INDONESIA'S CORAL TRADE

PITCHER-PLANT TRADE IN THE USA

DNA ANALYSIS OF WHALE MEAT SAMPLES

JUNE 1998

The Journal of the TRAFFIC Network disseminates information on the trade in wild animal and plant resources

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Assistant Editor
Julie Gray

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TRAFFIC - Trade Records Analysis of Flora and Fauna in Commerce

Cover photograph of White-topped Pitcher-plant courtesy of Royal Botanic Gardens, Kew.

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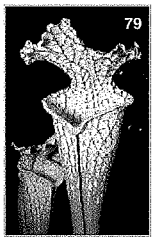

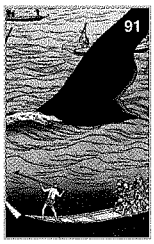

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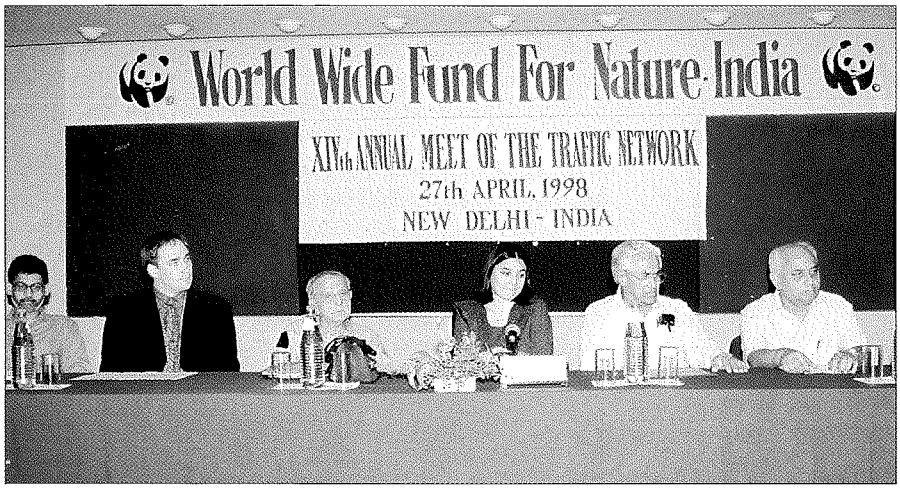


TRAFFIC India

From left to right: Manoj Misra, Director, TRAFFIC India; Steven Broad, Executive Director, TRAFFIC International; S.P. Godrej, President, WWF India; Maneka Gandhi, Minister of State for Welfare; Duleep Matthai, Chairman of the TRAFFIC India Advisory Committee; and, S.C. Sharma, Additional Inspector General of Forest (WildLife) and CITES Management Authority of India.

TRAFFIC Meeting in India

More than 35 TRAFFIC staff from around the world attended the Network's 14th annual meeting held at India's Corbett National Park from 29 April to 4 May 1998.

The opening ceremony, attended by more than 100 people, was held at WWF India's headquarters in New Delhi on 27 April, and featured India's Minister of State for Welfare, Maneka Gandhi, as the chief guest. Stressing the need to stop poaching and illegal trade in wildlife, the Minister called for greater enforcement resources in India, agreeing with a recommendation of TRAFFIC India for a directorate of wildlife intelligence to co-ordinate this effort. Other speakers included S.C. Sharma, Additional Inspector General of Forest (WildLife) and CITES Management Authority of India; Samar Singh, Secretary General, WWF India; S.P. Godrej, President, WWF India; Duleep Matthai, Chairman of the TRAFFIC India Advisory Committee; and, Steven Broad, Executive Director, TRAFFIC International.

The annual TRAFFIC meeting aims to enable the Network to review progress, and identify priorities and actions for the coming year. Among the key decisions reached in India is the need to ensure that the "Tigers" of the plant kingdom are now high on the Network's agenda. This issue is particularly important in India and other countries where people rely heavily on herbal medicines. The World Health Organization estimates that up to 80% of the world's population rely on medicinal plants and animals for their primary health care needs. The demand for medicinals is also rising in the industrialized world, where natural health remedies are becoming increasingly popular.

Monitoring and assessing the medicinal trade in plants and animals has long been one of the TRAFFIC Network's top priorities. To date, however, the Network has focused much of its efforts on monitoring the trade in some of the most endangered and high-profile animal species, such as Tigers and rhinos. These species will remain a focus, but the Network also agreed to turn its expertise to other aspects of trade and particularly medicinal plants.

The TRAFFIC Network plans a series of medicinal plant projects to assess the impact of this trade on both wild plant populations and local health care systems. In India, this work will include a comprehensive review of Ayurvedic and Tibetan medicine systems. Other projects will include research and action to assist in the conservation of plant resources used in traditional medicine in East Asia and to support effective management of trade in South America's medicinal plants. Specific financial support to this work is provided by WWF, the German Bundesministerium Für Wirtschaftlische Zusammenarbeit (BMZ) and the Rufford Foundation.

In Europe - one of the world's biggest consumers of medicinal and aromatic plants and plant parts - TRAFFIC will host the first international symposium on the conservation of medicinal plants in the region. The symposium, to be held from 22 to 23 June, will present the results of extensive research into this trade throughout Europe. In-depth research is also under way or planned in other regions, such as East and Southern Africa and North America.

Bobbie Jo Kelso,
Communications Manager, TRAFFIC International

Illustration: TRAFFIC India

In India, Ayurvedic medicine commonly utilizes about 500 plant species, such as Jatamansi **Nardostachys grandiflora** *(right), the dried roots of which are widely traded and used to treat certain types of fits, convulsions and heart palpitations. The plant is listed in CITES Appendix II.*

TRAFFIC NEWS

TRAFFIC North America

From 1 January 1998, TRAFFIC USA has expanded its area of responsibility to include both Canada and Mexico and, with a name change to TRAFFIC North America, becomes the sixth regional office in the TRAFFIC Network. A national representative has been appointed in Canada and there are plans to initiate a trade research programme in Mexico. North America is probably the largest wildlife consuming and exporting region in the world. Immediate goals for the office will be to identify conservation priorities for wildlife trade in the region, determine the extent of monitoring needed and to help wildlife officials assess whether protective measures should be implemented or improved.

Staff Changes

As well as having a wider remit, TRAFFIC North America has recruited a new Director, Simon Habel, following the departure of Gina DeFerrari. Simon was previously Director of TRAFFIC Oceania. Glenn Sant, formerly Senior Research Officer at that office, has been appointed TRAFFIC Oceania's Director.

Simon Milledge has commenced employment as Programme Officer at the TRAFFIC East/Southern Africa office in Dar es Salaam, Tanzania. Initially, Simon will be examining the trade in sea cucumbers, crustaceans and shells in Tanzania.

TRAFFIC On-line:

News of TRAFFIC's activities around the world is now available to Internet users. TRAFFIC's web site - updated weekly - provides information on:

- TRAFFIC's immediate and long-term objectives relating to the Network's four principal work priorities:

  ❶ trade in medicinals
  ❷ fisheries products
  ❸ timber and other wood products
  ❹ promoting the effectiveness of CITES and other wildlife trade controls

- an overview of the work carried out by staff at each of the 19 TRAFFIC offices situated in key wildlife trading countries;

- publication summaries, press releases, briefings, factfiles, and more.

Separate web sites are also maintained by TRAFFIC East Asia-Taipei, TRAFFIC East Asia-Japan and TRAFFIC Europe-Russia.

Available web sites:

http://www.traffic.org
http://wow.org.tw
http://twics.com/~trafficj
http://www.deol.ru/nature/protect

Deadlock in International Whaling Commission

A package of proposals put forward by Ireland at the International Whaling Commission (IWC) meeting in Monaco in October 1997 was designed to end the current impasse between the whalers (Japan and Norway) and non-whalers in the IWC. Currently, Japan and Norway are bypassing the moratorium on commercial whaling by exploiting loopholes in the International Convention for the Regulation of Whaling, and the IWC is powerless to stop the increasing catches by these nations which are conducted without any international regulation or supervision. The proposals, known as the 'Irish initiative', include:

- the completion of the Revised Management Scheme (RMS), a system which is being devised to regulate any future commercial whaling;

- the phase-out of lethal scientific research whaling as currently conducted by Japan in the Southern Ocean whale sanctuary;

- no international trade in whale meat; and

- exceptions in the moratorium on commercial whaling to allow whaling in the coastal areas of the nations now whaling, for local consumption only, and subject to the RMS. This would result in a *de facto* global oceans whale sanctuary.

Following these preliminary discussions of the 'Irish initiative', an informal inter-sessional meeting of IWC Commissioners was held in Antigua and Barbuda in February 1998. Even though this was only a consultation session, rather than a negotiating or decision-making meeting, neither Norway nor Japan showed any willingness to subject their current whaling to international regulation or to make any concessions on the key points in the Irish package. They stated that they were prepared to continue talking, but appeared to believe that such dialogue could continue for several years. The non-whaling IWC members stated strongly that the Irish package is already a compromise, and that they cannot make any further allowances. Michael Canny, the Irish Commissioner to the IWC and the current Chairman of the Commission, tabled a set of resolutions and schedule amendments as an illustration of how the package could be implemented. The ban on international trade, for example, could be implemented under the IWC by stipulating that the whale meat from any permitted whaling should be for local consumption only, and only sold within the country in whose waters it was caught. The IWC has several precedents for this provision, and CITES has already resolved it will not permit trade for the whales protected by the IWC. However, as there was no agreement on the broad elements, the fine details in Canny's text were hardly discussed. The 'Irish initiative' will be considered again at the 50th IWC annual meeting in Oman in May 1998.

Cassandra Phillips, WWF International Treaties Co-ordinator for Whales and Antarctica

Tackling CITES Sturgeon Listings

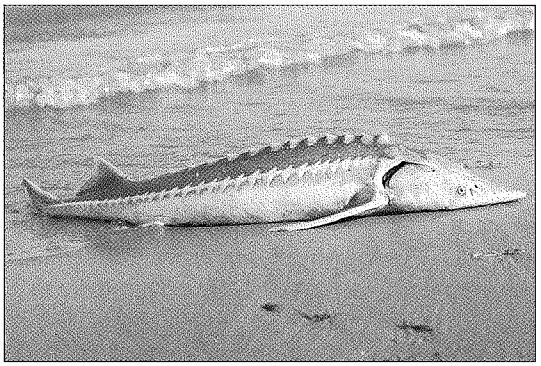
Regulating the harvest of sturgeons and closely monitoring the associated trade in caviar and meat is of paramount importance if the devastating impact of overexploitation on sturgeon populations is to be reversed. The populations in the Caspian Sea (from where practically all caviar in the world is produced) have been seriously reduced by illegal catch and an increased legal catch since the late 1980s; the other main threats to stocks are pollution and habitat loss. In April 1998, an opportunity to improve the perilous status of many sturgeon species arose with the listing of 23 species of Acipenseriformes in CITES Appendix II, which join those already covered by the Convention, and thereby include all sturgeon species under CITES.

In order to assist range States and consumer countries in implementing the provisions of the Convention for these valuable fish, a meeting, organized by the CITES Secretariat in co-operation with the State Committee of Environment of the Russian Federation, was convened in Moscow, Russia, from 19 to 23 January 1998. Ninety-seven participants attended the First Meeting on Conservation of Sturgeons and on Enforcement Aspects of their Inclusion in Appendix II of CITES, including representatives from CITES Parties: the Russian Federation, Iran, China, Belarus, Turkey, USA, Germany, France, UK, Switzerland, and Japan; non-Parties Azerbaijan, Kazakhstan, Turkmenistan, and Ukraine; and, international governmental organizations including the United Nations Environment Programme (UNEP), UN Office for Project Services (UNOPS), the World Bank, Technical Assistance to the CIS (TACIS) (programme of the European Commission), and the World Customs Organisation (WCO). Representatives of non-governmental organizations attending included IUCN-The World Conservation Union, TRAFFIC, and four members of the recently established ICIA (International Caviar Importers Association).

The meeting was divided into two parts: scientific aspects of sturgeon conservation and fisheries management in the range States, and enforcement aspects related to the inclusion of sturgeons in CITES Appendix II. In the scientific session, three working groups formulated a series of conclusions and recommendations which are summarized below:

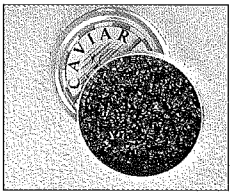
» Each range State should provide sufficient scientific information to demonstrate that the harvest of sturgeons is not detrimental to the species and populations concerned, and is at sustainable levels. The trade should be monitored by analysing CITES annual reports and application of the Significant Trade Process to Sturgeons, as agreed upon in Resolution Conf. 10.12, adopted at the tenth meeting of the Conference of the Parties.

» The poor economic conditions of the Caspian region are recognized as a driving force for sturgeon poaching. Attention should be paid to the status of the region's economy during the formulation of any plans for the conservation of biological resources.



Caroline Raymakers

In short supply: international co-operation is needed to halt the decline in sturgeon numbers.



WWF-UK

» Intergovernmental agencies, and trading and industrial companies, should plan to assist in the financing of conservation action, including that which relates to CITES implementation, and to projects for sustainable coastal development.

» A method of licensing fishers should be set up with their collaboration; a condition of such licensing should include the specification of appropriate harvesting techniques. The support of the processors should also be sought during the process of registration and licensing of factories and their produce.

» Range States should sign an agreement on the release and restocking of sturgeon fingerlings from hatcheries, on the establishment of annual fishing quotas in shared border zones (e.g. Caspian and Black Sea, Danube and Amur River), and on the creation of traders' associations that involve the entire chain of custody - from suppliers in the countries of origin to retailers in importing countries.

» Sturgeon stock assessments, based on sound scientific research, should be undertaken annually. Catch limits and quotas for caviar for each species, in each range State, could be determined from this information.

» Evaluation and monitoring of sturgeon stock enhancement activities are needed in order to develop an international restocking programme based on sound ecological principles. Such a programme may include the creation of a computer database on sturgeon stocks to co-ordinate restocking and fisheries management efforts, and the establishment of sturgeon gene banks.

» A global network of specialized NGOs and experts should be established for the exchange of information relating to research, monitoring and conservation of all sturgeons.

» The importance of natural reproduction should be emphasized and enhanced, possibly by means of rehabilitating natural spawning grounds, and installing fish bypass devices where dams are built.

» Support should be given to the enforcement of international treaties relevant to sturgeon conservation, such as the Convention on the Conservation of Migratory Species of Wild Animals (the Bonn Convention).

The numerous enforcement implications of the inclusion of sturgeons in CITES Appendix II were presented and thoroughly debated by representatives of the range States. The resulting recommendations summarized below were based on the text of Resolution Conf. 10.12.

» Range States should determine annual catch limits and export quotas for each species based on scientific data. Export quotas should be communicated by Parties to the CITES Secretariat, using "kg" as the common unit. The quotas for caviar should be established on the basis of its proportion of the total annual catch quota and allowance for domestic consumption, and the effects of illegal trade, if applicable. If a country fails to report an annual export quota for caviar from a species, then the export quota for that species from that country will be zero.

» All Parties should develop a uniform marking system for sturgeon products, which should include the scientific name of the species, the country of origin, the basin of origin, the year of harvest, and the name of the company exporting the specimens. In addition, a "bar code" labelling system should be considered with a cross-reference to the export permit or licence covering that shipment. The system should be worked out in detail through collaboration between the CITES Animals Committee and the relevant range States. It is important to ensure that the details of this system can be accommodated by Parties through all stages in the marketing process (for example, in cases where large shipments are divided up and despatched separately).

» CITES Management Authorities of range States should include in their marking system a register of traders, examples of the marking system they use and the place of origin of the product, and use the marking system in conjunction with export quotas and permit systems.

» All Parties should agree to waive the need for export permits for personal effects up to 250 g of caviar per person, and Parties deciding not to accept this exemption should notify the CITES Secretariat as soon as possible. The exemption should also apply to larger packages of caviar in excess of 250 g when two or more people are travelling together and the overall amount does not exceed 250 g per person.

» Importing and exporting countries should take any measures necessary to strengthen border controls including the designation, where possible, of ports of entry and exit for CITES specimens that are staffed by Customs officers trained in CITES procedures. The use of Customs tariff No. 1604 3010 of the Harmonized Commodity Description and Coding System should be employed for all caviar shipments. Enforcement agencies should use proven techniques for detecting illegal trade in sturgeon products including, where available, X-ray and DNA identification testing, and put special effort into monitoring the storage, processing and re-packaging of sturgeon specimens in Customs-free zones and free ports, and in airline and cruise line catering.

» Relevant institutions among Parties should exchange information on illegal activities, both bilaterally and through the CITES Secretariat and the World Customs Organisation.

Caviar traders expressed concern at the meeting about the lack of clear guidance on the application of CITES in relation to caviar exported for consumption on airlines and cruise liners, which represents up to 40% of the volume of caviar traded by some companies. The ICIA noted that special control measures should be established for such trade to prevent potential abuses.

The CITES Secretariat explained that the newly independent States must decide either to become a Party, or declare their intention not to join the Convention. Until then, these States would be "in limbo" as only re-export permits issued by the Russian Federation can be accepted for specimens originating in these States. Non-Parties, especially Azerbaijan, expressed great concern about this situation and, together with Kazakhstan, stressed its desire to join the Convention as soon as possible.

The final text of the recommendations was submitted to the CITES Standing Committee in March, and details about implementation measures will be discussed further at the CITES Animals Committee meeting in May.

Financial support for the Moscow meeting was provided by the governments of Germany and the USA.

Caroline Raymakers, TRAFFIC Europe

DNA Testing of Caviar

The procedure of DNA analysis for caviar identification is currently under development at the US National Fish and Wildlife Forensic Laboratory and has been applied in a market analysis of the caviar trade in North America. Six species were identified: Beluga *Huso huso*, Russian Sturgeon *Acipenser gueldenstaedti*, Stellate Sturgeon, *A. stellatus*, White Sturgeon *A. transmontanus*, Shovelnose Sturgeon *Scaphirhynchus platorynchus* and American Paddlefish *Polyodon spathula*. Over one hundred caviars from more than 20 major caviar importers in North America were examined. Although it has been reported by others that caviar is frequently mislabelled as to species origin, the results of the National Fish and Wildlife Forensic Laboratory indicate an incidence of less than 8%. Examples of such mislabelling include the identification of American Paddlefish eggs - valued at less than US$5 an ounce - contained in Sevruga caviar tins, on sale for US$50 an ounce, and Russian and Stellate Sturgeon eggs in Sevruga and Osetra caviars, respectively.

On 1 April 1998, the USA began using the DNA tests to monitor the trade in caviar more closely.

US National Fish and Wildlife Forensic Laboratory

Coast Clear for Sharks . . .

Basking Sharks, UK: With effect from 16 April 1998, Basking Sharks *Cetorhinus maximus* are protected in UK territorial waters. The measures announced by the Government complement those in place in the Isle of Man, where the species has been protected within a three-mile coastal zone since 1990. The shark, the second-largest living fish in the world after the Whale Shark *Rhincodon typus*, and the largest in UK waters, is now listed in Schedule 5 of the *Wildlife and Countryside Act* of 1981. The Act prohibits the killing, injuring, disturbing, or sale of listed species throughout Great Britain and within adjacent territorial waters up to 12 nautical miles from the shore.

The fish is taken mainly for its fin, and used as an ingredient in shark fin soup.

Great Whites and Grey Nurses, Australia: On 17 December 1997, the Australian Federal Environment Minister declared a prohibition on the killing and taking of the Great White Shark *Carcharodon carcharias* and Grey Nurse (Sand Tiger Shark or Spotted Ragged-tooth) *Carcharias taurus*. Both species have been listed as Vulnerable under the *Endangered Species Protection Act* of 1992. This decision complements the protection already given to these sharks in some State waters, and extends the protection from three nautical miles offshore to the edge of the continental shelf or the Australian Fishing Zone, whichever is the greater. Anyone found violating this order will be liable to fines of up to AU$50 000 (US$33 000).

The major factors contributing to the decline of these shark species is commercial fishing and incidental take. The Government will work with the fishing industry and other stakeholders to develop national recovery plans for both species to help their populations recover.

Whale Sharks and Manta Rays, Philippines: On 25 March 1998, the Government of the Philippines announced a prohibition on the killing and sale of Whale Sharks *Rhincodon typus* and Manta Rays *Manta birostris* under *Fisheries Administrative Order No. 193*.

The harvesting of Whale Sharks, the largest of all fishes, is reported to have increased dramatically in Philippine waters over the past seven years, and yet catch figures show a sharp decline. The fresh meat of this species is usually exported to Taiwan, where it is considered a delicacy. The dried meat of Manta Rays is mostly consumed locally and the dried gill rakers are exported.

Further information on Taiwan's Whale Shark fishery can be found in *TRAFFIC Bulletin* 17(1):53-57.

UK Department of the Environment, Transport and the Regions; Basking Shark Society, Isle of Man; Ministry for the Environment Media Release (Australia), 17 December 1997; Environment Australia; The Daily Telegraph (Australia), 18 December 1997; WWF-Philippines

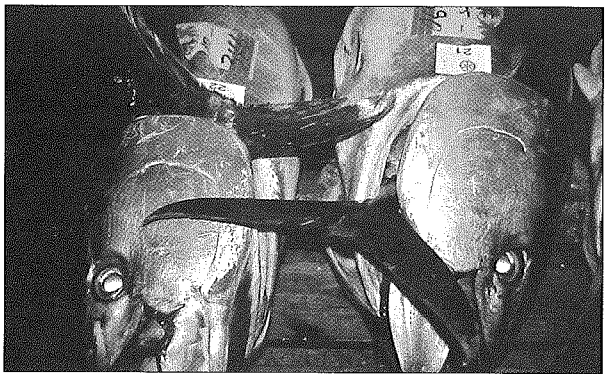
. . . While Tuna Talks Take a Dive

Southern Bluefin Tuna: The Commission to the Convention for the Conservation for Southern Bluefin Tuna (CCSBT) was unable to close its fourth annual meeting (most recently resumed on 19 February 1998), owing to several matters of business remaining unfinished. The three Parties to the Convention - Australia, Japan and New Zealand - have not yet set the Total Allowable Catch (TAC) for Southern Bluefin Tuna *Thunnus maccoyii* for the 1997/98 fishing season. Australia and New Zealand have declared their intention to fish no more than the equivalent quota allocation they received for 1996/97 (5265 t and 420 t, respectively). Japan has declared that it will fish the equivalent 1996/97 national allocation (6065 t) and in addition, possibly pursue a Unilateral Experimental Fishing Programme, independent of the CCSBT, which will catch an additional 2000 t. Owing to Japan's refusal to restrain its catch below 6065 t, Australia and New Zealand will not negotiate with Japan over access agreements to their respective Extended Economic Zones (EEZs).

Japan has also declared its intention to approach the Indian Ocean Tuna Commission (IOTC) with a proposal suggesting the Commission should have responsibility for managing Southern Bluefin Tuna.

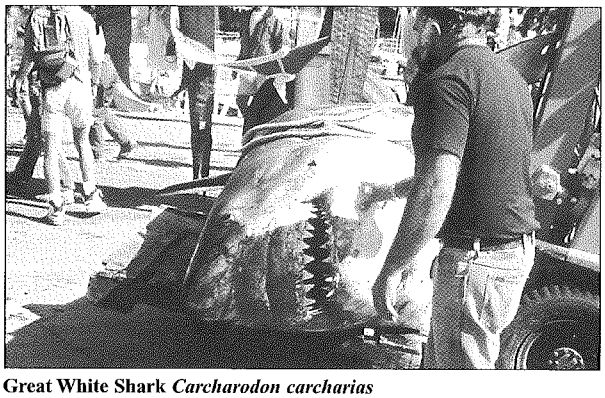
The fourth annual meeting of the CCSBT is expected to reconvene in May or June 1998.

TRAFFIC Oceania



Glenn Sant/TRAFFIC

Southern Bluefin Tuna *Thunnus macoyii*



G.M. Caillet/ IUCN/SSC Shark Specialist Group

Great White Shark *Carcharodon carcharias*

Tanzania Steps up Poaching Controls

Anti-poaching activities in Tanzania have been stepped up by the Government following evidence of a steep decline in animal populations in the country's protected areas. Censuses carried out in Selous Game Reserve - the largest in Africa - in 1976 and 1989, showed that the population had been higher in 1976. For example, 109 419 African Elephants *Loxodonta africana* and 2541 rhinos, compared with 29 894 and 26 specimens, respectively, in the later census. Poaching was recognised as being a major contributory factor in this decline.

With funds made available following the auction of ivory impounded in Europe in the 1980s, in mid-March 1997 the Wildlife Division - Anti Poaching Unit launched an operation to curb poaching and illegal trade of wildlife products in Selous/Mikumi, Ruaha/Rungwa and Ugalla/Moyowosi. The exercise - Operation NTA - was initially intended to take place over a 10-month period, but ran out of funds after eight months. However, during that period, some 255 poachers were arrested and prosecuted. Of these, eight were found with 53 elephant tusks, while 37 were in the unlawful possession of firearms. The exercise also established long-term strategies for similar operations in the future.

TRAFFIC East/Southern Africa

CITES Listings for Mahogany

Bolivia and Brazil have requested that their populations of Big-leafed Mahogany *Swietenia macrophylla* be listed in CITES Appendix III. The inclusion of the Bolivian population entered into force on 19 March, and that of Brazil will take effect on 26 July 1998. The controls are limited to the populations of the species in the Americas and to logs, sawn wood and veneer sheets. This species is already included in Appendix III at the request of Costa Rica.

A Mahogany Working Group will be held in Brasilia, Brazil, from 3 to 5 June 1998. This follows a proposal put forward by the Brazilian delegation at the tenth meeting of the Conference of the Parties to examine the conservation, exploitation, policies, management, and dimensions of international co-operation and trade, with a view to identifying further information and actions necessary to promote sustainable levels of production and commerce.

CITES Secretariat Notification to the Parties No. 1998/15, 27 April 1998; Institute of Environment and Natural Renewable Resources, Brazil

Handover Sees Little Change for Wildlife

Hong Kong reunited with the People's Republic of China as a Special Administrative Region on 1 July 1997. The end of British rule there saw the introduction of Hong Kong's new *Basic Law*. Apart from its effect on foreign affairs, this law means that Hong Kong will mostly maintain its *status quo* for another fifty years under the policy of 'One Country, Two Systems'. Excepting those which contravene the *Basic Law*, all laws previously in place will remain in force. The law that Hong Kong used to regulate wildlife trade and implement CITES - the *Animals and Plants (Protection of Endangered Species) Ordinance* - will continue to govern wildlife trade controls within Hong Kong, across its international borders, and across the border with mainland China, which did not become an open border after the handover. The Agriculture and Fisheries Department will remain the Hong Kong CITES Management Authority, while the Endangered Species of Wild Fauna and Flora Import and Export Administrative Office continues as China's CITES Management Authority.

With effect from 20 March 1998, the importation and export of CITES Appendix III live specimens and manufactured products of CITES Appendix II and III species for commercial purposes, is now subject to control in Hong Kong with the amendment of *Animals and Plants (Protection of Endangered Species) Ordinance, Cap. 187.*

TRAFFIC East Asia; Agriculture & Fisheries Department, Hong Kong Circular 7, February 1998

Nepal Destroys Wildlife Stocks

On 22 March 1998, animal skins and other parts seized from poachers and accumulated in Nepal over a period of seven years were destroyed by fire on the orders of the Nepalese Government. The growing stock which had been stored at Royal Chitwan National Park was said to pose a security risk and efforts by the Department of National Parks and Wildlife Conservation to maintain vigilance was costly. The stock destroyed included, among other items, 187 Leopard *Panthera pardus* skins, 874 rhino hides, 1363 rhino hooves, 144 kg Tiger *Panthera tigris* bones and 33 kg of Tibetan Antelope *Pantholops hodgsonii* wool. Some pieces were preserved, however, for museums and for the purposes of conservation education.

Wildlife Nepal Newsletter 10(13-14) of the Department of National Parks & Wildlife Conservation, Nepal; WWF Nepal Programme; TRAFFIC India

SYMPOSIA

The First International Symposium on the Conservation of Medicinal Plants in Trade in Europe

22-23 June 1998
Royal Botanic Gardens, Kew, UK

Hosts: TRAFFIC Europe; WWF
IUCN/SSC Medicinal Plant Specialist Group and Royal Botanic Gardens, Kew

Further details from TRAFFIC Europe

Presentations by representatives of conservation organizations, governments, the pharmaceutical industry, as well as the medicinal plant industry, traders and cultivators, will focus on five main themes: a European overview of the conservation and trade in wild medicinal plants; from collectors to users; management regimes and appropriate legislative tools; and, options for achieving workable solutions, the aim being to establish long-term conservation strategies for wild medicinal plant species in trade in Europe. The findings of surveys by TRAFFIC Europe, WWF-UK, and the German CITES Scientific Authority will be presented, together with papers on, for example, the changes in the market for medicinal plants since the fall of Communism in Hungary, trade in African Stinkwood *Prunus africana*, cultivation of Arnica *Arnica montana* and sustainable harvesting of the Himalayan Yew *Taxus wallichiana*.

K. Lochen/TRAFFIC

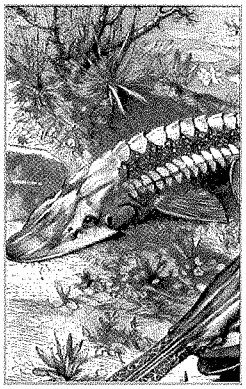
Symposium on the Harvest, Trade and Conservation of North American Paddlefish and Sturgeon

7-8 May 1998
Chattanooga, Tennessee, USA

Hosts: TRAFFIC North America, Southeast Aquatic Research Institute Tennessee Aquarium

Further details from TRAFFIC North America

North America, and the USA in particular, is a significant importer of caviar, principally from Russia, as well as a significant producer of caviar from wild and farm-raised sturgeon and paddlefish. This symposium aimed to increase communication to help ensure the long-term sustainability of American sturgeons and paddlefish, and provided a timely opportunity for discussion of enforcement of the listing of all Acipenseriformes in CITES Appendix II, which became effective on 1 April 1998. The Symposium was attended by State and federal fisheries and trade experts, non-governmental organization representatives, importers/exporters, fisheries industry representatives and members of the academic community.



Wood, 1863

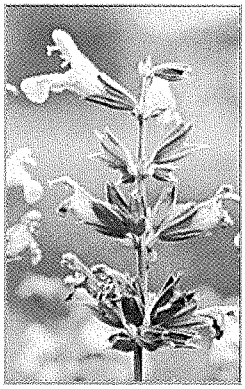
Medicinal Plants for Survival: International Conference on Medicinal Plants

16-19 February 1998
Bangalore, India

Organizers: The Foundation for the Revitalization of Local Health Traditions (FRLHT); International Development and Research Centre; IUCN/SSC Medicinal Plant Specialist Group

Further details from FRLHT

Presentations at this meeting were grouped into sessions on conservation; intellectual property rights and cross-cultural transactions; trade and enterprise; and traditional systems of medicine and medicinal plants, with workshops allowing participants to explore specific aspects of these issues in more depth. The Conference, attended by over 400 participants from around the world, concluded with a commitment to establish a global electronic network on medicinal plants, to be based at the Foundation for the Revitalization of Local Health Traditions in Bangalore, and interest on the part of the organizers to prepare an action plan to more effectively address issues of concern raised during the Conference.



K. Lochen/TRAFFIC

The First International Symposium on Endangered Species Used in Traditional East Asian Medicine: Substitutes for Tiger Bone and Musk

Organizers: TRAFFIC East Asia; Chinese Medicinal Material Research Centre of The Chinese University of Hong Kong

7-8 December 1997
Hong Kong

Further details from TRAFFIC East Asia

The forum focused on the latest research into substitutes for Tiger bone and musk in traditional East Asian medicines. These derivatives were chosen because of the highly endangered status of the Tiger and the vulnerable position of Musk Deer. The findings of laboratory research and clinical trials were presented, and the social, economic and environmental factors important in gaining acceptance for any substitutes that prove viable, were discussed. The bone of a mole rat *Mysospalax baileyi* is one of the most promising potential replacements of Tiger bone at this time, while Muskrat *Ondatra zibethicus* and two civet species *Viverra zibetha* and *Viverricula indica* are the main musk substitutes currently under consideration. The conservation implications of harvesting large numbers for medicinal use have yet to be fully explored, however.

C. Allan/TRAFFIC

PUBLICATIONS

The results of surveys which investigated the availability in the USA and Canada of traditional Chinese medicines (TCM) containing endangered species, has been published by TRAFFIC North America. ***While Supplies Last: The Sale of Tiger and Other Endangered Species Medicines in North America, 1996-1997***, focuses on investigations in seven cities (four in the USA and three in Canada) where medicines were found on sale listing ingredients of three endangered species - Tiger, rhino and Leopard (in which trade is illegal), and two – bear and musk deer (for which trade is regulated). It is hoped that the results of the report will motivate the US and Canadian governments to implement national strategies to stop this trade and improve national laws to address the issue of products claiming to contain endangered species. The report is available from TRAFFIC North America (address back page).

The study formed one part of a two-part project documenting the market and demand for endangered species products in North America. The findings of a survey into the attitudes of ethnic Chinese-Americans on their use of TCM in general, and of TCM products with endangered species specifically, will be published later in the year.

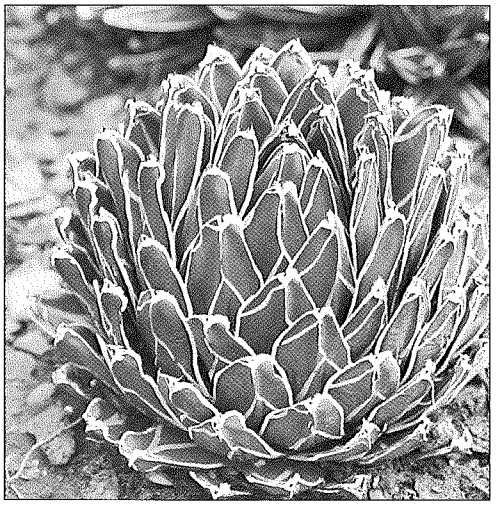
Wild-collection plays a vital role in the trade in medicinal and aromatic plants in Europe - in particular in Albania, Turkey, Hungary and Spain - as, in general, prices for such material are much lower than for material of cultivated origin. Collectors are, in the main, rural people, often women and children, for whom it is an additional income. ***Europe's Medicinal and Aromatic Plants: their Use, Trade and Conservation***, the latest publication in the TRAFFIC *Species in Danger* series, looks at plants that are used medicinally, or in other products such as cosmetics, domestic cleaning products, insecticides, in liqueurs and bitters, as well as those used as herbal teas and spices. The findings are based primarily on surveys carried out in the period 1994 to 1997, during which time an annual average of 120 000 t of plant material from up to 2000 taxa was imported by European countries.

The report identifies a number of plants that are considered to be threatened by collection and provides a detailed description, where possible, of their biology, ecology, trade and conservation status. Examples include: Pheasant's Eye *Adonis vernalis*, Liquorice *Glycyrrhiza glabra*, gypsophila *Ankyropetalum gypsophiloides,* Iceland Moss *Cetraria islandica* and Yellow Gentian *Gentian lutea.*

Details of availability from TRAFFIC International.

Some 34 000, or 12.5% of the world's known vascular plant species, are considered threatened according to the ***1997 IUCN Red List of Threatened Plants*** which was published on 8 April 1998. In addition to their use for food and timber, much of the world's pharmaceutical industry is based on the conifers, ferns, cycads and flowering plants that make up this group of plants. For instance, 75% of species of the yew family Taxaceae, a source of important anti-cancer compounds, are threatened, as are 12% of species in the willow family Salicaceae, from which aspirin is derived. Numerous other species whose value has not yet been studied are also at risk. With the loss of each species, access to genetic material that may have contributed to producing hardier, healthier crops for human and animal consumption are lost.

Compiled by the World Conservation Monitoring Centre (WCMC), this publication represents the pooled research and resources of many of the world's leading botanical and conservation organizations and is the most comprehensive compilation of data on threatened vascular plants ever published.



K. Lochen/TRAFFIC

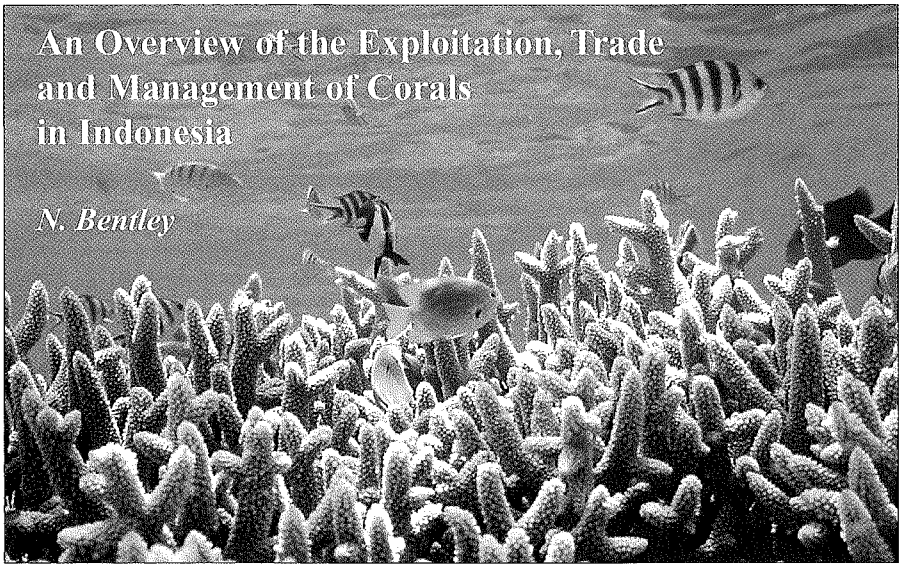
Agave victorae-reginae of Mexico is listed in the *IUCN Red List of Threatened Plants* as Endangered, a category indicating a species to be in danger of extinction.

Published by IUCN-The World Conservation Union, in association with other leading botanical institutions worldwide, the list can be obtained from IUCN Publications Services Unit, 219c Huntingdon Road, Cambridge CB3 0DL, UK. It is also available over the Internet at http://www.wcmc.org.uk.

IUCN Species Survival Commission

An Overview of the Exploitation, Trade and Management of Corals in Indonesia

N. Bentley



E. Green

Coral extraction is one of several factors threatening to undermine the viability of coral reefs in Indonesia. In recent years, this country has become the world's primary supplier of ornamental corals; in 1990 alone, it exported in the vicinity of one million pieces. The USA and Japan accounted for 85% of this trade between 1985 and 1995, mainly of live and dead specimens for the aquarium market. Use of coral in construction has a long tradition in Indonesia. Small-scale collection for use as building blocks is widespread but its effects are not well known. In contrast, large-scale mining of corals for lime production occurs at only a few locations but has resulted in clearly observable impacts on reefs. Although several laws regulate the mining of corals in Indonesia, it is apparent that these are not well enforced. Corals are also sought for making jewellery and anecdotal reports suggest that in many parts of Indonesia the slow-growing, long lived species that are in demand for such items are increasingly rare.

Although sedimentation and destructive fishing methods may pose more risk to Indonesian coral reef ecosystems as a whole, the commercial extraction of corals cannot be overlooked. Proper assessment, monitoring and enforcement of protective measures are necessary to ensure prevention of over-exploitation.

Introduction

Coral reefs are one of Indonesia's most important natural resources. Spanning an area of between 50 000 km^2 to 100 000 km^2, they are one of the most extensive of any country in the world. Coral reef ecosystems provide a source of food and income to thousands of coastal communities, in addition to offering coastal protection and revenue from tourism. Unfortunately, several factors threaten the viability of coral reefs in Indonesia. One of these is the extraction of the hard corals that form the backbone of the reef.

The group commonly known as hard corals consists of animal polyps that secrete external skeletons of calcium carbonate as they grow. These corals comprise a large number of morphologically diverse families. Some species, like the mushroom corals, consist of a single polyp, whereas others have colonies made up of thousands of small polyps. This study focuses on hard corals in the Orders Coenothecalia (blue coral), Milleporina (fire corals), Scleractinia (stony corals), Stylasterina (lace corals) and Stolonifera (organ pipe corals); also considered is the exploitation of semi-precious Antipatharia (black coral) species, which are easily distinguishable from hard corals, having a flexible, internal skeleton made of a horny, non-calcareous material. All these species are listed in CITES Appendix II and include all the coral species known to be harvested in Indonesia. There is no evidence that the large group commonly known as soft corals (subclass Alcyonaria) are exploited in significant quantities in Indonesia and this group is not considered further here.

In Indonesia, hard corals are collected for a wide variety of purposes, ranging from hotel construction to traditional medicine. However, three main types of exploitation have been identified: collection for aquarium and ornamental specimens, for construction purposes and for use in jewellery. This report examines the collection and trade associated with each of the three uses of corals, providing an overview of harvest locations, preferred species and dynamics of the trade, as well as the relative impacts on corals and coral reefs. TRAFFIC Southeast Asia is to produce a report which will focus in more depth on the trade in aquarium and ornamental coral pieces.

Methods

Research on the exploitation and trade of corals in Indonesia was carried out between June and October 1997. Information was obtained during interviews with coral collectors and traders, researchers and non-governmental organizations. In addition, two data sources were used to assess the extent and dynamics of Indonesia's international trade in corals: the *CITES Trade Database* and Indonesia's reports of *International Trade of Fisheries Commodities*. The *CITES Trade Database* contains trade records that Parties to the Convention are obliged to compile annually. The database is managed by the World Conservation Monitoring Centre, Cambridge, UK, on behalf of the CITES Secretariat (WCMC, 1996). Records pertaining to the

trade in corals from Indonesia were extracted for the period 1985 to 1995 and are referred to in this report as the CITES annual report data. Indonesian export records for 1995 had not been included in the *CITES Trade Database* at the time data for this report were analysed (March 1998).

The reports of *International Trade of Fisheries Commodities*, published annually by Indonesia's Directorate General of Fisheries, contain data from the Central Bureau of Statistics on the trade in fisheries commodities, including the category "Coral and similar substances". These are available for the years 1989 to 1995 and are referred to herein as DGF data.

During the latter part of 1997, the value of the Indonesian rupiah fluctuated significantly. The exchange rate used in this article is US$1 = Rp3000, the approximate exchange rate at the time of this research.

Coral Exploitation and its Uses

Aquarium and Ornamental Pieces

Nature of Use

Recent advances in technology have allowed hobbyists to keep corals alive in home aquaria. This has resulted in an increase in demand for live coral specimens, particularly for species with large colourful polyps such as *Catalaphyllia* and *Trachyphyllia* (O'Brien Shoup and Gaski, 1995). The largest market for these corals is the USA (see *International Trade*) where large pieces fetch up to US$200. Other species are prized for their ornate skeletons and dead specimens are popular as ornaments, both for aquaria and other purposes.

In addition to coral pieces, there is a significant trade in 'live rock'. This is usually fragments of dead coral which are naturally encrusted in live corraline algae (*Lithothamnion* spp. and *Neogoniolithon* spp.) and other marine organisms. Varieties of live rock advertised recently by aquaria suppliers in the USA have names which reflect their Indonesian origin – "Premium Red Algae Jakarta Rock" and "Fancy Bali Red Live Rock", for example.

Background

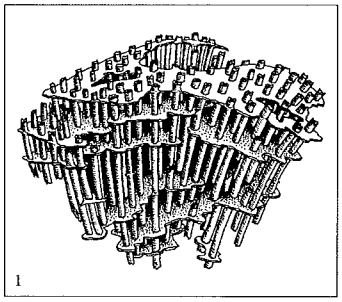
Prior to the early 1980s, the Philippines was the world's major supplier of ornamental corals to international markets. However, Presidential decrees in 1977 and 1980, which banned coral exports, resulted in a dramatic reduction of trade from that country. By the late 1980s only about half of the trade originated from the Philippines (Mulliken and Nash, 1993) and by 1993 fewer than 500 pieces of coral were reported as exported from that country each year (O'Brien Shoup and Gaski, 1995; Mulliken and Nash, 1993). Concurrent with the reduction in trade from the Philippines, exports from Indonesia rose and by the early 1990s that country was supplying as much as 95% of the corals reported in international trade (O'Brien Shoup and Gaski, 1995).

In response to concerns of over-exploitation, all 150 species of black coral (Order Antipatharia) were listed in CITES Appendix II in 1981 followed, in 1985, by the 17 coral genera most commonly exported from the Philippines (O'Brien Shoup and Gaski, 1995). However, problems with enforcement were encountered owing to difficulties in distinguishing these latter 17 genera from other hard corals. Therefore, in 1989, all members of the Orders Scleractinia and Coenothecalia and the Family Tubiporidae (of the Order Stolonifera) were included in Appendix II. Currently, there are five hard coral Orders listed, which include over 250 genera (O'Brien Shoup and Gaski, 1995).

Collection and Domestic Trade

Although Indonesia has extensive areas of coral reef, the collection of aquarium and ornamental pieces appears to be confined mostly to locations relatively close to Bali and Jakarta. These areas have the advantage of being close to transportation centres: both Jakarta and Bali are served by international airports, which offer the primary means of export for coral pieces.

Collection is carried out by local fishers diving from boats using 'hookah' – diving apparatus that uses air supplied through a line from a surface compressor - or by free diving using only a mask. Fishers may cover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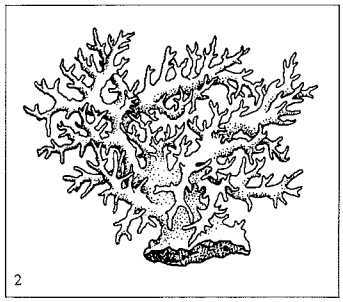
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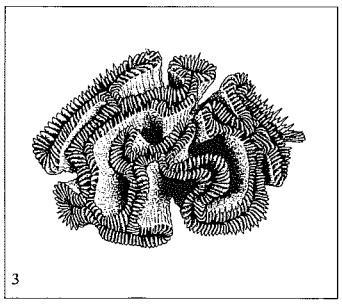
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The ornate skeletons of *Tubipora* [1] and *Pocillopora* [2] species are popular as ornaments; those of *Euphyllia* [3], prized for their large, colourful polyps, are in demand as live aquaria specimens. Drawings by Geoffrey Kelly, *CITES Identification Manual* Volume 4.

large areas of reef in their search for desired species, often using a basket to hold the coral. Some species that are sought occur on reef flats and can be collected on foot at low tide.

Collectors often sell their catch to village-based dealers who, in turn, sell to exporting companies. For example, on a small island off Ujung Pandang there are four dealers, each with onshore tanks or small, submersed offshore cages for keeping corals alive. Each operator sends about two shipments per week to Ujung Pandang, receiving between Rp300 (US$0.10) and Rp3000 (US$1) per specimen depending on the species. One operator interviewed had about 500 pieces of live coral awaiting shipment.

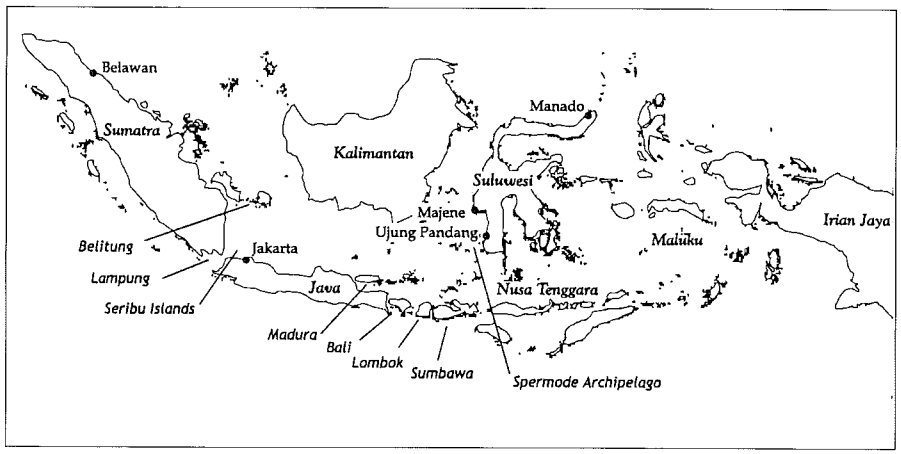


Figure 1. Map of Indonesia. *Shading indicates areas of coral reef. Source: ReefBase, 1997*

Coral exporting companies based in Jakarta mostly buy corals from collectors operating in the Seribu Islands, Belitung Island and the Lampung area. In the main, those based in Bali obtain corals from around Madura, Lombok and Sumbawa islands. Although some coral collection may occur in more remote areas of the country, no evidence of this has been found and it is probably minor compared to the areas described.

Although there is a growing domestic demand for aquarium and ornamental pieces in the more affluent centres of Jakarta and Bali, this trade is minor compared to the quantity exported.

Reporting on the International Coral Trade

CITES annual report data

CITES annual reports record the country of origin, export/re-export and importing country, quantity, units (e.g. kilogrammes or pieces), description (e.g. live, raw, carvings), purpose (e.g. commercial trade, personal) and source (e.g. wild, bred in captivity). The reports provide a useful tool for assessing trade volumes. However, owing to a number of factors, accurate assessment of trade volumes is hindered. For example, different units may be used to describe the same coral shipments (e.g. pieces or kilogrammes); because some countries, including Indonesia, report on the basis of the number of specimens included on all permits issued rather than on the actual number of items traded; export permits may be issued in one year but not used until the next, with the result that the trade is reported in separate years by the exporting and importing country; or, trade is reported at a different taxonomic level. The situation is complicated even further in the case of Indonesia's annual reports, which contain numerous records of new permits issued to be used in lieu of permits, or parts of permits issued previously, all of which are included in the CITES annual report data compiled by WCMC (J. Caldwell pers. comm. to T. Mulliken, April 1998). As a result many shipments may be recorded more than once.

Virtually all coral reported as exported from Indonesia was reported as originating in that country. The vast majority of reported trade is recorded in terms of number of pieces, with very little recorded by weight: only 545 t of coral were reported as imported from Indonesia and 115 t were recorded as exported by Indonesia during 1985 to 1994, which is estimated to be less than 10% of the volume traded during this period. Of these, 76 t were recorded as "grapel" (presumably gravel) and 36 t as "coral sands" in 1993. In addition, Indonesia's annual reports showed the export in that year of 1100 bags of "coral sand". These records have been excluded from the following summaries of CITES data. Based on an analysis of US import data for the 1980s, the average weight of a "piece" of coral has been estimated at just under one kilogramme (Anon., 1989). This conversion factor has been used to convert all raw coral "pieces" reported in trade by weight to numbers of "pieces".

Indonesia's CITES annual reports for the period studied do not record the source of specimens in trade or the purpose of transactions. This information was reported by many importing countries, however, as is shown below. Indonesia began providing this information in 1996 (J. Caldwell pers. comm. to T. Mulliken, April 1998).

DGF data

The DGF data category relevant to coral is "Coral and similar substances" (Code 050800100). While this classification suggests that other reef animals could be included, separate categories exist for the other main commercial taxa in trade, namely, 'mother of pearl shell', 'trochus' and 'other shells and sponges'. Therefore, if other reef animals are included, the weight is likely to be small. The data summarize export weight (kg) and value (US$) by month, by destination and by port of export.

Analysis of CITES trade

A comparison of CITES import and export data reveals that Indonesia generally reports a higher quantity of exports than is recorded by importing countries. This is not surprising, however, given the characteristics of Indonesia's CITES annual report data noted above, e.g. that trade records show all specimens on permits issued. From 1985 to 1994, CITES annual report data for Indonesia show the export of a total of 8.5 million pieces, whereas reported imports totalled 5.1 million. The discrepancy is most marked during 1993, when the difference between recorded exports and imports was approximately 1.6 million pieces. Indonesia's CITES annual report records nearly 2.7 million pieces exported by Indonesia during 1993. But, a summary provided in the annual report indicates that approximately 1.7 million pieces were exported during 1993 (Anon., 1993). This latter figure may more closely reflect the actual trade as it is likely to exclude cancelled permits. In other years, Indonesia's reported exports are either higher or are very close to reported imports (Figure 1). Only four minor importing countries - Australia, Belgium, Spain, and the Republic of Korea - reported imports greater than reported exports. In all these cases the discrepancy in reported trade was fewer than 15 000 pieces in any one year.

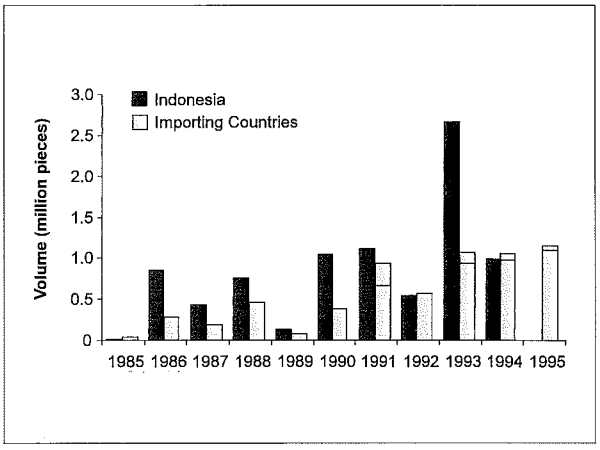


Figure 1. Comparison of the number of coral pieces recorded as exported from Indonesia, by Indonesia and importing countries, 1985-1995. *Source: CITES Trade Database*

CITES gross trade by country

CITES gross trade quantities have been estimated for this study by comparing annual import records for each importing country, with corresponding export records from Indonesia. According to these estimates, the USA and Japan accounted for 85% of the reported imports of corals from Indonesia between 1985 and 1995 (Table 1). Apart from a peak in 1993, exports to the USA have fluctuated at around 700 000 pieces annually, and show no obvious trend. Exports to Japan and Europe, while still minor compared to the USA, have increased significantly since 1990 (Figure 2).

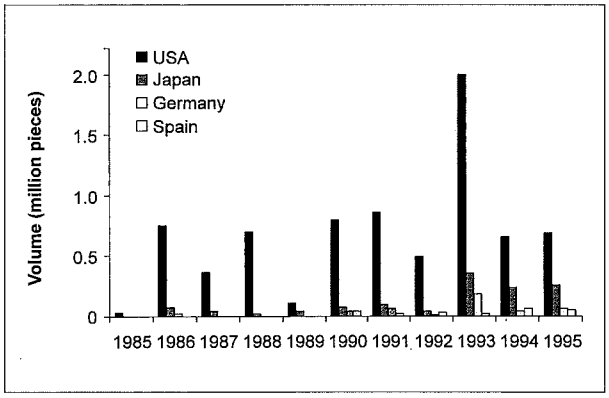


Figure 2. Reported imports of Indonesian corals for the top importing countries, 1985-1995.
Source: CITES Trade Database

CITES trade by term, purpose and source

As noted above, Indonesian CITES data did not specify a purpose or source for exports during the period studied. Furthermore, they do not discriminate between live and dead coral pieces. Trade data from importing countries show that trade is commercial in nature and involves wild-caught specimens, and that "Live" corals represent close to half the trade (Table 2). An indication of live coral trade is provided in Indonesia's 1993 annual report which gives "live rock" as the common name for numerous shipments of *Acropora* spp. Analysis of CITES annual report data provided by countries importing from Indonesia (Table 3) shows trends in the relative proportions of various genera of coral in trade.

Figure 3. The proportion of coral reported by the USA as imported from Indonesia, by description, 1985-1995.
Source: CITES Trade Database

Importer	Pieces	Importer	Pieces
USA	676 531	Canada	5 730
Japan	114 219	Singapore	2 809
Germany (F.R.)	38 986	Austria	1 821
Spain	21 493	Hong Kong	1 671
Italy	20 540	Malaysia	1 258
France	17 275	New Zealand	1051
Netherlands	11 030	Korea (Rep. of)	978
UK	10 253	Other countries	3 802

Table 1. Average annual CITES trade in Indonesian corals for the top 15 importing countries, 1985-1995.
Source: CITES Trade Database

There has been a gradual increase in the proportion of live corals imported by the USA (Figure 3). "Raw coral" made up 83% of imports by Japan, the remainder being "carvings", and 97% of coral imports by Germany were of "raw" material.

CITES by species

The taxonomic description of coral in trade is similar between importing countries and Indonesia, which identified 127 and 131 different taxa respectively. Ranks of taxon abundance are also similar between import and export records. However, as Indonesia's trade data do not generally distinguish between live and dead coral, import records must be consulted to assess the relative volumes of different genera traded as live and dead specimens.

	Importing Countries
Purpose	
Commercial trade	97.17
Unspecified	2.74
Scientific	0.05
Circuses and travelling exhibitions	0.03
Zoos	0.01
Personal	<0.01
Source	
Wild	44.87
Unknown	34.83
Unspecified	19.31
Confiscated/seized	0.73
Pre-CITES	0.26
Captive-bred	0.02
Description	
Raw corals	54.53
Live	42.69
Carvings	2.61
Unspecified	0.08
Bodies	0.08
Shells	0.01
Scientific specimens	<0.01

Table 2. The percentage of coral exports by purpose, source and term, as reported by importing countries.
Source: CITES Trade Database

As would be expected, raw coral exports, in demand for ornamental purposes, are dominated by genera with ornate skeletal structures including *Pocillopora* spp., *Acropora* spp. and *Fungia* spp. In addition, unusual species such as the blue coral *Heliopora* spp., and the colourful organ pipe coral *Tubipora* spp., are among the most commonly exported raw corals.

Live coral exports are largely composed of corals that are popular for keeping live in aquaria. Specimens of *Euphyllia, Gonopora, Catalaphyllia, Plerogyra, Trachyphyllia* and *Heliofungia*, which have large live polyps, often with spectacular lobes, are particularly common.

Raw	Pieces	%	Live	Pieces	%
Pocillopora	561 654	16.6	*Euphyllia*	274 720	10.3
Acropora	428 256	12.6	*Goniopora*	199 407	7.5
Heliopora	297 917	8.8	*Catalaphyllia*	163 186	6.1
Fungia	242 889	7.2	*Trachyphyllia*	113 200	4.3
Tubipora	134 562	4.0	*Plerogyra*	112 667	4.2
Porites	124 782	3.7	*Heliofungia*	79 069	3..0
Seriatopora	91 204	2.7	*Acropora*	77 079	2.9
Stylophora	61 129	1.8	*Porites*	62 014	2.3
Euphyllia	55 029	1.6	*Pocillipora*	51 989	2.0
Other genera	407 616	12.0	Other genera	356 754	13.4
Unidentified *Scleractinia*	986 695	29.1	Unidentified *Scleractinia*	1 165 491	43.9

Table 3. Number of pieces and percentage of "Raw" and "Live" coral imports reported as imported from Indonesia, by genera, 1985-1995.
Source: CITES Trade Database

DGF data

Since DGF data are recorded in kilogrammes it is difficult to compare these with CITES trade data. In most years total export quantities recorded by the DGF data are below 200 t. However, in 1992 a total of 1200 t were exported, of which over 1000 t were exported to Japan (Table 4). Over 95% of coral exports reported by DGF were sent to Japan, USA and Taiwan. There is no consistent trend in DGF exports to any of these countries, either in weight or value, or in the relationship between these.

According to the DGF data the major export points were the seaports of Belawan, north Sumatra; Tanjung Priok, Jakarta; Tanjung Emas, central Java and Tanjung Perak, east Java. Smaller amounts of coral were reported as being exported from Ngurai Airport, Bali

Year	DGF exports (kg)	Year	DGF exports (kg)
1989	104 160	1993	135 818
1990	76 240	1994	155.098
1991	199 691	1995	73.569
1992	1 199 919		

Table 4. DGF exports from Indonesia, 1985-1995. *Source: CITES Trade Database and Directorate General of Fisheries, Indonesia.*

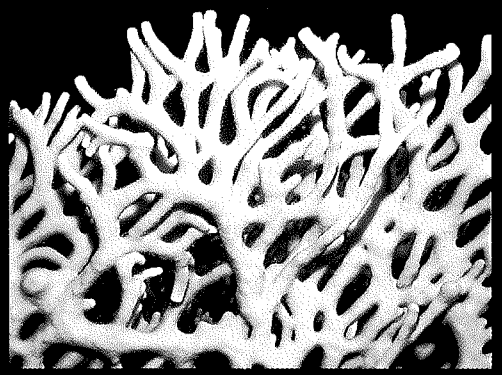
and Hassanudin Airport, Ujung Pandang. The preponderance of seaports in the DGF data set suggests that it mostly records dead coral exports as live coral would be unlikely to survive long ocean journeys. It also suggests that the DGF data underreport coral exports because the significant quantities that are known to leave from airports are not recorded. Export quotas are set by the Indonesian authorities for "shingles from corals and similar substances" (see **MANAGEMENT/ REGULATIONS**). This quota is set in terms of kilogrammes and the DGF data may be recording only this commodity under the classification "coral and similar substances".

Construction Material

Throughout coastal Indonesia, corals are used for construction, either crushed and fired to produce lime (an important constituent of cement), or as pieces for use as building blocks for walls and foundations. Their use in construction is reported from Java, Kalimantan, Bali, Lombok, Sulawesi, and Maluku (Polunin, 1983; Cesar, 1996) and consists mainly of genera with dense calcium carbonate skeletons such as *Platygyra*, *Porites* and *Favia* (Table 5).

Box 1. Predicting conversion rates: the chemistry of making lime from corals

Coral skeletons consist mainly of calcium carbonate which, in the presence of heat, decomposes to produce calcium oxide (lime) and carbon dioxide $CaCO3 > CaO + CO2$. Using this equation and the atomic weights of the elements it contains, the conversion ratio between corals and lime can be estimated. For every 100 kg of calcium carbonate that is burned, 56 kg of lime and 44 kg of carbon dioxide are produced. In other words, every kilogramme of lime that is produced requires at least 1.8 kg of coral.



E. Green

Since the 1800s, coral limestone - the skeleton of dead corals - has been mined from Jakarta Bay for use in the construction of jetties. Annual coral extraction from the Jakarta area in the late 1920s and early 30s has been estimated at between 10 000 m^3 and 25 000 m^3 (Polunin, 1983). In 1970, the mining of coral, sand and stone in the seas off Jakarta was banned (Lang, 1992). However, some of these activities have continued. Six small islands in the Thousand Islands Archipelago have recently disappeared, reportedly owing to sand mining for the construction of the Soekarno-Hatta International Airport and land reclamation in north Jakarta (Anon., 1997a). There are also reports of coral limestone being used for the construction of a new airport runway in Lombok.

Genus	%
Platygyra	26
Porites	25
Favia	20
Acropora	15
Favites	10
Pocillopora	4

Table 5. Taxonomic composition of corals collected for lime production at a location in Bali.
Source: Sarjana Putra, 1992

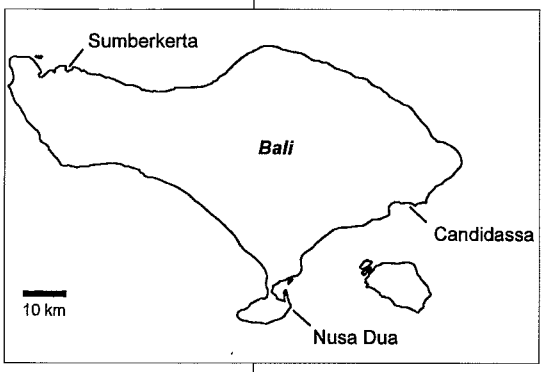
Corals are also used for small-scale construction throughout coastal Indonesia. For example on an island off Ujung Pandang, south Sulawesi, coral heads are used for small breakwalls as protection against shifting sands close to houses. At Majene, south Sulawesi, coral rocks are used to line shrimp ponds.

Reports of coral burning for the production of lime date to 1854 (Polunin, 1983). Corals are collected in shallow water, broken into smaller pieces and then burned in a kiln or open fire until only lime remains. A relatively low conversion ratio of about 1.8:1, corals to lime by weight, is obtained after burning the coral skeletons (Box 1). Although the practice of small-scale coral burning appears to be widespread in Indonesia, it is perhaps best known from Lombok island, and in Bali where the damage caused by these practices has led to significant and expensive erosion problems (Box 2). At one mined site on Bali, coral cover is now less than 5%, with a virtual absence of the species that were preferred for lime production. Subsequent monitoring has shown very little recovery of mined sites throughout Bali (Sarjana Putra, 1992). Coral mining in Bali has now largely ended.

In Lombok, coral mining for lime production still occurs at Teluk Dalam (Box 3) and to a lesser extent at Pelangan on the southwestern peninsula. Although there are no definitive estimates of the total lime production from corals in Indonesia, the operations at Teluk Dalam are probably the largest in the country. The cost of explosives is probably too great to warrant its use for the production of lime and there are no reports of large-scale coral mining in Indonesia using large ships or dredges.

Jewellery

Of the 200 species of black coral, about ten, mostly of the genus *Antipathes*, are commercially exploited for use in jewellery (Grigg, 1984; Fitzgerald, 1989). A large number occur in Indonesia and have been collected since at least the eighteenth century (Yogev, 1978). Almost all occur at depths accessible by diving and are generally collected by small-scale fishers using compressors. In the Spermonde Archipelago the delicate black skeletons are cut into one-metre lengths and sold for Rp5000/kg (US$1.67) (Erdmann, 1995). Souvenir and jewellery shops in nearby Ujung Pandang sell black coral bracelets for between Rp4000 and Rp7000 (US$1.33 and US$2.33) each. Here, half metre lengths of dried black coral sell for Rp50 000 to Rp70 000 (US$16 to US$23) each, although they are only long enough to make four or five bracelets. The price discrepancy is caused by the presence or absence of the organism's holdfast – a structure that attaches the coral to the substrate - which is used in this region as a medicine for treating sore joints and infertility. Collection of black coral appears to be getting rarer and anecdotal reports throughout Indonesia suggest that it is now hard to find.



Management/Regulations

Export of aquarium and ornamental coral, and jewellery

The Directorate General of Forest Protection and Nature Conservation (PHPA) in the Ministry of Forestry is the authority responsible for issuing CITES permits. Based on advice from the National Institute of Sciences (LIPI), it sets export quotas for various taxa in the trade. These quotas are assigned to the Indonesian Coral Shell and Fish Association (AKKII) whose members are the only people in Indonesia permitted to export corals. It is not known how or if the quotas are divided among member companies of AKKII.

It is not clear to what extent export quotas have been enforced: AKKII claim to be within their quotas, but there are reports that non-member companies based in Ujung Pandang and Menado are exporting corals without permits. In 1995, total quota levels were set at 1 075 000 pieces (O'Brien Shoup and Gaski, 1995). Gross trade reported by importing countries in the same year totalled 1 154 979 pieces, 7% over the quota level. Quotas for 1997 were set at 765 000 pieces of "live stony corals" (broken into 39 categories), 90 000 pieces of "base rock" (assumed to mean pieces of dead coral skeleton encrusted with algae, sponges and other invertebrates), and 45 000 kg of "shingles from corals and similar substances" (assumed to mean pieces of broken coral suitable for use as aquarium substrate gravel) (Anon., 1997b). Indonesia's trade records for this year are not yet available.

Box 2. Using corals for hotel construction in Bali: costly consequences

During the late 1970s, the rapid tourist boom in Bali brought with it the construction of new hotels along the coast. A cost-effective way of producing lime for cement was to mine corals on the reefs adjacent to the hotel sites. By the 1980s there were more than 400 coral burning kilns on the eastern and southern coasts of the island. Most were concentrated in Candidassa (125 kilns) and Nusa Dua (134 kilns). Corals were manually removed from shallow reefs to depths of up to two metres, and broken into pieces ready for firing in kilns (Sarjana Putra, 1992).

The volume of coral mined from the south coast of Bali has been estimated at up to 150 000 m^3. The resulting erosion of the beachfront has been significant and millions of dollars have subsequently been spent on protective measures, such as seawalls and breakwaters: some hotels are reported to be spending over US$100 000 each year (Cesar, 1996). Today at Candidassa, the beach has virtually disappeared and waves crash at the base of hotel retaining walls.

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In 1985, the Balinese government outlawed coral mining. Initially, the response to this regulation was slow, but by 1990 mining had stopped in most areas. The exception is Sumberkerta, a small town on the north coast, where small amounts of dead coral are still used for lime production. This reduction in mining can partly be attributed to the end in the hotel building boom, and a general increase in the standard of living that gave miners alternative job opportunities.

Coral mining

Coral mining falls under the jurisdiction of the regional government (Lang, 1992). In 1970, *Decree No. 15/12/43/70* banned the mining of coral, sand and stone in the seas off Jakarta (Lang, 1992), and in 1985 Bali outlawed coral mining (*Law PP No. 10/1983*).

Several national regulations also pertain to coral mining. The *Wildlife Protection Ordinance of 1931* restricted the exploitation of live corals and required permits for collection. *The Conservation of Living Resources and their Ecosystems Law No. 5, 1990* has repealed this law although the management of coral exploitation is covered by this legislation. Despite their applicability to coral mining, however, neither of these laws has been well-enforced (Lang, 1992; O'Brien Shoup and Gaski, 1995). Furthermore, national *Government Assessment/Analysis of Environmental Impacts Regulation No. 29, 1986* does not appear to have been applied to coral mining which, as an activity which exploits natural resources, should be covered by this regulation (Lang, 1992).

Despite the problems caused by coral mining, members of LIPI and the Department of Trade, meeting in 1984, recognized that corals represent an important construction material for small island communities (Sarjana Putra, pers. comm., July 1997). Owing to the expense of purchasing alternative construction materials, it was decided to allow the collection of dead corals only. It is not clear whether a law has been passed based upon these recommendations. However, such a law would be hard to enforce as identifying live from dead coral can be difficult, particularly when specimens have been split and dried for lime production.

Domestic trade in ornamental corals

There are no known restrictions on the collection or domestic sale of precious corals in Indonesia, including ornamental and aquarium pieces.

Conclusions and Discussion

Although coral exploitation in Indonesia is widespread, it is also varied. Different types of exploitation target quite different species and operate over different spatial scales. This makes a comparison of their overall impact on coral reefs difficult. However, some general conclusions can be drawn.

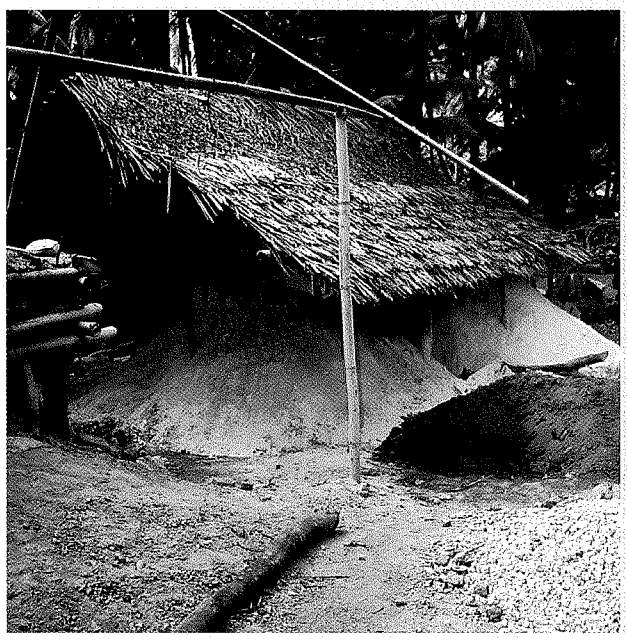
Coral mining is a highly localized activity that can cause significant impacts on coral reefs. Furthermore, experience has shown that these effects on the habitat can have major implications for coastal protection, potentially resulting in great cost: a recent analysis (Cesar, 1996) estimated that one square kilometre of reef mined for lime production in Indonesia yielded benefits of US$121 000 to the miner over 25 years, but caused losses to society of US$93 600 in fisheries value, US$12 000-US$260 000 in coastal protection value, US$2900-US$481 900 in tourism value and US$67 000 in forest damage caused by the collection of firewood for lime kilns. The total net losses to society are estimated to be 7.5 times higher than the net individual benefits (Cesar, 1996).

Recolonization of reefs after mining may take a long time. Catastrophic storms in Hawaii resulted in reductions in living coral cover from 46% to 10%: 12 years later coral cover had only increased to 15%. Extrapolation of these results suggests recovery to pre-storm conditions in 40 to 70 years (Dollar and Tribble, 1993). Preliminary research in Indonesia suggests that recovery rates after mining may also be very slow (Sarjana Putra, 1992).

The amount of coral utilized for construction purposes is probably greater than coral exploited for other purposes. Large-scale mining operations at Teluk Dalam alone have been estimated at around 1800 t annually. Combined with the widespread, small-scale collection of coral that occurs elsewhere, the annual volume of coral mined for construction purposes countrywide could amount to over 5000 t a year. In contrast, even assuming each piece of coral that was exported weighs one kilogramme, exports of coral have probably never been more than 3000 t a year. However, comparison of the relative impacts of these types of exploitation based on weights alone could be misleading.

Although coral mining causes the localized destruction of coral habitats, collection for ornaments, aquaria and jewellery focuses on a small number of species that are often rare and slow-growing. While this is unlikely to result in damage to the reef ecosystem, it could result in severe localized depletion of some species. Such impacts have been documented on reefs exposed to collection activities in the Philippines (Ross, 1984).

Export quotas are almost certainly the most effective means of limiting the exploitation rates of corals collected for aquaria and ornamental purposes and destined for overseas markets. The huge expanses of coral reef in Indonesia preclude the usefulness of on-the-ground enforcement under the current budgetary constraints of the relevant enforcement agencies. However, to prevent the localized depletion of sought-after species, in areas close to transport centres for example, it may be appropriate to combine export quotas with local regulations. For instance, the rotational harvesting of areas of a reef could provide a relatively easily enforceable means of preventing the localized depletion of coral populations. Such local-based regulations are more likely to be successful if designed and implemented by Government together with coral collectors.



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Piles of lime at Teluk Dalam.

Box 3. Lime production at Teluk Dalam, Lombok

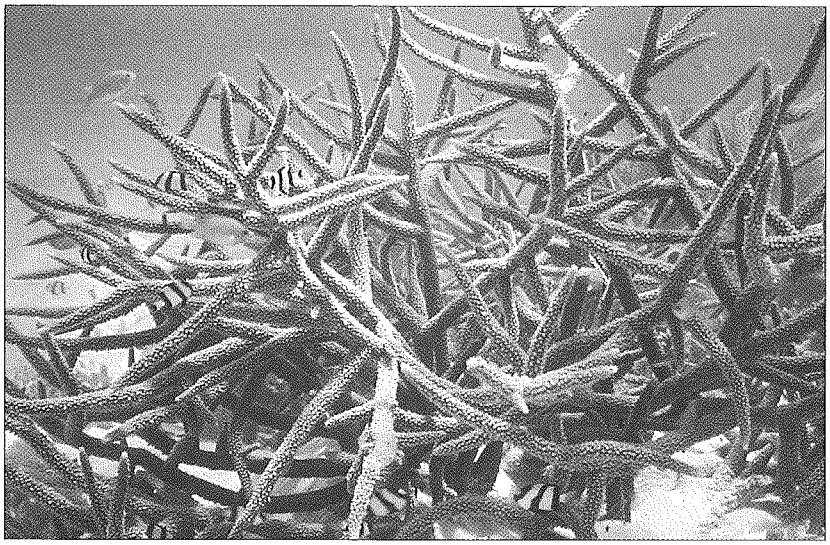
Coral has been mined at Teluk Dalam, on the northwest coast of Lombok, since the late 1940s. The mine is probably the largest in Indonesia, and operations here reflect the general methods used to mine coral for lime in other, smaller, occasional, operations that may be scattered throughout the country. Men travel out in small canoes and dive in shallow water to collect coral heads of species such as those of *Porites* and *Favia*. Nowadays, they need to travel up to one kilometre because areas closer by have already been depleted. Depending upon sea conditions, collectors make up to five trips a day, each time collecting 1 m^3 to 1.5 m^3 (about 200 kg) of coral.

On shore, women and men split the coral into smaller pieces ready for firing. There are about twenty kilns fired with wood from nearby forests. After four days in the kiln, the coral is reduced to a fine lime and shovelled from the base of the kiln into piles to await packaging in sacks, ready for shipment. Each sack weighs between 20 kg and 25 kg and is sold for about Rp2500 (US$0.80). Each kiln, which measures about 3 m^3 to 4 m^3, takes three loads a month, producing a total of about 175 sacks of lime. Production is divided between two companies employing a total of some 125 people. Most of the lime produced in Teluk Dalam is used locally in the private and government sectors for building construction (Cesar, 1996).

Each week, two 10 t lorry loads of sacks are taken away to be sold, which suggests an annual lime production of about 1000 t. This would require the collection of about 1800 t of raw coral. Information on collecting activities supports this value. It is suggested that, on average, 20 boats make two to three trips a day, 300 days a year, each time collecting 150 kg. This is equivalent to an annual coral harvest in the vicinity of 2000 t.

In addition to local level regulations, an effective management system will need to set export quotas appropriately. Ideally these would be based on information on the area of coral reefs, colony densities, individual colony growth, mortality and the annual recruitment of new colonies, its variability and relationship to the number of adult colonies. Given the difficulty of obtaining such information, a more feasible short-term alternative is to base quotas on monitoring of current population levels. Trends in the size and density of colonies of each species could be used to assess the sustainability of export quota levels. Although defining meaningful base levels for these indicators might be difficult, significant declines in either would suggest the need for reductions in the size of export quotas.

In the absence of such research or monitoring, the most appropriate approach is a precautionary one. In particular, quota levels should be related to what is currently known about population dynamics and abundance of the species, with those species that are least abundant and the slowest growing having the lowest quotas assigned to them. This does not appear to be the case at present. For example, *Acropora* and *Pocillopora*, both common and fast-growing genera, were assigned quotas of 30 600 and 2700 pieces, respectively, in 1997. In contrast, the less abundant genera *Euphyllia*, *Plerogyra* and *Trachyphyllia* were assigned quotas of 110 250, 51 300 and 70 650 pieces, respectively (Anon., 1997b). This appears to be contrary to the relative distribution of harvest levels that we would expect based on current knowledge about abundance and growth rates of these species (Table 6).



Acropora sp., WWF/Rod Salm

Although coral mining causes the localized destruction of coral habitats, collection for ornaments, aquaria and jewellery focuses on a small number of species that are often rare and slow-growing. While this is unlikely to result in damage to the reef ecosystem, it could result in severe localized depletion of some species.

Although basing quota levels on published estimates of growth and abundance can provide guidelines in the absence of other information, it should be noted that these factors can vary considerably. Growth rates have been shown to vary within species, depending on aspects such as depth, sedimentation, location and morphological variants (Buddemeier and Kinzie, 1976; Van Veghel and Bosscher, 1995). Furthermore, there may be variation in abundance within a genus. For example, *Goniopora columna* is common and often forms large stands whereas other members of the genus, such as *G. stokesi,* are small and uncommon. This illustrates the need for management decisions to be based at the species rather than at genus level, and for more accurate collection of trade data.

As well as considering the state of coral stocks, a precautionary approach to quota setting may also be beneficial to the coral exporting industry in Indonesia. In particular, consideration of the worldwide supply and demand of corals may be worthwhile in determining quota levels. The prices that aquaria enthusiasts are willing to pay for coral specimens are often related to the species' relative rarity; prices in consuming countries can vary from week to week depending on their availability (O'Brien Shoup and Gaski, 1995). Because a reduction in the number of coral pieces available may increase their unit price, coral exporters may not necessarily suffer a reduction in total revenue if export quotas were reduced.

In this context, Indonesia could take advantage of its place at the centre of coral species diversity (Veron, 1993). Although species such as *Euphyllia* are widespread in the Indo–Pacific, others like *Catalaphyllia* are restricted to central Asia (Veron, 1993), and large-scale commercial collection of this species only occurs in Indonesia (O'Brien Shoup and Gaski, 1995). Indonesia is also home to endemic species (e.g. *Indophyllia macassarensis*). The increasing popularity of corals for aquaria means that collectors are seeking rare forms. But while this type of demand could be used positively to promote an export industry based on low volumes of valuable species, care must be taken that export quotas are adhered to and that smuggling of rarer species does not occur. According to anecdotal reports, black coral has already been severely overexploited in Indonesia and is in urgent need of attention. Generally, these species are slow growing and long lived, making them vulnerable to overexploitation. Grigg (1984) estimated a maximum sustainable yield of around six tonnes per year (equivalent to only about 3.5% of the biomass) from a bed of about 84 000 colonies of *Antipathes dichotoma* in Hawaii. In contrast to aquarium and orna-

Use	[1]Abundance	Growth Rate (cm/yr)[2]
Live export		
Euphyllia	uncommon	4.6 - 7.9
Goniopora	common	1.8
Catalaphyllia	uncommon	-
Trachyphyllia	common	-
Plerogyra	uncommon	1.4
Raw export		
Pocillopora	common	0.8 - 5.2
Acropora	common	3.0 - 18.1
Heliopora	common	-
Fungia	common	0.8 - 2.8
Tubipora	common	-
Mining		
Platygyra	common	1.3 - 1.3
Porites	common	2.8
Favia	common	1.4 - 2.3
Acropora	common	3.0 - 18.1
Favites	common	-

Table 6. Abundance[1] and growth rates of the coral genera most commonly exploited in Indonesia.

Source: [1]Based on descriptions in Veron, 1986. Abundance will vary with location, habitat and among species within the genus. Here it refers to density within distribution. Almost all the genera involved in the trade occur throughout Indonesia, so it is abundance within their range which is of most concern.

[2]Linear growth rates in the Philippines, Gomez et al., *1985.*

mental pieces, a significant proportion of black coral collected in Indonesia appears to be consumed domestically. This may make exploitation levels more difficult to regulate.

Other impacts on coral reefs also need to be considered when assessing the potential effect of coral exploitation. Increased sedimentation caused by logging, soil erosion and dredging has been shown to have harmful effects on corals (Bak, 1978; Babcock and Davies, 1991). Nutrient enrichment caused by the increased use of fertilizers and land clearance may have similar effects (Tomascik and Sander, 1985, 1987a, 1987b; Hunte and Wittenberg, 1992). Activities related to expanding tourism can also have significant impacts on coral reefs (Rinkevich, 1995 and references therein) as can destructive fishing techniques using dynamite and cyanide (Johannes and Riepen, 1995; Erdmann and Pet-Soede, 1996).

Where it occurs, coral mining probably has ecosystem impacts comparable to any of these other threats. In contrast, coral collection activities for the export of aquarium and ornamental pieces and for the making of jewellery, may be a relatively minor risk to the overall health of coral reef ecosystems. However, the impact of such activities on the abundance of certain species cannot be ignored. Effective setting and enforcement of exploitation levels will be required to ensure that these species can continue to contribute to the benefits that Indonesia derives from its coral reefs.

Recommendations

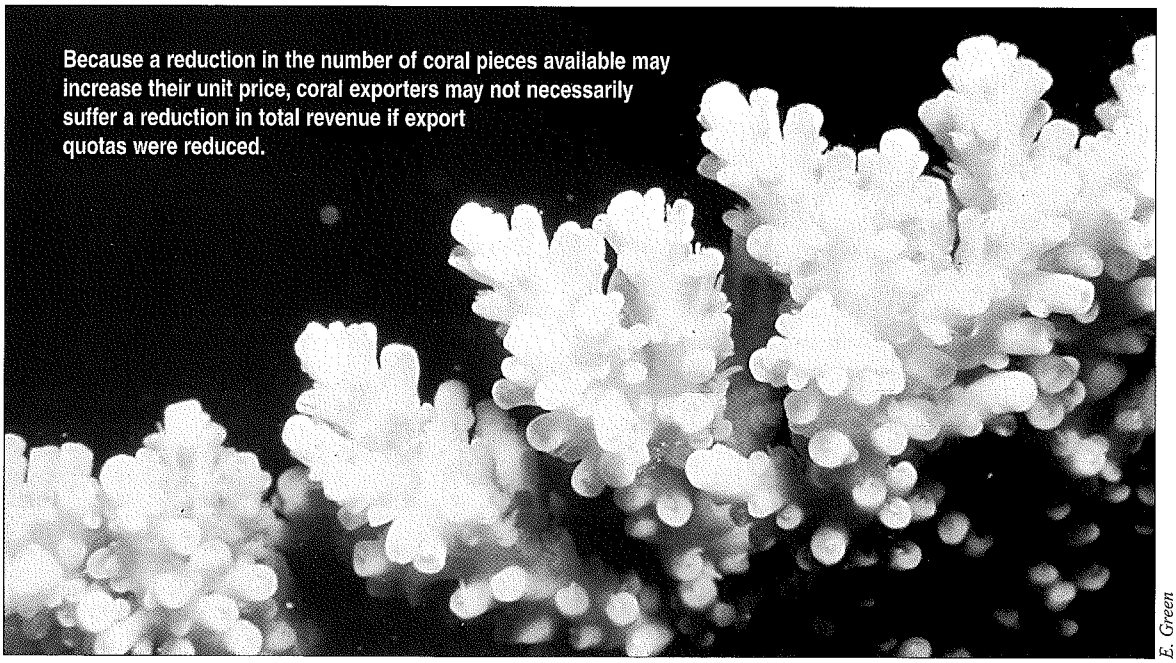
- In recognition of the environmental and economic impacts that can be attributed to coral mining activities, (a) Indonesian national and provincial governments should move towards banning large scale coral mining activities for the production of lime and seek to provide alternative forms of incomes for the communities involved; and, (b) the Indonesian Government should study the feasibility of providing alternative materials to replace smaller-scale exploitation for construction.

- The PHPA, in association with the AKKII and local government authorities, should consider the use of area-based limits on collection activities. This would augment the effectiveness of the current export quota system and prevent the concentration of coral collection activities in specific areas which can lead to localized depletion of aquarium and ornamental species.

- Appropriate research and monitoring by Indonesia's CITES Scientific Authority, LIPI, should be carried out on the stocks of coral species in trade in order that appropriate export quota levels are set.

- In order to ensure that the Indonesian coral export industry can be maintained into the future, a precautionary approach must be taken in the setting of export quotas: existing information on the abundance and population dynamics of coral species should be utilized in this regard and it should be recognized that even short term export earnings may not be adversely affected by setting quotas conservatively.

- In recognition of the vulnerability of black corals *Antipathes* spp. to overexploitation, regulations should be considered governing the collection and domestic sale of these species.



Because a reduction in the number of coral pieces available may increase their unit price, coral exporters may not necessarily suffer a reduction in total revenue if export quotas were reduced.

E. Green

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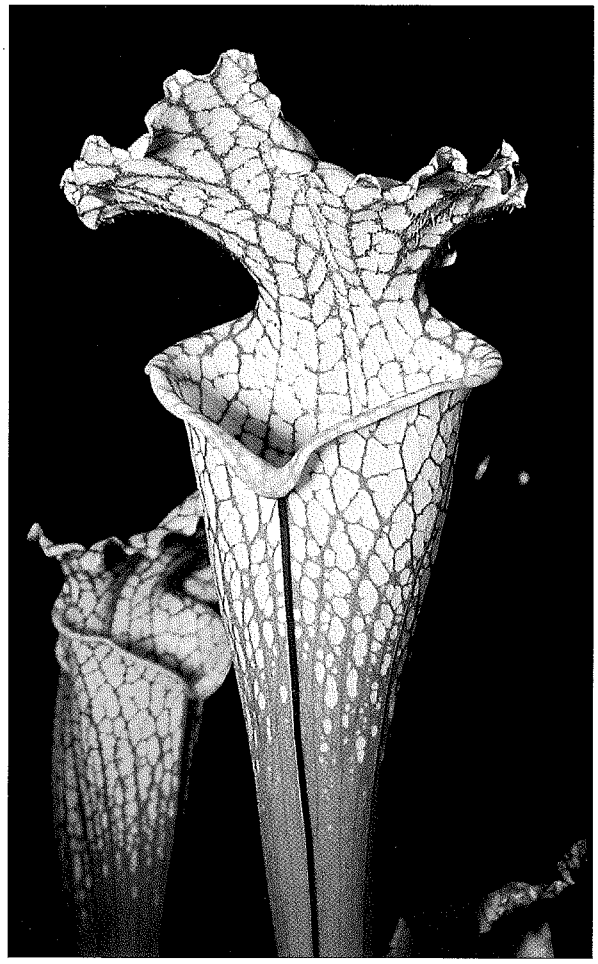
Examination of the US Pitcher-plant Trade

With a focus on the White-topped Pitcher-plant

C.S. Robbins

The unique appearance of carnivorous plants of the North American genera Sarracenia, *their leaves modified to form pitcher-like organs that trap and digest insects, make them highly desirable to plant collectors and breeders. Whole plants artificially propagated in the USA are on sale worldwide and there is an emerging interest in the use of pitcher-plants for medicinal application. The cut pitchers of wild specimens, once exported from the USA, now appear to be mainly collected to supply the US domestic market in cut flowers. However, as the report below describes, the extent of the exploitation of wild-collected* Sarracenia *specimens for this trade is largely undocumented, as a consequence of which any damage such harvesting might be having on populations, many of which are already vulnerable to habitat loss, is unknown.*



Royal Botanic Gardens, Kew

White-topped Pitcher Plant *Sarracenia leucophylla*

Introduction

Carnivorous plants are an enigmatic group of plants that use specialized morphological adaptations, known as traps, to capture small animals, primarily insects, for supplementary nutrition. Globally, there are 15 genera of carnivorous plants, comprising more than 500 species. Their unique biology and unusual appearance make many of these species highly sought by collectors. Some taxa, particularly tropical pitcher-plants *Nepenthes* and the naturally occurring hybrids of the native North American pitcher-plants *Sarracenia*, are quite rare and under increasing pressure from habitat alteration, and the harvesting of cut pitchers and living plants for commercial trade and for personal collections. There is also a known yet poorly documented commercial medicinal market for carnivorous plants.

North America is home to five genera of carnivorous plants, including the ornamentally popular White-topped Pitcher-plant *Sarracenia leucophylla*, one of eight generally recognized species in the genus. Pitcher-plants derive their name from their leaf structure, which consists of an erect funnel-shaped tube or "pitcher", on top of which sits a lid-like hood (Slack, 1979). These are designed to attract and passively trap insects, which upon capture fall to the pitcher's base and are slowly digested by acids and enzymes. Pitchers of *Sarracenia* are typically adorned with vertical red veins that encircle the leaf and are connected by smaller, web-like veins that guide insects to sources of nectar and the "pit-fall" trap.

Conservationists have been particularly concerned about the vulnerability of the White-topped Pitcher-plant because the species has a very restricted range, its habitat is diminishing, and specimens remain popular in the cut flower and horticultural trades. Although all *Sarracenia* species are listed in the CITES Appendices and a number of species in the genus are afforded national protection in the USA, allegations of illegal exports of whole plants from the USA in recent years have intensified concerns for the species.

The following report summarizes the findings of a study undertaken by TRAFFIC USA into the US trade of wild-collected pitchers of, in particular, White-topped Pitcher-plants, the extent of pitcher-plant cultivation in the USA and an analysis of exports of artificially propagated whole specimens.

Background

At the CITES Plants Committee meeting in May 1994, TRAFFIC North America (formerly TRAFFIC USA) expressed concern about the possible illegal export of pitcher-plants, particularly of the White-topped Pitcher-plant, from southern US ports. Although a follow-up investigation by the US Animal and Plant Health Inspection Service (APHIS), the branch of US

Government that implements and enforces CITES trade controls for plants in the USA, found no evidence of illegal exportation, TRAFFIC decided to conduct its own enquiry because of continuing concerns about levels of commercial exploitation of pitcher-plants and the species' worsening habitat loss. The White-topped Pitcher-plant was the focus of the study, but information on the trade in other pitcher-plants in the USA was obtained in order to gain a more complete understanding of the trade.

TRAFFIC's review served two ends: firstly, to synthesize information on the conservation status, management and trade of wild *Sarracenia* species and, secondly, to determine the extent to which species are artificially propagated in the USA and investigate the lack of transparency in export data for cultivated specimens.

Although trade, and the impact of trade on wild populations of these species, is at the centre of this review, it is important to note that the genus, and particularly the White-topped Pitcher-plant, is at far greater risk from wetland drainage for development and pine plantations, and the silvicultural practices of timber companies. Suburban development and tree farms can irreparably alter suitable *Sarracenia* habitat, while the effects of fire suppression and the use of and runoff of herbicides can harm wild *Sarracenia* populations.

Methods

Although specimens, including pitchers, collected for export are subject to regulation under CITES and federal exporting requirements, the harvesting of White-topped Pitcher-plants for US domestic trade is generally not controlled or monitored at the State or federal level. As a consequence, the data on the number of plants collected and traded within the USA are incomplete, making it difficult to assess overall exploitation of the species and evaluate the impact of collection on native wild populations.

TRAFFIC's study was conducted during 1996 and 1997. In the absence of harvest data, investigators relied on other sources of information such as US mail-order catalogues and plant vendors for assessment of the availability of White-topped Pitcher-plants offered in the USA. US exports of pitcher-plants were examined by compiling CITES annual report data and comparing these with plant-health, or phytosanitary, certificates issued for the export of pitcher-plants. Overseas markets were also examined through interviews with pitcher-plant vendors in key importing countries such as the Netherlands and Japan. APHIS plant inspectors at the US ports of Mobile (Alabama), Gulfport (Mississippi) and New Orleans (Louisiana) - key ports for pitcher plant exports - were questioned about pitcher-plant shipments. Field botanists from US State natural heritage programmes and the US Fish and Wildlife Service (USFWS), and academic and botanical garden researchers were contacted for information on the conservation status, ecology, management and protection of the White-topped Pitcher-plant. Information from internal memoranda of the US CITES Scientific Authority that is used by the US Government to determine whether exports of pitcher-plants would be detrimental to wild populations was extracted and analysed.

Distribution and Status

The White-topped Pitcher-plant, or swamp lily as it is sometimes known, favours moist habitats and soil that is usually acidic and lacking in nutrients. It occurs naturally in small discontinuous patches of bog, wet pine savannas and flatwoods (wooded areas growing on flat terrain) in the southeastern States of Alabama, Florida and Mississippi. Most of the suitable habitat is in Alabama, some of which is managed by State and federal governments but most is on private land owned by timber companies. The species is believed to be extinct in Georgia, where a single population has not been found in the last eight years.

The Nature Conservancy (TNC - a US-based international conservation organization), in co-operation with individual States, ranks the rarity of plants in North America on the estimated number of occurrences (locations) and individual plants reported by States (as well as other factors such as suitable habitat, habitat loss and overexploitation). According to this system, the White-topped Pitcher-plant is considered critically imperilled in Georgia (five or fewer occurrences or fewer than 1000 individuals), imperilled in Mississippi (six to 20 occurrences or fewer than 3000 individuals), and vulnerable in Alabama and Florida (21 to 100 occurrences or fewer than 10 000 individuals) (TNC, 1997).

The level and intensity of management of the White-topped Pitcher-plant and information on the species' population varies from State to State. There are a reported 319 occurrences of White-topped Pitcher-plants in Florida, 70% of which have been documented on public land, and 30% on private land (Knight *in litt.*, 1995). Most populations on public land are located in the western panhandle of Florida, which is well-managed through growing-season fire (Knight *in litt.*, 1995). Conversely, private lands in Florida are not actively managed to preserve White-topped Pitcher-plant habitat (Knight *in litt.*, 1995). In Alabama, there are 98 known occurrences of White-topped Pitcher-plants, most of which are located in Baldwin, Washington, Mobile and Escambia Counties (Lewis *in litt.* to Kutchock, 1997). Eighteen extant populations of White-topped Pitcher-plants occur in Mississippi, eight of which occur on land owned by timber companies in the southeastern corner near the Alabama border. The remaining populations in that State have been documented on State lands in George, Jackson, Green and Wayne Counties. Mississippi does not actively manage White-topped Pitcher-plant habitat or populations.

Madeleine Groves, Atlanta Botanical Garden

⩽ Cut pitchers of White-topped Pitcher-plants being harvested in Alabama. They are placed in buckets of water on all-terrain vehicles which are typically used during collection to get in and out of pitcher-plant bogs.

PROTECTION

The entire *Sarracenia* genus is listed in the CITES Appendices: *Sarracenia jonesii*, the Green Pitcher-plant *S. oreophila* and two subspecies Alabama Canebrake Pitcher-plant *S. alabamensis alabamensis* and *S. rubra alabamensis* are listed in CITES Appendix I, while all other *Sarracenia* are listed in Appendix II. The *US Endangered Species Act* (ESA) prohibits interstate commerce and export of Green Pitcher-plants, Alabama Canebrake Pitcher-plants *S. rubra alabamensis* and Mountain Sweet Pitcher-plants *S.r. jonesii*. Although the White-topped Pitcher-plant is currently being evaluated for protection under the ESA, it receives no federal protection at the present time. The State legal designation of the White-topped Pitcher-plant in Florida is Endangered and permits regulate collection. While there is no legal protection for White-topped Pitcher-plants in Alabama, Mississippi and Georgia, trespass laws in the former two States require collectors to obtain permission from landowners prior to collection.

WILD HARVEST

Although the whole plant may sometimes be removed, typically, it is the funnel-shaped section of the White-topped Pitcher-plant, or pitcher, which is harvested from the wild for the US domestic trade. This occurs twice in each growing season - from late April to early July and again from early August to October/November - along the Gulf Coastal Plain of southeast USA (Groves, 1992). There are usually between four and seven pitchers per plant. Most White-topped Pitchers are collected in Alabama and may be collected illegally in western and northern Florida (Groves, 1992). The extent of collection in Mississippi is not known. Each cut pitcher fetches between seven and 10 cents (or less), or 30 to 40 cents per bunch of 10, and can potentially earn the harvester US$150 to US$200 a day (Groves *in litt.*, 1998). Most harvesters (and growers) sell cut pitchers to brokers who serve as intermediaries between the harvester/grower and the florist.

State botanists have been concerned about heavy collection of White-topped Pitcher-plants in southern Alabama, particularly in northern Baldwin County near the town of Perdido, and in Washington County, where their collection from the wild for the domestic cut-flower trade is becoming a cottage industry (Hilton *in litt.*, 1995). Reportedly, White-topped Pitchers have been transported out of southern Alabama by the lorry-load (Hilton *in litt.*, 1995). A US timber company with large holdings in southern Alabama once leased its land to *Sarracenia* collectors, but this practice has now ceased (Folkerts pers. comm., 1997).

Owing to the absence of permit requirements in Alabama, there are no known public records of the number of pitchers collected in that State, and inventories maintained by local collectors and companies are not accessible to the public. The Alabama Division of Game and Fish has previously stated that there should be no harvest of pitcher-plants until a management plan has been established for them (Office of Scientific Authority *in litt.* to Office of Management Authority, 1992). However, based on the lack of protection plants receive in Alabama, and the lack of resources devoted to plant conservation in that State, the likelihood of a management plan for pitcher-plants in Alabama, at least in the forseeable future, is low.

A permit is required to collect White-topped Pitcher-plants in Florida. According to State records, four permits have been issued for *Sarracenia* collection since January 1991: two permits issued in January 1991 and October 1993 authorized the collection of 2500 and 100 specimens of White-topped Pitcher-plants, respectively; two permits issued in May 1991 and November 1994, respectively authorized the collection of an unlimited number of *Sarracenia* specimens and White-topped Pitcher-plants (Anon., 1995). No collecting permits were issued in 1995 or 1996; no records for 1997 are yet available.

The quantity of pitcher-plants collected is not necessarily as harmful to populations or habitat as is the damage caused by repeated foot traffic and vehicle use which compact the soil and alter moisture levels (Hilton *in litt.*, 1995). However, over-harvesting can harm a local population over time because harvesters can potentially cut more than one pitcher per plant within a growing season year after year. It is considered by some scientists that removal of the plants' pitchers not only affects photosynthesis, but it also eliminates the mechanism from which supplemental nutrition is derived which may stress, or even kill the plant.

US Market

Half or more of the White-topped Pitchers collected from the wild in 1989 are believed to have been purchased by US florists for domestic sale (Anon., 1989). Today, the US market for fresh and dried cut White-topped Pitchers may be even larger. By contrast, the US export market for cut specimens, once comprising tens of thousands, appears to have declined since 1989. Rhizomes and seeds of pitcher-plants can also be found in trade, but in insignificant quantities; these are believed to be mostly artificially propagated stock as they are recorded in the CITES annual reports to genus level, in common with other *Sarracenia* specimens that have been artificially propagated, whereas wild-collected plants are generally recorded to species level.

As part of the survey, TRAFFIC interviewed five major wholesalers/distributors in Alabama and Florida by telephone to obtain information on the species, volume, source (i.e. wild or artificially propagated), prices and market availability of *Sarracenia*. Of these five, two (Companies A and B) indicated that they obtain cut pitchers from Alabama and sell them to domestic florists only. The remaining three companies did not respond to the survey.

According to Company A, an international cut-flower wholesaler located in Alabama, it purchases *Sarracenia* pitchers from local harvesters who allegedly collect wild specimens legally on leased land in Alabama. The company states that it does not buy specimens harvested from endangered populations, including those in Florida where the species is considered endangered (Mater Engineering, 1993). Company A states that it is unaware of any availability of cultivated supplies of White-topped Pitcher-plants in Alabama. It does not export White-topped Pitcher-plants because of the species' close resemblance to endangered species in the genus.

Company B, also based in Alabama, purchases White-topped Pitcher-plants from a source in Mobile, Alabama, and resells live plants at US$4.95 each; it does not export any specimens. It is unable to confirm whether the plants are collected from the wild or cultivated.

Harvesters in Alabama. Bunches of ten pitchers are cut to size and then dipped in water to clean the stems and to offset wilting.

Photographs by Madeleine Groves, Atlanta Botanical Garden

Harvesters at a shade house, Mississippi.

A retail company in the State of Maine contacted by TRAFFIC offered dried wreaths decorated with *Sarracenia* in its 1995 Christmas catalogue (identified by TRAFFIC as being White-topped Pitchers). The company informed TRAFFIC that it has purchased wreaths from a local floral manufacturer which, in turn, claimed to have bought an unknown quantity of dried *Sarracenia* from Company A in Alabama; these speci-

mens are all believed to have been wild-collected. Based on the number of pitchers used per wreath and the total number of wreaths produced, it is estimated that at least 45 000 dried *Sarracenia* pitchers were purchased for wreaths sold in 1995. This retail company no longer offers the wreaths for sale.

A review of US nursery price lists indicates that prices for White-topped Pitcher-plants range from US$4.00-US$5.25 for a whole plant; seeds and rhizomes are offered for US$3.00 each.

Export Approval

The US Fish and Wildlife Service (USFWS) is the designated US CITES Scientific and Management Authority and, as such, must ensure that any CITES-listed species, or specimens thereof, that are exported, have been legally acquired and that exports will not be detrimental to the species' survival.

Before recommending to the Office of Management Authority (OMA) whether a CITES permit for the export of *Sarracenia* should be issued, the Office of Scientific Authority (OSA) at USFWS usually requires and reviews the following information: (1) the *Sarracenia* species to be exported; (2) if applicable, the harvest frequency and total number of specimens harvested the previous year, the acreage and description (i.e. whether leased or exporter's own land) of site harvested the previous year; (3) the estimated number of plants and indication of part of the plant to be harvested for the domestic market and export; (4) the acreage and brief description of site from where *Sarracenia* are to be extracted; (5) the estimated frequency and intensity of harvest at site; (6) the current and projected extent of *in situ* and *ex situ* artificial propagation; (7) signs of unauthorized collection; and (8) accessibility of site (OSA *in litt.* to OMA, 1992, 1993, 1994).

OSA has previously recommended the issuance of export permits for *Sarracenia* on the condition that the intensity of collection be limited to one mature pitcher per plant every two to three years. In addition to OSA's information requirements and recommendations, OMA must be reasonably assured that *Sarracenia* specimens being exported were not obtained in violation of State or federal law.

US Exports and International Trade

According to US CITES annual report data, US exports of wild White-topped Pitcher-plants declined considerably from the mid-1980s and there have been no reported exports of any wild *Sarracenia* specimens since 1992, when 6300 live White-topped Pitcher-plants were exported to Taiwan (6000) and the Netherlands (300). The export trade in artificially propagated cut pitchers has declined owing to increased availability of *Sarracenia* from growers overseas, particularly in Europe. The reported number of artificially propagated *Sarracenia* whole plants exported from the USA, however, remains high, with the exception of a drop in exports in 1993 (1992: 83 900; 1993: 3600; 1994: 60 500; 1995: 48 740; 1996: 97 200) (USFWS, 1997). Since 1994, exports of artificially propagated Appendix II-listed *Sarracenia* have been entered into the US CITES annual report database at the genus level, which has impeded the monitoring and quantification of exports of propagated White-topped Pitcher-plants or any other *Sarracenia* species.

There appears to be a discrepancy between the number of phytosanitary certificates issued and the quantity of *Sarracenia* exports recorded in the US CITES annual reports for 1995 and 1996. In theory, these should be the same or similar. However, US CITES annual reports show fewer *Sarracenia* exports than phytosanitary certificates issued for exports during those years. The US Department of Agriculture (USDA) at the port of New Orleans, Louisiana, issued phytosanitary certificates for the export of 59 000 Purple Pitcher-plants *Sarracenia purpurea* and 11 000 Parrot Pitcher-plants *S. psittacina* to the Netherlands in 1995. By comparison, US CITES annual report data show that only 44 000 *Sarracenia* plants were exported to the Netherlands in 1995 (live, artificially propagated). Similarly, in 1996, USDA issued phytosanitary certificates for the export of 90 980 *Sarracenia* specimens to the Netherlands: 44 600 Purple Pitcher-plants, 32 400 Parrot Pitcher-plants, 1500 Sweet Pitcher-plants *Sarracenia rubra*, 10 500 *S. wherryi* (= *S. r. wherryi*) and 1980 *Sarracenia* hybrid pitcher-plants. Surprisingly, US CITES annual report data record only 13 400 *Sarracenia* (live, artificially propagated) exported to the Netherlands in 1996, a discrepancy of 78 580 specimens.

The only recent documented case of illegal *Sarracenia* trade in the USA involved a shipment of carnivorous plants which was destined for the Netherlands but intercepted by authorities at Baltimore International Airport in January 1996. The shipment consisted of 8190 Venus Flytraps *Dionaea muscipula*, 130 Purple Pitcher-plants and one Sweet Pitcher-plant, all of which had clearly been removed from the wild in North Carolina and intended for commercial resale and artificial propagation (Lieberman, *in litt.*, 1996). The shipment was not declared to the appropriate US authorities prior to export and false documentation accompanied the plants (Lieberman, *in litt.*, 1996).

There appears to be a horticultural market in the Netherlands for whole *Sarracenia* plants that have been artificially propagated in and exported from the USA. Historically a major importer and re-exporter of wild *Sarracenia* from the USA, the Netherlands has achieved success in propagating *Sarracenia* spp. by seed and tissue culture that has resulted in more desirable, smaller and uniformly sized plants for the trade in cut flowers (Determann pers. comm., 1995). A Dutch grower

informed TRAFFIC that improved propagation techniques such as tissue culture had enabled his nursery to produce twice as many *Sarracenia* in 1995 as in 1994. The same grower imported approximately 44 000 artificially propagated *Sarracenia* specimens from the USA in 1995 and more than 130 000 in 1996. This figure points up another discrepancy in the trade figures, which record a total of 97 200 specimens exported from the USA in 1996, 13 400 going to the Netherlands, although phytosanitary certificates were issued for the export of 90 980 *Sarracenia* specimens to the Netherlands in that year. Nearly two-thirds of 1995 imports and half of 1996 imports were Purple Pitcher-plants.

According to CITES annual report data, other European countries importing *Sarracenia* specimens from Europe include the Czech Republic, Italy and Austria. Japan imports large quantities from the USA and may be supplying its domestic market with plants cultivated from those originally imported from the USA.

US Imports

Prior to 1993, there were very few reported imports of *Sarracenia* to the USA. Since that time, an annual average of 700 live *Sarracenia* have been imported. As the trade figures do not discriminate among individual species identified by the exporter as artificially propagated, these specimens were likely to have been artificially propagated. Canada has been the largest supplier of *Sarracenia* to the USA, exporting 614 live specimens in 1993, 783 in 1994, 663 in 1995 and 716 in 1996. From 1993 to 1996, live imports were also received from the UK (271), the Netherlands (204) and Australia (11).

< In recent years, Yellow Pitcher-plants *Sarracenia flava* (left) have been exported from the USA to Canada for medicinal purposes.

Royal Botanic Gardens, Kew

Medicinal Trade

Carnivorous plants have traditionally been collected, cultivated and traded for decorative purposes, but there appears to be a limited albeit little-documented medicinal market for some species, including *Sarracenia*. According to Grieve, 1980, the root and leaves of the Purple Pitcher-plant are taken as a tincture, or in fluid or powder form as a tonic, laxative, stomachic, and diuretic. In the southern USA the plant is used in the treatment of dyspepsia. The plant's principal value appears to be in torpid liver, stomach, kidney and uterus complaints (Grieve, 1980). It is also taken to alleviate pain (Sheldon *et al.,* 1997). Native Americans have used the Purple Pitcher-plant as a diuretic and to treat smallpox, lung and liver ailments, and the species is listed in the Physicians' Desk Reference, a reference list on available pharmaceuticals (Foster and Duke, 1990). Owing to the increased scarcity of this species, US botanical companies in the last several years have reportedly offered prices as high as US$30/lb (454 g) (Sheldon *et al.,* 1997). The USFWS regional field office in North Carolina and botanists working for that State have reported an increase in the number of queries from natural product companies regarding the availability of Purple Pitcher-plants. In one instance, a company wished to know where it could secure 1000 lbs (400 kg) (dry weight) per year of Purple Pitcher-plants for the production of an extract known as *Sarapine*, a muscle relaxant used primarily on horses. Apparently, the company's previous supplier, which harvested Purple Pitcher-plants from the New Jersey pine barrens – a biologically rich area in southern and central New Jersey comprising over one million acres of sandy and peaty soil wooded with Pitch Pine *Pinus rigida* - was no longer supplying it with material. In 1994 and 1996, 1000 wild Yellow

Pitcher-plants *Sarracenia flava* and 1500 specimens of *Sarracenia*, respectively, were reportedly exported from the USA to Canada for medicinal use (USFWS, 1997). Purple Pitcher-plants have also been documented on the German medicinal market (Lange and Schippmann, 1997). TRAFFIC, in co-operation with relevant experts, intends to examine the demand for and trade in *Sarracenia* offered on the US, Canadian and European medicinal markets, including a study of the plant's uses.

Conclusions

Conservation of the White-topped Pitcher-plant is largely a US issue for which US solutions should be identified and implemented, particularly at the State and consumer levels. Four conclusions can be drawn from this review:

- the greatest long-term threat to White-topped Pitcher-plants is loss of habitat, which is widespread and possibly accelerating in areas prone to suburban sprawl and pine plantation development. Approximately 98% of the habitat suitable for *Sarracenia* has been eliminated across its range in the lower Gulf Coastal Plain (Folkerts, pers. comm., 1995);

- the international market for cut pitcher-plants harvested from the wild and exported from the USA has shrunk from tens of thousands to no reported wild specimens today. All cut pitcher-plants exported in recent years appear to have been artificially propagated. By contrast, US demand for the domestic trade in cut pitchers for floral arrangements remains high and is the greatest factor driving wild harvest;

- there is insufficient information on the location of, and levels of, wild *Sarracenia* harvests, or on the extent of *Sarracenia* artificial propagation in the USA; and

- the quantity of White-topped Pitcher-plants collected may not be as harmful to populations and habitat as the damage caused by foot traffic and vehicles during collection of pitcher-plants.

Recommendations

In order to address the long-term conservation and exploitation of White-topped Pitcher-plants, further research is needed to study the level and potential and known impacts of trade and habitat loss on wild populations of the species. The author recommends that, to improve management of White-topped Pitcher-plants, and the monitoring of harvesting and trade, the following steps should be taken:

- individual US State governments should design and implement a management plan that provides harvesters of wild White-topped Pitcher-plants with information on less harmful harvesting techniques and that improves the monitoring of harvest on public land, particularly in Alabama. The latter could be achieved through a permitting system, whereby in-State plant vendors and nurseries would apply for and obtain collecting permits prior to harvest. Further, if land is going to be converted to use that is inconsistent with the habitat requirements of *Sarracenia*, private landowners should be encouraged to donate *Sarracenia* plants to plant rescue operations, thus allowing specimens to be propagated and distributed to other institutions, to reputable outlets of the horticultural trade and to selected individuals, for restocking other wild populations;

- State governments, in co-operation with regional botanical gardens and research institutions, should produce and distribute literature to *Sarracenia* wholesale vendors and retail florists in the USA, particularly in Alabama and Mississippi, on the status of the White-topped Pitcher-plant and the long-term effects of poor harvesting methods on wild plants;

- garden clubs should encourage their members to determine the source of cut pitcher-plants (i.e. whether wild or artificially propagated) by examining catalogues and querying vendors, and to make every effort to determine the origin of cut pitcher-plants, whole plants and rhizomes, before making a purchase;

- federal and State officials should monitor the US domestic market for evidence of fresh and dried White-topped Pitchers, as well as whole plants and rhizomes, to determine whether protection or regulation is required at the State or federal level;

- APHIS and the USFWS should identify and account for gaps in trade data through the exchange of information on *Sarracenia* exports: this could be achieved by the provision by APHIS of copies of relevant phytosanitary certificates to the USFWS who, in turn, could supply APHIS with copies of approved export permits for *Sarracenia* and pertinent CITES annual report data for comparison.

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The sources of information upon which the cases below are based are cited at the end of each country section.

EUROPE

BELGIUM

On 11 December 1997, at Zaventem Airport, Brussels, Customs officers arrested a Dutch citizen returning from Kenya with live reptiles concealed in his luggage. These included 76 chameleons, including 22 Jackson's Three-horned Chameleons *Chamaeleo jacksonii* (App. II), 130 tree frogs, 266 geckos, and a Bell's Hinged Tortoise *Kinixis belliana* (App. II). One third of the animals were dead on arrival; the live specimens were placed at Antwerp Zoo. By early January 1998, 17 chameleons and most of the geckos had died; a number of pregnant females in the shipment had produced 14 young. The importer, who is already subject to a criminal investigation, was cautioned for cruelty to animals and for illegal importation of protected animals, and released.

TRAFFIC Europe

GERMANY

Two cacti collectors charged in June 1995 with smuggling some 576 cacti from Mexico to Germany have each been fined DM18 000 (US$10 000). The specimens, which included wild-collected *Ariocarpus* and *Turbinicarpus* spp. (both App. I/II), were seized from the homes of the German pair (*TRAFFIC Bulletin* 15(3):116).

CITES Management Authority, Germany

NETHERLANDS

On 12 February 1998, during a routine inspection, Customs officers at Schiphol Airport seized a large number of reptiles from the luggage of a Czech national travelling from Peru to Prague: 151 turtles, 54 snakes, 43 crocodiles and caimans were discovered in a suitcase and a rucksack in the suspect's possession, including Boa Constrictors *Boa constrictor* and Rainbow Boas *Epicrates cenchria* (both App. II). The animals had been placed in plastic boxes within small plastic bags. At the time of the arrest, 13 animals were dead and the remainder were underweight. The case is under investigation.

On 26 March 1998, Zhi Lin Dong and his company, Chinese Medical Centre, in Utrecht, were found guilty of trading packages claiming to contain ingredients of CITES-listed species. Dong was sentenced to gaol for three months' and fined HFL10 000 (US$5000); the company was fined HFL80 000 (of which HFL50 000 was suspended). The prosecution follows a raid of the premises in February 1996, after an investigation of the company by TRAFFIC. Eight lorry-loads of traditional Chinese medicines were seized. Some packets claimed to contain, among others, derivatives of Tiger *Panthera tigris* bone and rhino horn (both App. I), bear gall bladder and musk deer *Moschus* (both App. I/II), Saiga Antelope *Saiga tatarica* and pangolin *Manis* (both App. II). Many of these claims were supported by forensic tests of the items, which was organized by TRAFFIC.

Telegraaf (Netherlands), 13 February 1998; TRAFFIC Europe

SPAIN

An investigation which began in Colombia in 1995 recently culminated in the seizure of 125 000 illegally acquired dead butterflies, beetles and tarantulas from a private residence in Madrid. Some 1642 specimens were CITES Appendix II-listed butterflies from Indonesia.

Authorities in Colombia had sought the assistance of Spain's CITES Management Authority after advertisements giving a Spanish address seeking to purchase butterflies and beetles appeared in Colombian newspapers. The commercial export of wildlife from Colombia is prohibited with the exception of captive-bred specimens under licence.

After a lengthy investigation, the Guardia Civil seized the following dried birdwing butterflies from the Madrid residence: 140 Goliath Birdwings *Ornithoptera goliath*; 10 Paradise Birdwings *O. paradisea*; 100 Priam's Birdwings *O. priamus poseidon*; 201 *O. priamus* ssp. (*euphorion* and others); 120 Rothschild's Birdwings *O. rothschildi*; 140 *O. tithonus*; 4 *Troides haliphron*; 185 *T. hypolitus*; 1 *T. magellanus*; 640 *T. oblongomaculatus*; 100 *T.o. thestius*; and, 1 *T. rhadamantus*. Also seized were a further 124 000 butterflies and over 4000 beetles and tarantulas. All specimens had originated in South America, the Philippines, Malaysia, Indonesia, Taiwan and other countries.

The insects have been placed with the Environmental Sciences and Natural Resources Department at the University of Alicante. Prosecution of the person suspected of being involved in the importation of these insects is in the hands of the Spanish authorities.

CITES Management Authority, Spain

UK

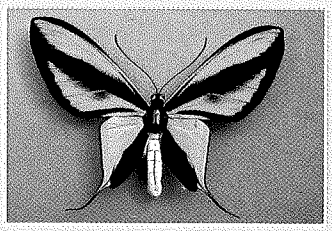
On 11 March 1998, at King's Lynn Crown Court, Norfolk, Wilfred Bull, serving a life sentence for murdering his wife, was found guilty of masterminding a conspiracy to sell 127 rhino horns. Bull, an antiques dealer, acquired the horns legally prior to his murder conviction in 1985 and before their sale had become illegal in the UK, which happened later that year. Believing that he was close to release from gaol, Bull contacted girlfriend Carol Scotchford-Hughes to sell the horns and launder the money through a firm of solicitors. She enlisted the assistance of friends David Eley and Elaine Arscott. The latter, using a false name, contacted the London Stock Exchange to enquire about selling rhino horn. The man she spoke to tipped-off the RSPCA and an undercover operation was launched. Posing as buyers, police officers, assisted by RSPCA personnel, subsequently arrested the couple and seized the horns from storage in London.

Bull, formerly of Coggeshall, Essex, was sentenced to 15 months' imprisonment to run concurrent with his life term. Scotchford-Hughes, of Willingham, Cambridgeshire, received a 120-hour community service order. Eley, of Great Shelford, Cambridgeshire, was gaoled for nine months and Arscott, also of Great Shelford, ordered to serve a community service order. The rhino horns have been confiscated.

TRAFFIC International

Birdwing butterflies *Ornithoptera* are among the largest of all butterflies and have long been desired by collectors for their spectacular wing colouring. The trade in dead specimens is difficult to monitor because of the ease with which they can be transported: the wings are folded and the butterflies stored in envelopes; they are usually spread and pinned following transport.

Most birdwings have restricted geographical distributions, and, in addition to the pressures from collectors, many are vulnerable to habitat and environmental change. All *Ornithoptera* are included in the CITES Appendices. Among the large number of species recently seized in Spain (left), some are protected in their native countries, including the Goliath Birdwing *Ornithoptera goliath*, which occurs in Indonesia and Papua New Guinea, Rothschild's Birdwing, endemic to the Arfak Mountains in Irian Jaya, and the Cairns Birdwing *Ornithoptera priamus euphorion* (below), one of Australia's largest butterflies, which is restricted to Cairns, in northeast Australia.



Paradise Birdwing *Ornithoptera paradisea* (Photo: WWF/W. von Schmieder); Cairns Birdwing *Ornithoptera priamus euphorion* (Photo: D. Thomae)

Extract from Swallowtail Butterflies. An Action Plan for their Conservation. Compiled by T.R. New and N.M. Collins, IUCN/SSC Lepidoptera Specialist Group, IUCN, 1991.

On 2 April 1998, following a lengthy investigation, Customs officers seized three specimens of one of the world's rarest birds from three houses in Yorkshire. The Lear's Macaws *Anodorhynchus leari* (App. I) were among a large haul of birds and eggs thought to have been smuggled into Britain from South America, Australia and Malaysia. The species was believed to be extinct in the wild until 1978 when fewer than 100 breeding pairs were found in north-eastern Brazil. Also seized were Palm Cockatoos *Probosciger aterrimus* (App. I) and several Yellow-tailed and Red-tailed Black-Cockatoos *Calyptorhynchus funereus* and *C. banksii* (both App. II). Three men were arrested and the case is under investigation.

Daily Mail (UK), 3 April 1998

ASIA

EAST ASIA

HONG KONG

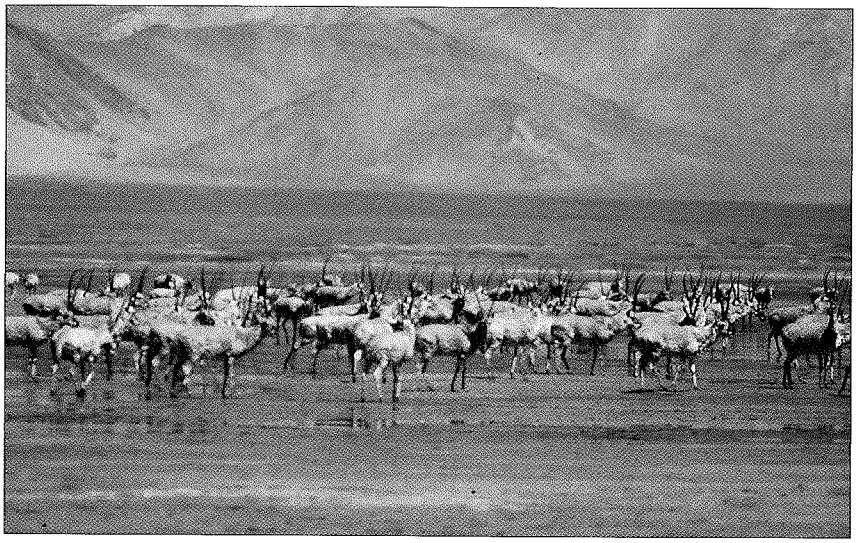
On 3 September 1997, at South Kowloon Magistracy, a restaurant in Tsim Sha Tsui was fined HK$15 000 (US$1936) for possession of 344 g of whale meat without a licence. The finding, made by Agriculture and Fisheries Department (AFD) officers in February, prompted the AFD to issue a press release reminding restaurants that possession or sale of endangered species without a licence is an offence under the *Animals and Plants (Protection of Endangered Species) Ordinance* and offenders liable to a maximum penalty of HK$5 million and two years' imprisonment.

On 22 September 1997, the AFD seized 30 Common Iguanas *Iguana iguana* and a Eurasian Hobby *Falco subbuteo* from a reptile shop in Causeway Bay. Both species are listed in CITES App. II and protected under the *Animals and Plants (Protection of Endangered Species) Ordinance*. A trial is pending.

Shahtoosh shawls, similar to this specimen from a consignment seized last year in the UK, were recently discovered on sale in Hong Kong. *(Photo: C. Allan/TRAFFIC)*

On 17/18 December 1997, the AFD seized a total of 186 shahtoosh shawls during raids on a number of premises: some 130 were seized from a private exhibition at the Furama Hotel and a further 10 from the exhibitor's shop; the following day 46 specimens were seized from another three shops. Shahtoosh shawls are made from the wool of the Tibetan Antelope *Pantholops hodgsonii* (App. I) and consumers in Hong Kong will pay between HK$8000 (US$1000) and HK$40 000 for one specimen, depending on colour, embroidery and softness; however, illegal possession in the region contravenes section 6(3) of the *Animals and Plants (Protection of Endangered Species) Ordinance*.

Agriculture and Fisheries Department Press Releases, 18/23 September 1997; WWF-Hong Press Release, 19 December 1997; TRAFFIC East-Asia



A large herd of Tibetan Antelopes *Panthelops hodgsonii* (App. I), Aqik Lake Plain, Arjin Mountains Nature Reserve, Xinjiang, China. This endangered antelope is killed for its wool - known as 'shahtoosh' - which is woven into much-prized shawls (as illustrated above). *(Photo: WWF/Ron Peloza)*

TAIWAN

On 11 November 1997, Kaohsiung Customs officers discovered over 2000 kg of medicinal materials in a container of TCM ingredients that had been imported from Hong Kong by a local trading company. These included over 1200 kg pangolin *Manis* (App. II) scales, importation of which is in violation of the *Wildlife Conservation Law*.

On 25 December 1997, Hsinchu city police arrested three individuals for their alleged involvement in smuggling 212 parrots (including 209 lovebirds *Agapornis* spp. (App. II), 12 of which were Black-masked Lovebirds *A. personatus*), as well as non-wildlife items, on a local fishing craft. The captain of the vessel claims to have purchased the birds at Hsinchu flower market, for release offshore as "fang sheng", a Buddhist practice of releasing captive wild animals to gain merit. Several of the parrots were of species protected under the *Wildlife Conservation Law*. The case is being investigated.

On 12 March 1998, police in Tainan city searched the homes of three people suspected of involvement in ivory smuggling and uncovered a number of ivory items, including name seals, pipes, mahjong tiles, and Buddhist figures. The three have been turned over to the Tainan District Court on charges of violating the *Wildlife Conservation Law*. Police are continuing to search for other ivory products.

On 14 January 1998, two people (a Taiwan national and a Canadian national) were arrested at Chiang Kai-Shek International Airport for allegedly smuggling a large number of endangered species, including over 200 lizards, pythons and frogs, several of which are thought to have originated in Madagascar. Included in the pair's luggage were Veiled Chameleon *Chamaeleo calyptratus* (App. II), Carpet Chameleon *C. lateralis*, Panther Chameleon *C. pardalis* and *Brookesia perarmata*; frogs, including *Mantella madagascariensis* and *Mantella aurantiaca*, and snakes, including Boa Constrictor *Boa constrictor* and *Tropidurus melanoleucus*; many specimens had perished on their journey from Prague, via Paris and Kuala Lumpur. The couple were referred to the Taoyuan District Prosecutor's office on charges of violating the *Wildlife Conservation Law*.

On 2 April 1998, police in Keelung seized 190 tusks and 383 ivory pieces weighing a total of 1454 kg. Police and Customs officials, acting on a tip-off, raided the China Freight Station in the northeastern port city of Keelung and found the smuggled items in two boxes hidden behind loads of heavy timber. The tusks had been imported from Nigeria and registered to a local trading firm.

China News (Taiwan), 14 March 1998; Kaohsiung Customs Office Press Release (Chinese), 11 November 1997; United Daily News (Taiwan), 26 December 1997: China Post (Taiwan), 15 January/3 April 1998; summaries and English translations by TRAFFIC East Asia-Taipei

SOUTH ASIA
INDIA

On 7 October 1997, authorities arrested two traders and seized one Tiger *Panthera tigris* (App. I) skin, after staff of the Wildlife Protection Society of India, working undercover, were shown the skin as an example of further such items (and Tiger bones) that the traders claimed they could procure. A second Tiger skin was seized the same day and investigations are underway. Both skins had come from animals poached in the Sunderbans Tiger Reserve, an area considered to contain the largest single population of Tigers in the world: the last official census which took place in 1993 placed the number there at 251.

On 6 November 1997, in Meghalaya, Assam, the following materials being transported from Jowai to Champai in the Garo Hills were seized: 113 kg of ivory; a 9 ft piece of Tiger *Panthera tigris* (App. I) skin and 13.5 kg of Tiger bones; 4 pieces of Leopard *P. pardus* (App. I) skins, 13 pieces of river otter skins; and 20 kg of Pangolin *Manis* (App. II) scales. The items were to be sent to Myanmar and onto China.

Three persons who were arrested in connection with the incident were released on bail but a notice was issued for their re-arrest.

In early November 1997, two rhino horns were recovered from smugglers near Kaziranga National Park.

Wildlife Protection Society of India
Aaranyak Nature Club, Guwahati, India;

PAKISTAN

On 3 November 1997, at Quaid-i-Azam International Airport, Karachi, a consignment of 18 Houbara Bustards *Chlamydotis undulata* (App. I) bound for Muscat, Oman, was seized during a random inspection. These migratory birds were contained in cages, together with waterfowl specimens, and were to be exported as local pet birds. One bustard was dead and remaining specimens were released in Khirthar National Park.

A few weeks earlier, on 30 September, 10 Houbara Bustards were seized by the Sindh Wildlife Department from a man travelling by bus to Karachi. The birds were in a carton and one specimen was dead. The suspect was fined Rs7000 (US$160) and the birds released in Khirthar National Park.

TRAFFIC International; Dawn (Pakistan), 6 November 1998

SOUTHEAST ASIA
MALAYSIA

On 18 December 1997, a restaurateur from Taman Datuk, Kandan Baru, Puchong, pleaded guilty to three charges of keeping parts of protected animals, allegedly for medicinal purposes. Officials of DWNP had discovered a variety of animal parts in the defendant's fridge, including 1 kg of Leopard *Panthera pardus* meat, the leg of a Malayan Sun Bear *Helarctos malayanus*, 8 Marbled Cats *Pardofelis marmorata* (all App. I), 9 Leopard Cats *Prionailurus bengalensis* (App. I/II), 111 Large Flying Foxes *Pteropus vampyrus* (App. II), 1 Indian Muntjac *Muntiacus muntjak* trophy, 1 Lesser Mouse Deer *Tragulus javanicus*, 1 Malay Civet *Viverra tangalunga*, parts of a Pig-tailed Macaque *Macaca nemestrina* and Common Water Monitor *Varanus salvator* (both App. II). The defendant was fined RM9000 (US$2250).

Anaconda trade data extracted from International Trade in Reptile Skins: A Review and Analysis of the Main Consumer Markets, 1983-91. *Martin Jenkins and Steven Broad, Species in Danger Series, TRAFFIC International.*

Anaconda *Eunectes murinus* (App. II) - six specimens were found in a consignment of ornamental fish being shipped from Peru, bound for the USA. A fairly high number of Anaconda skins appeared in international trade in the 1980s (over 80 000 skins during 1983 to 1989). The EU and USA between them accounted for the great majority of trade.
(Photo: WWF/Fernando Urbina)

On 7 January 1998, a raid on a house at Taman Muda, Ampang, by the Department of Wildlife and National Parks (DWNP), yielded 18 Large Flying Foxes *Pteropus vampyrus*, 13 kg of Common Water Monitor *Varanus salvator* meat (both App. II), and 9 Common Palm Civets *Paradoxurus hermaphroditus* (App. III). A restaurant worker was subsequently charged under the *Wildlife Protection Act* for keeping and trading in endangered species. He was fined RM7500 (US$1800) and gaoled for one day. The defendant had previously been directed to obtain a licence but had failed to do so.

Department of Wildlife and National Parks of Peninsular Malaysia

Common Palm Civet
Paradoxurus hermaphroditus
(Photo: WWF/Ron Pelocz)

OCEANIA

NEW ZEALAND

On 29 June 1997, at Otahuhu District Court, Loraine Dale Tait of Havelock North, was charged with importing elephant hide products (a rifle scabbard, wallet and belt) and ivory jewellery upon her return from safari in Zimbabwe in October 1996. She is reported to have placed stickers stamped with the words "genuine buffalo" on the rifle case and belt, and had obtained a false purchase invoice which was presented to Customs on arrival. She claimed that the jewellery was made of bone.

Tait pleaded guilty to two charges (trading in endangered species and producing a false invoice) and was fined a total of NZ$250 (US$142); this was raised to NZ$1000 following an appeal by the Wildlife Enforcement Group, on behalf of the Department of Conservation and Customs.

TRAFFIC Oceania; CITES Task Force, New Zealand

AMERICAS

PERU

On 23 August 1997, Customs officers at Jorge Chávez International Airport, Lima, seized some 1000 animals concealed in a shipment of ornamental fish. The consignment, which was found in an airport shop, included 3 Common Iguanas *Iguana iguana*, 30 Yellow-footed Tortoises *Geochelone denticulata*, 24 Matamata Turtles *Chulus fimbriatus*, 13 Giant South American Turtles *Podocnemis expansa*, 8 Guyana Caiman Lizards *Dracaena guianensis*, 6 Anacondas *Eunectes murinus*, 6 Rainbow Boas *Epicrates cenchria*, 6 Boa Constrictors *Boa constrictor* (all App. II), 18 dwarf caimans *Paleosuchus* sp., 310 Jungle runners [skinks] *Ameiva* sp., 117 seasnakes, 242 tree frogs including 150 Hylidae spp. Some 200 of the skinks had perished.

The specimens were being shipped without the necessary permits by an aquarium firm and were bound for the USA. They are now being cared for by Las Leyendas Park, the State zoo. The CITES Management Authority - the National Institute of Natural Resources (INRENA) - fined the company the equivalent of US$5400.

CITES Management Authority, Peru

USA

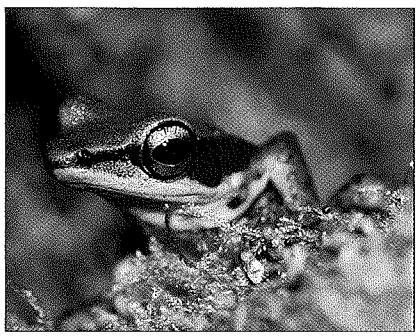
On 14 August 1997, in the Southern District of Florida, three local men were charged with conspiracy and with illegally taking and poaching 610 Loggerhead Turtles *Caretta caretta* (App. I) in violation of the *Endangered Species Act* and the *Lacey Act*. The charges arise following an incident on the night of 19 June, when defendants Barry A. Hayes and Bruce Bivens were approached by Florida Marine Patrol officers as they collected the eggs on Singer Island Beach (a third man, Leonard Bertoloti was waiting in a vehicle). In trying to rid themselves of the evidence, the two flung a sack containing the eggs into the air, scattering and breaking many of them. The eggs are reported to be used as barter for crack cocaine, or sold locally as aphrodisiacs.

The trial is pending.

On 28 August 1997, in the Southern District of Florida, Juan Morales, of Miami, pleaded guilty to charges of illegal commercial sponge collecting and lobster harvesting. Morales was observed on two occasions as he fished in the lobster sanctuary in Biscayne National Park and prised sponges from the sea bed in the Everglades National Park - in November 1996 and July 1997, respectively. In both instances he had docked his ship outside park boundaries and used small skiffs to enter the protected areas. The trial is pending.

On 2 September 1997, in the Southern District of Florida, five individuals were charged with killing a Loggerhead Turtle *Caretta caretta* (App. I) and taking 458 Queen Conches *Strombus gigas* (App. II) from the waters of Biscayne National Park. Sentenced to three years' probation, a three-year ban from all national parks in the State of Florida, and 100 hours of community service devoted to environmental clean-up were: Omar Marine, Angel Marine, Mariano Acosta Sr., Mariano Acosta Jr., and Miguel Bonachea, all of Hialeah, Florida.

The five had been fishing near Bache Shoal when a park ranger boarded their vessel and discovered the specimens. The taking of Queen Conch is strictly prohibited by both State and federal law. There are estimated to be only three breeding aggregations of Queen Conch in the park and the poachings were considered by the court to have a very serious effect on the recovery of conch populations in that area. The defendants were also in possession of 37 protected fish.



150 Hylidae specimens were among more than 1000 reptiles and amphibians seized in Peru. *(Photo: WWF/Mattias Klum)*

On 3 November 1997, Theodora Swanson, of Memphis, Tennessee, sentenced in April 1996 to 37months' imprisonment for her role in smuggling over 400 cockatoo eggs from Australia to the USA, had her sentence reduced to 30 months. Swanson had remained free pending an appeal hearing. The sentence was to take effect on 5 January 1998 (*TRAFFIC Bulletin* 15(3):119; 16(2):76).

On 2 February 1998, Michael J. Van Nostrand, owner and president of Strictly Reptiles, Hollywood, Florida, was convicted of smuggling more than 1500 rare reptiles into the USA. He was sentenced to eight months' imprisonment and a further eight months' home confinement as part of a plea agreement. He was also ordered to pay nearly US$250 000 to the WWF Indonesia Programme to implement a government-supervised programme which will focus on initiating, expanding, improving and maintaining wildlife projects in Irian Jaya, from where many of the smuggled animals had been trapped. Additionally, the agreement bars the company and its owner from trading, selling or handling any endangered or threatened wildlife, as well as certain species specifically identified in the agreement, for five years.

The sentencing follows charges, in July 1997, that Van Nostrand conspired to purchase Frilled Dragon Lizards *Chlamydosaurus kingii* and Fly River Turtles *Carettochelys insculpta* exported from Indonesia, via the Netherlands, in violation of Indonesian law. Further charges included the purchasing and illegal importation to the USA of Argentinean reptiles including Argentine Boa Constrictors *Boa constrictor occidentalis* (App. I), Red-footed Tortoises *Geochelone carbonaria*, Chaco Tortoises *G. chilensis*, Rainbow Boas *Epicrates cenchria*, tegu lizards *Tupinambis* ssp. and Yellow-spotted Amazon Turtles *Podocnemis unifilis* (all App. II).

The investigation was conducted with the cooperation of authorities in the Netherlands, including the Netherlands National Police and the District Office of the Public Prosecutor at Breda. The Netherlands National Police provided the US Fish and Wildlife Service (USFWS) with audiotapes from electronic surveillance of Dutch reptile dealers revealing that protected Indonesian reptiles were being laundered through the Netherlands and shipped to Strictly Reptiles Inc., falsely labelled as captive bred.

On 11 March 1998, at Orlando federal court, Florida, Friedrich Karl Postma of the Netherlands was found guilty of illegally importing reptiles. He had been arrested on 28 August 1997 at Orlando International Airport, after US Customs Service Agents, working in conjunction with the USFWS, found 13 Radiated Tortoises *Geochelone radiata* (App. I and listed in the US *Endangered Species Act*) concealed in five socks in Postma's luggage. The animals are indigenous to Madagascar.

Postma, who runs a reptile business in the Netherlands, had been under observation by the authorities in both countries. He was sentenced to time already served plus six months in a community detention centre and a US$3000 fine. The USFWS and Department of Justice have requested an appeal because the sentence was less than had been agreed upon during a plea agreement reached between the Department of Justice and Postma.

US Department of Justice News Releases,14/28 August/4 September 1997/February 3 1998; US Fish and Wildlife Service

A Preliminary Report on DNA Sequence Analysis of Whale Meat and Whale Meat Products Collected in Japan

M. Phipps, A. Ishihara, N. Kanda, and H. Suzuki

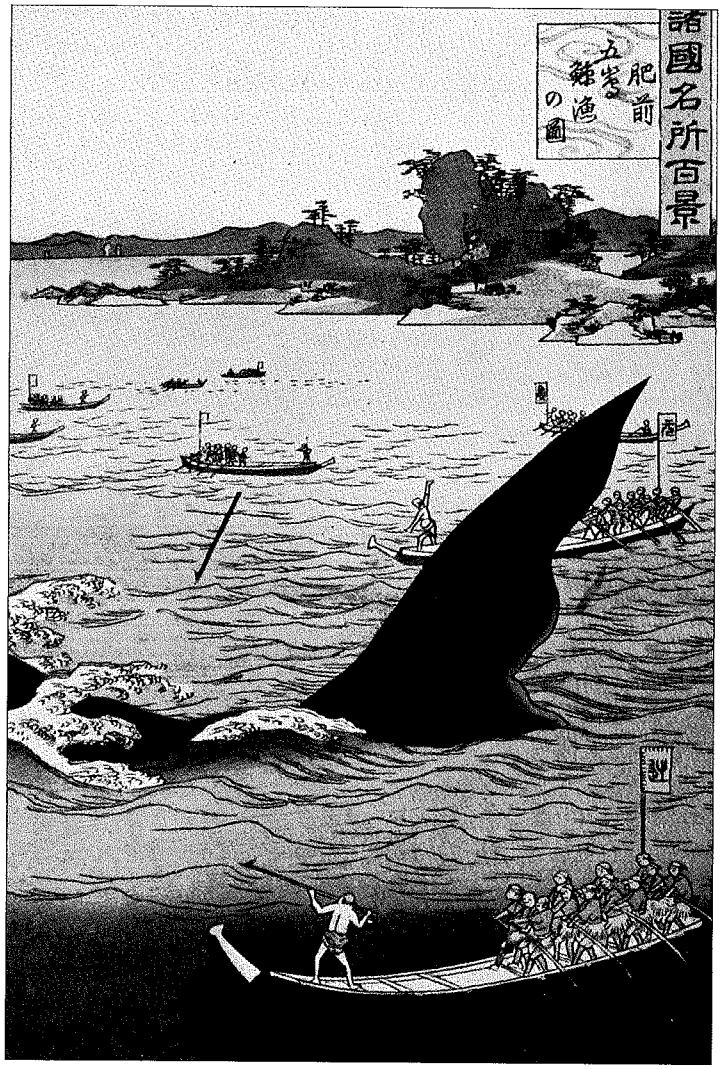
Introduction

In 1982, the International Whaling Commission (IWC) adopted a moratorium on commercial whaling under the schedule of the International Convention for the Regulation of Whaling (ICRW). The moratorium entered into force in 1986 and remains in place today. All cetaceans covered by the IWC moratorium currently are listed in CITES Appendix I, effectively banning international commercial trade. Several countries have lodged objections to the IWC moratorium, entered reservations on the CITES Appendix I listings, or both. Domestic trade in cetaceans and their products, which does not fall under the jurisdiction of CITES or the IWC, remains legal in a number of countries.

The ninth (1994) and tenth (1997) meetings of the Conference of the Parties to CITES, after due consideration, voted not to accept proposals by Japan and Norway to downlist to Appendix II certain populations of Grey Whale *Eschrichtius robustus*; Minke Whale *Balaenoptera acutorostrata*, and Bryde's Whale *Balaenoptera edeni*. The same meetings adopted Resolution Conf. 9.12 (1994) *Illegal trade in whale meat* and Decisions 10.40 to 10.43 (1997) *Co-operation in monitoring illegal trade in whale parts and derivatives* in recognition of the importance of preventing illegal trade in whale meat and other whale products.

While there are no legal restrictions on the domestic buying and selling of whale meat in Japan, legal importation of whale meat products appears to have ceased since 1992 when Japan officially stopped importing whale meat (Chan *et al.*, 1995). However, reports of a number of smuggling attempts intercepted by Japan and other countries have led to concern that some level of illegal trade involving Japan may persist.

Since 1995, TRAFFIC East Asia has monitored whale meat trade in East Asia and conducted market surveys in a number of countries in the region (Chan *et al.*, 1995; Anon., 1996; Mills *et al.*, 1997). The aim of these surveys has been to document domestic control of whale meat trade; the extent to which regional trade takes place; and, where possible, to identify the species and origin of whale meat being offered for sale. To this end, in 1995 TRAFFIC researchers collected 53 samples of whale meat and whale meat products from 10 cities in Japan. However, because visual identification of whale meat products to the species level is, generally, not possible, TRAFFIC engaged scientists to carry out DNA sequence analysis of the samples. TRAFFIC also invited the Japan Fisheries Agency (JFA) to conduct its own analysis of the samples. This preliminary report describes the results of analysis by TRAFFIC's consultants to date and briefly compares TRAFFIC's results with those of the JFA.



Nineteenth century woodcut of whalers in Goto Islands, Hizen (present-day Nagasaki prefecture in Kyushu), Japan. (*Hiroshige Utagawa II*)

Methods

Sample collection

From 10 to 21 April 1995, a TRAFFIC researcher surveyed over 900 retail outlets in 13 cities in Japan (Chan *et al.*, 1995); 51 of these were found to be selling whale meat. A total of 53 samples were purchased in 10 cities during the survey. The samples were preserved in a solution of 75% ethanol and stored at room temperature prior to DNA analysis.

Reference number	City of origin	Product description by retailer	Scientific name	Common name
TR1	Tokyo	red meat	*Balaenoptera bonarensis*	Southern Minke Whale
TR2	Tokyo	red meat	*B. bonarensis*	Southern Minke Whale
TR3	Tokyo	salted meat	*B. bonarensis*	Southern Minke Whale
TR4	Tokyo	red meat	*B. bonarensis*	Southern Minke Whale
TR5	Tokyo	salted blubber	*B. bonarensis*	Southern Minke Whale
TR6	Tokyo	marinated meat	No amplification	-
TR7	Tokyo	red meat	*B. bonarensis*	Southern Minke Whale
TR8	Tokyo	red meat 'gondo'	*Phocoenoides dalli*	Dall's Porpoise
TR9	Tokyo	none	*Balaenoptera bonarensis*	Southern Minke Whale
TR10	Osaka	none	*B. bonarensis*	Southern Minke Whale
TR11	Osaka	none	*B. edeni*	Bryde's Whale
TR12	Osaka	none	*B. bonarensis*	Southern Minke Whale
TR13	Osaka	red meat	*B. bonarensis*	Southern Minke Whale
TR14	Osaka	red meat	*B. bonarensis*	Southern Minke Whale
TR15	Osaka	none	*B. bonarensis*	Southern Minke Whale
TR16	Osaka	none	*B. bonarensis*	Southern Minke Whale
TR17	Osaka	none	No amplification	-
TR18	Kobe	red meat	*B. bonarensis*	Southern Minke Whale
TR19	Kobe	none	*Phocoenoides dalli*	Dall's Porpoise
TR20	Nagasaki	red meat	*Balaenoptera bonarensis*	Southern Minke Whale
TR21	Nagasaki	boiled meat	*B. physalus*	Fin Whale
TR22	Nagasaki	salted meat	*Lissodelphis borealis*	Northern Right Whale Dolphin
TR23	Nagasaki	salted meat	*Balaenoptera physalus*	Fin Whale
TR24	Nagasaki	red meat	*B. bonarensis*	Southern Minke Whale
TR25	Nagasaki	red meat	*B. acutorostrata*	North Pacific Minke whale
TR26	Nagasaki	salted 'une'	*Phocoenoides dalli*	Dall's Porpoise
TR27	Miyagi	'kujira-kun'	*P. dalli*	Dall's Porpoise
TR28	Miyagi	bacon	No amplification	-
TR29	Miyagi	bacon	*Balaenoptera bonarensis*	Southern Minke Whale
TR30	Miyagi	red meat	*B. bonarensis*	Southern Minke Whale
TR31	Miyagi	none	*B. bonarensis*	Southern Minke Whale
TR32	Miyagi	none	*B. bonarensis*	Southern Minke Whale
TR33	Miyagi	red meat	*B. bonarensis*	Southern Minke Whale
TR34	Miyagi	none	*B. bonarensis*	Southern Minke Whale
TR35	Fukuoka	blubber	*Tursiops truncatus*	Bottlenose Dolphin
TR36	Fukuoka	red meat	*Globicephala macrorhynchus*	Short-finned Pilot Whale
TR37	Fukuoka	salted meat	*Balaenoptera bonarensis*	Southern Minke Whale
TR38	Fukuoka	meat steak	*B. bonarensis*	Southern Minke Whale
TR39	Fukuoka	none	*Phocoenoides dalli*	Dall's Porpoise
TR40	Fukuoka	throat	*Balaenoptera bonarensis*	Southern Minke Whale
TR41	Fukuoka	none	No amplification	-
TR42	Fukuoka	none	*B. bonarensis*	Southern Minke Whale
TR43	Sasebo	salted meat	*B. bonarensis*	Southern Minke Whale
TR44	Sasebo	red meat	*B. bonarensis*	Southern Minke Whale
TR45	Sasebo	red meat	*B. acutorostrata*	North Pacific Minke Whale
TR46	Sasebo	salted meat	*Berardius bairdii*	Baird's Beaked Whale
TR47	Sasebo	red meat	*Balaenoptera bonarensis*	Southern Minke Whale
TR48	Sasebo	red meat	*Globicephala macrorhynchus*	Short-finned Pilot Whale
TR49	Sasebo	salted meat	*Berardius bairdii*	Baird's Beaked Whale
TR50	Hiroshima	red meat	*Balaenoptera bonarensis*	Southern Minke Whale
TR51	Hiroshima	salted meat	*Phocoenoides dalli*	Dall's Porpoise
TR52	Chiba	red meat	*Ziphius cavirostris*	Cuvier's Beaked Whale
TR53	Niigata	salted meat	*Balaenoptera bonarensis*	Southern Minke Whale

Table 1. Results of DNA sequence analysis by TRAFFIC of 53 whale meat samples, 1996-1997.

DNA extraction, amplification, and sequencing

In this case, DNA analysis involves a three-step process: DNA extraction, amplification, and sequencing. DNA extraction was carried out at the Tokyo University of Agriculture and Technology. DNA amplification and sequencing were carried out at Hokkaido University. The entire process was carried out over a one-year period, May 1996 to May 1997.

Well-established methodologies for DNA extraction, amplification, and sequencing were used to reveal species-specific differences in a specific section of the DNA. The extraction process separates the chromosomal and extranuclear DNA from the rest of the cellular components such as fats and proteins. The amplification process utilizes the polymerase chain reaction (PCR) to produce large concentrations of the targeted section of DNA. For this study, the mitochondrial cytochrome B gene was targeted.

The sequencing process reads the series of nucleotide bases, the A's, G's, C's, and T's, which make up the information content of the DNA. Where possible, 402 nucleotide bases were sequenced for each sample. For some samples, only smaller fragments of DNA were available. For these, 180 nucleotide bases were sequenced. In either case, resulting sequences were compared to type specimen sequences from known animals.

For more detailed descriptions of methodologies, the reader is referred to Suzuki *et al.,* 1997; Kocher *et al.,* 1989; and, Hillis *et al.,* 1996.

RESULTS

A note on taxonomy

Reeves and Leatherwood (1994) state that mainstream classification of cetaceans is relatively underdeveloped below the species level, in part because of limited sampling. Of direct relevance to this report are ongoing debates over the taxonomy of the Minke Whale and Bryde's Whale. Three distinct morphological forms of the Minke Whale and a diminutive form of the Bryde's Whale have been documented, but their status as races, subspecies, or separate species needs to be clarified (Reeves and Leatherwood, 1994).

This article uses the *1996 IUCN Red List of Threatened Animals* (IUCN, 1996) as its taxonomical reference. The Southern Minke Whale *Balaenoptera bonarensis* is treated therein as a separate species rather than as a subspecies of *B. acutorostrata,* as in the CITES Appendices, which refer to a single Minke Whale species, *Balaenoptera acutorostrata.* Both CITES and IWC provide for treatment of species on the basis of geographically separate populations or stocks if necessary. It should also be noted that the report of the JFA analysis (Anon., 1997) refers to the Southern Minke Whale as the Antarctic Minke Whale.

Results of TRAFFIC's analysis

Results were obtained for 49 of 53 samples (Table 1). Four samples could not be amplified, possibly because of the presence of impurities or because of post-mortem damage to the DNA.

Of the 49 samples identified to the species level, 36 were identified as originating from four species of Mysticetes or baleen whales; 13 samples were identified as having originated from six species of Odontocetes or toothed whales.

Baleen whales identified included Minke Whale *Balaenoptera* spp. (n = 33); Bryde's Whale *Balaenoptera edeni* (n = 1); and Fin Whale *Balaenoptera physalus* (n = 2). Thirty-one of the 33 Minke Whale samples were identified as Southern Minke Whale *B. bonarensis.* Of the toothed whale samples, the most common species identified was the Dall's Porpoise *Phocoenoides dalli* (n = 6). Other species identified were Northern Right Whale Dolphin *Lissodelphis borealis* (n = 1); Bottlenose Dolphin *Tursiops truncatus* (n = 1); Short-finned Pilot Whale *Globicephala macrorhynchus* (n = 2); Baird's Beaked Whale *Berardius bairdii* (n = 2); and Cuvier's Beaked Whale *Ziphius cavirostris* (n = 1). None of the Odontocete species identified above is under the jurisdiction of the IWC. Five species are listed in CITES Appendix II, and the sixth, *Berardius bairdii,* in Appendix I, although Japan has a reservation on this listing.

Comparison with JFA results

The JFA presented a preliminary report on its analysis of the TRAFFIC samples to the forty-ninth meeting of the IWC in October 1997 (Anon., 1997). Results from the two sets of analysis were similar for the most part, but TRAFFIC and the JFA obtained differing results from 14 samples (Table 2). Of the 14, a total of eight samples could not be amplified by one or the other laboratory. Two samples (TR38; TR40) were identified as North Pacific Minke Whale by JFA and Southern Minke Whale by TRAFFIC. TR42 was identified as Southern Minke Whale by TRAFFIC and as a dwarf form of Minke Whale by JFA. An additional three samples (TR19; TR26; TR39) were identified by each laboratory as being of two different species. Neither laboratory was able to amplify one sample (TR6).

The inability of one or the other of the laboratories to amplify the eight samples referred to above could be a result of problems with the samples themselves, handling prior to or during laboratory analysis, or the use of different marker genes or regions in the mtDNA. Differences in identification at the subspecies or population level may have resulted from the interpretation of results. TRAFFIC and JFA used differing identification techniques (cytochrome B and control region) and different databases as references. However, the differing species results for TRAFFIC and the JFA's analyses of samples TR19, TR26, and TR39 are perplexing.

The presence of Dall's Porpoise in the marketplace is not surprising in itself as Japan recorded catches of this species exceeding 70 000 specimens in the period 1990 to 1993 (Chan *et al.*, 1995). Several possible explanations for the differing results exist. Mixing of meat from different species in the marketplace, either accidentally or deliberately, could result in 'compound' samples. If a single sample was contaminated with tissue from two different species, results could differ between the two

Reference number	TRAFFIC results	JFA results
TR8	Dall's Porpoise	No amplification
TR17	No amplification	Southern Minke Whale[1]
TR19	Dall's Porpoise	Southern Minke Whale
TR26	Dall's Porpoise	Southern Minke Whale
TR27	Dall's Porpoise	No amplification
TR28	No amplification	Southern Minke Whale
TR37	Southern Minke Whale	No amplification
TR38	Southern Minke Whale	North Pacific Minke Whale
TR39	Dall's Porpoise	Southern Minke Whale
TR40	Southern Minke Whale	North Pacific Minke Whale
TR41	No amplification	Southern Minke Whale
TR42	Southern Minke Whale	Dwarf Minke Whale
TR43	Southern Minke Whale	No amplification
TR51	Dall's Porpoise	No amplification

Table 2. Samples for which TRAFFIC and JFA obtained differing results. *Source of JFA results: Fisheries Agency, Government of Japan* (Anon., 1997). [1]The Southern Minke Whale is referred to in Anon., 1997 as the Antarctic Minke Whale.

laboratories. Contamination during sample acquisition or in the laboratory is also possible. However, Dall's Porpoise had not previously been analysed in the laboratories where TRAFFIC's analysis of sequences was conducted, and the chances of contamination in the laboratory environment were minimal. Moreover, TRAFFIC's analysis recorded five different and unique sequences in the six samples identified as Dall's Porpoise, making it unlikely that all the samples were contaminated.

The reasons for these differing results are unclear, but the differences are more likely owing to human error than to any fundamental problem with using cytochrome B or control region sequences to identify species. TRAFFIC would like to re-examine these samples in co-operation with the JFA to determine the source of the differences.

Discussion

Mills *et al.* (1997) outline three avenues for whale meat of IWC-listed species to enter Japan's retail market legally: via the factory ship of Japan's scientific whaling fleet; from frozen domestic stocks originating from past whaling or importation; and from bycatch in Japan's territorial waters. The samples identified in this study conceivably could have originated from any of these sources. Should CITES in future choose to downlist any of the baleen whales to Appendix II, international trade could provide an additional legal avenue. Meat from small cetaceans, harvest of which is not regulated by the IWC, is also available in the market and may be sold under the generic term 'whale meat.'

While there has been no proof of illegal whale meat entering Japan to date, interception by Japanese and other authorities of a number of attempted illegal shipments has resulted in concern that illegal trade may take place. Under the terms of CITES Resolution Conf. 9.24, proposals to downlist species from Appendix I to Appendix II must show that adequate trade control mechanisms are in place to ensure that removal of the species from Appendix I does not jeopardize that species or other species still in Appendix I. Norway is developing domestic trade control and inspection systems that incorporate DNA profiling and creation of a DNA register of individual whale "fingerprints" as important components. Japan is considering development of a similar system.

In Japan, DNA profiling could provide an effective tool for monitoring whale meat stocks only if samples from all legitimate sources of whale meat were to be included. Under the current domestic management system, a DNA register would need to include samples of meat alleged to originate from frozen domestic stocks and legitimate bycatch as well as samples from Government-controlled whaling. A partial register would be of limited use in determining the legality of whale meat in the marketplace. In any event, DNA analysis cannot determine the length of time samples have been in storage.

An additional consideration is the reliability of this type of analysis for samples sourced from the marketplace where compounding may occur. Analysis of the 53 samples under discussion was carried out by two groups of qualified scientists utilizing differing but standard methodologies in controlled laboratory conditions. Although the results from the two sets of analysis corresponded for the most part, there were significant differences for several samples. A DNA register would need to include appropriate measures for cross-checking the results of DNA analysis.

There is the possibility that all whale species protected under the IWC moratorium on commercial whaling could enter the Japanese market either through existing frozen stocks or bycatch (Mills *et al.*, 1997). Should meat from frozen stocks and bycatch remain outside of a future DNA register, it would continue to be difficult to distinguish meat from some species as legal or illegal in origin. The Government of Japan needs to consider this when developing future trade control mechanisms to meet the requirements of CITES Resolution Conf. 9.24.

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