Imports of Indonesian Marine Products into the European Union 1990-1995

CAROLINE RAYMAKERS

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Caroline Raymakers

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Front page: *Bajo (former sea-nomads) fishing settlement in Tukang Besi archipelago, Southeast Sulawesi, Indonesia*
(Photo: Caroline Raymakers)

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EXECUTIVE SUMMARY

The demand for exotic fisheries products in the European Union (EU) is increasing at a rapid pace. Marine wildlife specimens from the rich Indonesian waters are driven into this acceleration. Trade data between Indonesia and the EU from 1990 to 1995 highlight particular trends. Corals, marine aquarium fish, shrimps (or prawns), seaweed, and many other products from seas and oceans, are imported for various purposes: food, ornamental, educational (zoos and aquariums), breeding, and research. These goods are sold immediately or after processing to European consumers, while others will be transformed and re-exported. A wide range of commodities, from tuna to mother of pearl, is supplied by tropical countries where biodiversity is high and the average income per capita relatively low. These involve industrial catches as well as small-scale traditional fisheries products.

The EU, USA, Japan, and China (including Hong Kong), are the main official importers of natural resources in the world. The development of trade between two partner countries often depends on historical circumstances, particularly between EU countries and their former colonies. Present shipping and airline contracts are still influenced by centuries-old trade links. For instance flights frequency and numerous destinations between Indonesia and EU Member States provide constant, quick and reliable supply to retailers such as aquarium and seafood shops in countries of destination. Meanwhile in Indonesia, villagers who supply the export market live in remote coastal settlements, and depend almost entirely on marine resources for their food and income, benefit from the stable demand.

The worldwide intensification of and competition in air transportation has resulted in a decrease in the cost of air flown goods. In Indonesia, the Asian financial crisis that started in October 1997 and the destitution of a president after almost 35 years of "reign" created a new economical and political context. A great deal of inhabitants are forced to find new options to support their livelihood. With the drop in value of the country's currency (Indonesian rupiah), only the export market can keep people's buying-power from falling too far down. This situation will certainly increase the flux of marine life towards foreign well-to-do markets revealed in the study from 1990 to 1995. Higher exploitation of reef organisms, particularly for low investment traditional reef fisheries products, can be expected.

Indonesian coastal ecosystems and coral reefs have never been so threatened. In addition to the predictable increase in human pressure described above, effects of deforestation caused by 1997/1998 forest fires and of El Nino on coastal habitats and coral reefs, are starting to show. September 1998 scientific surveys revealed that vast areas of reefs in the Strait of Malaka are now covered with sediments from land based run-offs, and that sea water temperature rise (1°C is enough) provoked coral bleaching in the South China Sea.

International trade creates a raising lucrative outlet for marine wildlife products. From 1990 to 1996, the average unit value of Indonesian marine products exported to the EU has increased by 12.3%, from US$4/kg to US$4.6/kg. One of the potential reasons for this trend is the increase in value-added commodities, fillets instead of whole fish, agar instead of raw seaweed, surimi, etc.

Exports and imports are monitored and controlled by customs, mostly regulated by national laws, and sometimes by international conventions. National customs services provide import and export data. The Harmonised Commodity Description and Coding System, used by many Custom services in the world, does not provide species specific trade data. When listed in CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) Appendices, and/or in the Annexes of the EU Wildlife Trade Regulation (EC) No 338/97, species trade internationally will be recorded separately, and detailed analysis of their exports/imports can be made. These data allow to make detailed analysis.

Corals

More than 200 species of hard corals, and all "Black corals" (Antipatharia) are listed in CITES Appendix II. Indonesian law prohibits the harvest and trade in Black corals, but they are openly sold in popular department stores in Jakarta. In 1995, Indonesia reported to have exported worldwide a total of 1,155,000 pieces of hard coral (slightly less than 1kg per piece). Between 1985 and 1995 the EU was the second largest importer of hard corals from Indonesia, with an annual average of 122,000 pieces — far behind United States (677,000 pieces) but ahead of Japan (114,000 pieces). EU imports of Indonesian hard corals increased by 400% in 5 years, from about 39,400 pieces of coral in 1990 to 154,450 in 1995.

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Hard coral export quotas are established annually by the Indonesian CITES Scientific Authority for marine organisms (National Institute of Oceanography, P3O-LIPI). Annual export quotas are not set at species level but per genus of hard corals. The demand however focuses on a very limited number of species in each genus. The curio trade focuses on dead corals and the attractive shape of the stony skeleton of certain species. While the aquarium traders take into account the aesthetic features of coral species in their live forms (e.g. size and colours of tentacles during the day). Unfortunately, these commercial criteria do not distinguish between hard coral species that are common and/or fast growing, and the rare ones with limited distribution that are more vulnerable to over-harvesting. Because of the nature of corals (stony like colonies of organisms sometimes difficult to identify), there is much confusion over what should or should not be considered protected under the CITES legislation. Therefore P3O-LIPI also determines export quotas for non-CITES coral products (e.g. fossil coral of unidentifiable species). Nowadays, pet shops specialised in aquarium fish sales also provide a variety of live coral species, both hard and soft. The development of local and intercontinental transportation, speedboats and air-freight, allows the trade of more fragile species and live corals. Since the late 1980s, large amounts of live hard corals have been imported for the aquarium trade. From 1990 to 1995, the proportion of Indonesian corals imported live into the EU for the aquarium trade increased from 9 to 38% of the total.

TRAFFIC Europe's recommendations concerning Indonesian coral collection and exports are as follows:

- determine annual export quotas for CITES listed corals per species and not per genus;
- give priority to measures that prevent over-exploitation of coral species with highest commercial value;
- concentrate management efforts on reefs that are under particular pressure because of their geographical location, for instance the ones close to international transport facilities;
- implement field projects aiming at selective coral collection in time and in space; and
- improve enforcement of the Indonesian law that prohibits "Black corals" collection and trade;
- promote Indonesian conservation efforts through trade channels to the EU: build awareness among Indonesian exporters and EU importers, involve them in conservation efforts by stimulating marketing incentives of corals from sustainably managed reefs, and inform consumers in Europe of environmental reliable sources.

Shells and sea turtles

Seven species of marine shells that occur in Indonesian waters are included in CITES Appendix II, and six species of sea turtles in Appendix I. Between 1990 and 1995, 21 specimens of shells, and 400 kg plus 2 specimens of sea turtles were officially shipped from Indonesia to the EU. Custom seizures in the EU during the same period averaged 48 specimens of shells and 19 specimens of sea turtles annually. This suggests that illegal imports do occur, whether voluntarily or by ignorance. Since the late 1980s, important efforts were made to develop Giant clams (*Tridacna* spp and *Hyppoppus* spp) culture in Indonesia. However, according to official lists, captive breeding facilities that are able to produce significant quantities of second generation specimens (compulsory under CITES provisions) are not yet operational. Concerning sea turtles, close to

100% of the eggs are collected for human consumption on almost all accessible beaches in the country. During the 1980s various so-called "ranching" activities took place in Indonesia. Most have been abandoned, some had negative impacts and none received proper scientific and technical follow-up.
TRAFFIC Europe recommends:

- to visit Giant clams breeding facilities that claim to produce second generation shells;
- Based on the results of the study on shells and sea turtles trade from Indonesia to the EU,
- to use existing state-owned Giant clams hatcheries in order to develop ranching projects of various species in national parks;
- to study impacts of sea turtle "ranching" projects initiated in the 1980s;
- to manage sea turtle eggs collection on a great number of Indonesian turtle nesting beaches;
- to improve enforcement of Indonesian law prohibiting collection and trade of all sea turtles, except for Green turtles; and
- to promote awareness concerning CITES provisions for sea turtles among tourists visiting Indonesia as well as traders in Southeast Asia and in the EU.

For fisheries products that are not covered by CITES, trade data are provided by FAO (Food Agriculture Organisation of the United Nations) and Eurostat (EU office of statistics) where annual reports of Custom services are compiled. More than 15 groups of products were studied. The following appeared to be most relevant regarding the potential environmental impacts of EU imports on Indonesian marine and coastal resources: marine ornamental fish, shrimps, and seaweed.

Marine aquarium fish

Imports of marine aquarium fish from Indonesia to the EU increased by 150% in 6 years, from 85.2 tonnes in 1991 to 217.1 t in 1997, US$ 2 million and 4.2 respectively. Usually statistic on tonnage of live fish are based on data from shipments that do not separate weight of the fish from weight of water and containers. This misleads the reading of figures of which only 1.5 to 3% of ornamental fish shipments is fish, the rest being mostly water. The wet weight of marine aquarium fishes ranges from 7 to 10gr each. Based on these two parameters 217.1 t represents very roughly 651,000 fishes. Trade records reported by Indonesia to FAO do not distinguish marine from freshwater fish, let alone the species in trade. The lack of readily available trade records per species of marine aquarium fish in FAO and Eurostat data does not allow to estimate the impact of EU imports on Indonesian reef populations. Detailed records are particularly vital for rare species and reef fish with limited distributions: we need to know if catches jeopardise the conservation of wild populations, and if so which ones. Wild populations can be affected not only by the number of fish caught but also by destructive fishing techniques. A common fishing technique, although forbidden by law in Indonesia as in most countries concerned, involves cyanide. It stuns the fish and allows divers to catch them alive, and quickly. Unfortunately, cyanide causes irreversible damage to fish and to coral polyps present in the area of active cyanide dispersion.
In light of these findings on marine aquarium trade, TRAFFIC Europe would recommend that:

- Consistent trade records on aquarium fish species imported should be compiled by EU Custom services to determine their status in the long-term and identify species at risk. In some cases, detailed trade figures (volumes and values) may be collected using existing customs records;
- Trade records reported by Indonesia to FAO should distinguish marine from freshwater fish;
- Species that have been recognised of conservation concern should be proposed for listing under CITES Appendix III, or under Annex D of the EC No 338/97 Regulation. Since June 1997, all sea horses species (*Syngnathidae*) have been included in Annex D of the EC Regulation, to monitor imports of live and dead (dried) specimens into the EU;
- More research must be undertaken to document the extent of destruction of coral reef organisms by cyanide and the long-term impact on this ecosystem. The results should provide a more accurate picture of the ecological and economical costs of cyanide fishing. These figures would further help with estimating the potential long-term benefit of projects for the sustainable exploitation of reefs with coastal communities that fully depend on their resources;
- Field project proposing alternative fishing methods (nets) to fishers should be supported and further promoted through trade channels to the consumer.

Shrimps (or prawns)

Shrimps made the second largest proportion of all fisheries products imported from Indonesia by the EU in 1996 (4,630 t), after tuna species. In 1993, half of the Indonesian shrimp production was destined to the export market. From 1994 to 1996, the total annual average EU imports of shrimps (frozen, prepared and preserved) worldwide was 306,400 t, worth US$ 806.8 million (Eurostat). As the value of the Japanese Yen dropped in 1997, Southeast Asian countries shifted their exports to other markets (Vietnam, for example, now focuses on the EU). EU imports of Asian shrimps may therefore have increased recently. Asian imported shrimps come from two distinct industries, shrimp trawling and shrimp farming. In 1993, wild catch represented 65 to 70% of the world's total shrimp production, the remaining percentage being produced in shrimp farms. In 1992, Indonesian total reported shrimp production amounted to 189,000 tonnes. Just over a third of that came from trawling, while two thirds were produced by intensive shrimp farming.

Both trawling and shrimp aquaculture cause heavy and losses in marine and coastal resources. Trawlers are equipped with a small-mesh bag-like net. They aim at shrimps but catch a bigger proportion of various marine species, such as large and small fish, molluscs, rays, sharks, and even turtles and dugongs. Most of these organisms die before, or while, they are on the deck of the vessel. Not having enough economic value to be stored and processed, they tend to be discarded immediately into the sea. As a result, shrimp trawlers that supply overseas consumers' markets, often pollute water and beaches, and deplete local fish stocks — main source of subsistence in remote coastal villages. This large volume of wasted marine life is called "by-catch" and can reach 92% of the total catch of shrimp trawlers operating in Indonesian waters. Bottom trawling also causes destruction of sea grass beds and mud flats in Eastern Indonesia. Since the mid-1970s the Government of Indonesia has adopted a series of laws that set geographical limits to shrimp trawling and force the use of By-catch Excluder Device (BEDs). These devices (e.g. By-catch Reduction Device, Turtle E.D.), constituted of a large-mesh net or a rigid grid, have proved to significantly decrease by-catch, but reports indicate that most vessels do not obey the law.
Coastal aquaculture is a centuries-old tradition in most Asian countries. Nowadays, the traditional low investment, extensive (low density) and multi-species brackishwater ponds have been replaced by high investment, intensive and mono-specific shrimp farming. Intensive farming is associated with the high-stocking density of shrimps in ponds. This practice involves artificial food supply (fish meal pellet) and the use of chemicals to eradicate predators, plus antibiotics to prevent infections. It needs important quantities of fish meal, has caused pollution of coastal waters and damaged valuable land. Alternative methods are progressively being applied to decrease the negative environment impacts.

In the following recommendations TRAFFIC Europe insists on actions towards sustainable shrimp production that involve, directly or indirectly, trade between Indonesia and the EU. Specific conservation efforts on shrimp fisheries and aquaculture to be undertaken locally, by the Government of Indonesia and local companies, are listed in the report.

- Governments of EU consumer countries should assist in the transfer of technology and stimulate law implementation in Indonesia, the supplying country. For instance: provide fishing devices that enable local companies to comply with possible new regulations without direct cost, and include environmental issues (e.g. by-catch and habitat damage) in bi- or multilateral trade agreements. Indonesia and the EU could point the way forward here;
- By offering market incentives to their products, seafood importers in the EU and exporters in Indonesia should encourage companies to comply with guidelines, criteria and/or regulations that aim at sustainable shrimp production practices. This applies to shrimp trawling and to shrimp farmers that should both commit to reduce environmental impacts of their activities. For instance, the use of BEDs by shrimp trawlers, and less intensive farming practices in shrimp aquaculture. Some representatives of the shrimp industry in Europe recognise that certification, whether national or international, can bring them clear benefits, such as the labelling of their products as originating from environmentally-sound shrimp operations. Most tropical waters shrimp trawling operations and investors in shrimp farms will have to make changes in order to warrant certification. Governments should foster trade and market incentives for the products of these fisheries and farms;

- In the EU, consumers should be told of the ecological and socio-economic consequences of their food habits. They should be made aware of alternative techniques, which promote the sustainable exploitation of natural resources, but are still disregarded by the majority of the industry.

Seaweed

Red seaweed grow unattached in sea waters. Indonesia produces large quantities of it. Red seaweed such as *Eucheuma*, *Kappaphycus* and *Gracilaria* have been used for centuries, as human food, feed for livestock, fertilisers and as soil conditioners. Nowadays they are also used to produce substances known as colloids that dissolve in water to give thick or viscous gel-like solutions. Agar and carrageenan are colloids extracted from *Gracilaria*, and *Eucheuma* and *Kappaphycus* respectively. Large volumes of these substances are needed by modern food and pharmaceutical industries in the EU.

In 1991, EU Member States were the most important buyers of Indonesian dry seaweed, 4,944 tonnes worth US$ 2.26 million representing half of the country's total exports. 85% of these imports went to Denmark to supply one of the Europe's largest colloids processing factories.

Because of its importance in EU food and pharmaceutical industries, Indonesian seaweed is an export commodity enjoying a stable and raising demand. International trade could play a potential role in promoting seaweed originating from remote villages in Indonesia where it now represents the main source of income, replacing other fisheries resources in households economy.

While small-scale seaweed farms probably have a limited ecological impact, little is known about the possible impacts of unplanned expansion of seaweed culture on vast areas of reef flats where coral, seagrass, and other marine organisms occur. Less sunlight, for instance, underneath vast areas of seaweed culture, might be a factor causing the decrease in photosynthetic growth.

In many circumstances seaweed culture has however become a valuable alternative income-generating activity. Target areas include those where villagers are struggling for their livelihood, and where fishermen are driven into the use of destructive fishing practices (blast and cyanide fishing), and over-exploitation of depleted marine ecosystems. A survey in islands indicates that, 44% of the villagers who converted to seaweed farming completely abandoned their previous occupation, and 64% of them were fisherman.

After gathering and analysing facts and figures on seaweed culture and trade, TRAFFIC Europe suggests the following recommendations:

- A thorough assessment of potential ecological impacts of seaweed culture development in Indonesian coastal zones should be made before investors or officials decide to support it;
- The planning should then aim at preventing negative spin-offs, in particular effects on the local environment, caused by the possible uncontrolled expansion of seaweed farming;
- The marketing of seaweed products need to be prepared;
- It is essential that major importing companies of agar and raw seaweed, particularly in the EU first importer of Indonesian products, increase their participation in seaweed culture integrated conservation and development projects. This should mainly happen through technical expertise, marketing assistance, and by encouraging joined-ventures in the development of the local industry for the extraction of agar and carrageenan.

TRAFFIC Europe's main recommendation is to focus on the necessity to actively involve traders in conservation efforts. At both ends, in this case the EU and Indonesia, trade aspects should be integrated in projects designed to collect, exploit, farm and harvest wild resources in a sustainable way, including environmentally-sound quantities and practices. Fisheries and aquaculture do not only supply the needs and demand of people, they must maintain nature's fragile balance on reefs, mud flats, sea grass beds, etc. Fishing communities should receive a fair share of their fisheries as an incentive to manage instead of depleting them. Fisher folks are not the only beneficiaries of the exploitation of the seas and oceans, "middlemen" and consumers also are.

Map of Indonesia

--- E.E.Z. (Exclusive Economic Zone)

INTRODUCTION

Tropical climate allows the development of the highest biodiversity in the world. This is not only true for the rainforest, but also for marine ecosystems. The highest marine biodiversity has been recorded in coral reef ecosystems. Over 30% of the world's coral reefs are found in South East Asia alone. Indonesia, located between 10° latitude South and 6° latitude North, is composed of over 17,000 islands with a total of 81,000 km coastline (Badrudin 1996), and 7500 km2 , or 750,000 ha coral reef coverage (intertidal -exposed at low tidal- portion) (Anon. 1992). The highest diversity of reef-building corals, some 500 to 700 species, occurs in the vast Indo-Pacific biogeographic region (Briggs 1974), where about 450 nominal Scleractinian coral species are recorded from the Indonesian Archipelagos thus far (Tomascik 1997). With as many as 3,000 different species (fish, invertebrates and algae) on a single coral reef (Wells 1992), Indonesia is recognised as the depository of some of the most diverse reefs in the world.

Coral reefs are, however, extremely vulnerable to human induced external pressure, such as overfishing, destructive fishing techniques, the use of explosives and poison (e.g. cyanide), pollution, siltation, and dredging. Artisanal and industrial fisheries, which are important sources of subsistence and foreign currencies in the Southeast Asia Region (Cesar 1996), put the reefs under very high pressure. Many marine species are subjected to over-exploitation: tunas by purse seines or shrimps by trawling; sharks by gill-nets and hooks; sea cucumbers, shellfish, seahorses caught and collected by numerous fishing communities for commercial purposes. Since the drastic drop of Philippines' supply in marine products (McAllister 1988) in the early 1990s, due to wild stock depletion and to recent stricter national regulations adopted by the Government of the Philippines, fisheries efforts have increased dramatically in the neighbouring Indonesian waters (Shoup 1996). This involved particularly marine ornamental fish and curio (e.g. shells and corals). Meanwhile, Philippine exports of ornamental fish recovered (Vallejo 1997), mostly because fishing communities benefited from training, education and other efforts of non-government organisations (NGOs: Ocean Voice International, International Marinelife Alliance (IMA), etc.) as well as of the government, concerning sustainable exploitation of marine resources and reef management.

In Indonesia all large cities are located on the coast. More than 6 million full- and part-time workers are directly involved in fisheries (Anon 1993)(see pictures Annex III). The marine environment is both a dominating physical reality and a source of national wealth. Indonesian territorial waters total 5.6 million km2, 3.1 million km2 as the national domain and 2.5 million km2 as the 200-mile Exclusive Economic Zone (EEZ) added to Indonesia's maritime jurisdiction in March 1980 (Bailey 1987).

In 1996, government and non-government partners launched the "International Coral Reef Initiative", 1997 was chosen to be the "International Year Of the Reef" (IYOR, Anon. 1997c), and 1998 the "Year of the Oceans". Marine biodiversity has been described in details in key publications (Norse 1993; McAllister 1995; Tomascik 1997). WWF and IUCN have recently co-published a document on the implementation of the Biological Diversity Convention (BDC) in marine and coastal habitat (de Fontaubert *et al.* 1996). Field projects have started throughout archipelagos in Indonesia and in the Philippines. These projects involve preservation of key marine sites, management of marine resources, coral reef surveys, awareness of fishing communities, and lobby of provincial and national authorities for fisheries law enforcement.
A great deal of products from small-scale and industrial fisheries in Southeast Asia are exported to supply markets in Hong Kong, Japan, the United States, Europe, etc. The influence of trade trends must be taken into consideration when developing and implementing marine conservation strategies in Southeast Asia. Therefore, WWF-Netherlands decided to undertake a study of Indonesian marine products imported into the European Union (EU -15 Member States-).

The present study describes the Indonesian marine fisheries commodities that are imported in the EU, and documents how European consumption patterns may affect Indonesia's marine wildlife. The results can be used in developing marine conservation projects in Indonesia, and in designing consumer awareness programmes in Europe.

METHODS

The study was undertaken in 1997. At that time complete fisheries data were available until December 1995, and trade data until December 1996.
The work was limited to 6 years: 1990 to 1995.

Marine commodities that are targeted include two distinct types of commodities:

- products from species listed in CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) Appendices (see list of species and taxa in Annex I), with data provided by WCMC (World Conservation Monitoring Centre, Cambridge) (Anon. 1997a). Corals, shells, and turtles are the main marine CITES listed taxa in trade, but for conservation and socio-economical purposes lizards and crocodiles from associated ecosystems, coasts and islands were added to this study (see Annex VII). Indeed, together with fish and marine invertebrates, lizards and crocodiles play a role in the ecosystems (e.g. lizards are predators of turtle eggs on beaches), and their products have a high commercial value for coastal and island villagers. Thus they are of importance for WWF's integrated conservation and development approach that is implemented by field projects.

- products from other taxa (groups of species) that are targeted by industrial fisheries on one hand (e.g. tunas, shrimps and prawns), and by artisanal fisheries on the other hand (e.g. live fish, various cephalopods, and other invertebrates including sea cucumbers ("teripang") as well as jellyfish), all commonly caught for the export market in Indonesian waters. Data on landings were provided by FAO Fisheries Statistics from 1988 to 1994 (Anon. 1995e; Anon. 1996a), and EU Member States declared import data were provided by Eurostat from 1990 to 1996 (see list of commodities codes based on the EU Combined Nomenclature (CN) in Annex IV).

The type of data used and their sources are as follows:

Species	Reporter	Data	Source
CITES listed	EU Member States	Imports from Indonesia	WCMC
Not CITES listed	Indonesia	Total exports to the world	FAO
Not CITES listed	EU Member States	Imports from Indonesia	Eurostat

In the absence of substantive alternative sources these data provide the best indication of the magnitude of trade links between Indonesia and the 15 EU Member States. At various occasions Indonesian export records are compared to EU Member States import figures. Recognising that such comparison may lack accuracy, these percentages do however give a rough indication of the relative importance of the trade between partners.
Focus is put on trade data (EU imports, and Indonesia's exports). These do not reflect trends of fisheries landings in Indonesia. The latter may show that marine resources are under heavier pressure than suggested by the country's export data (re. **Indonesian fisheries products: Groupers**).

A request for information on seizures by custom services of Indonesian marine products was sent to the CITES Management Authorities (MA) of EU Member States.
The information made available by the MAs and custom services was as follows:

Table 1 Response of CITES Management Authorities (MA) and Customs Services (CU)*

	1988	1989	1990	1991	1992	1993	1994	1995	1996
Austria (1)	0	0	MA	MA	MA	MA	MA	MA	0
Belgium (1)	0	0	0	0	0	0	CU	0	0
Denmark (3)	MA	MA	MA	MA	MA	0	0	0	0
Finland (1)	0	0	MA	MA	MA	MA	MA	MA	0
France (2)	0	0	0	0	0	0	0	0	0
Germany	0	0	0	MA	MA	MA	MA	MA	0
Greece (2)	0	0	0	0	0	0	0	0	0
Ireland (1)	0	0	0	0	0	0	0	0	MA
Italy (1)	0	0	0	0	0	0	0	MA	MA
Luxembourg (1)	0	0	0	0	0	0	0	0	CU
Netherlands	0	0	CU	CU	CU	CU	MA	MA	0
Portugal (2)	0	0	0	0	0	0	0	0	0
Spain (1)	0	0	MA	MA	MA	MA	MA	0	0
Sweden (1)	0	0	MA	MA	MA	MA	MA	MA	MA
Un.-Kingdom	0	0	MA	MA	MA	MA	MA	MA	0

** In most countries data about recent seizures (performed less than two years ago) are not available because the seizures are still under investigation, and the information about on-going court cases must be kept secret.*
(1 Data not available at MAs offices, at the time the study) (2 No answer)
(3 Statistics compiled per annum were available until 1992)

GOVERNMENT OF INDONESIA NATIONAL REGULATIONS

Indonesia has domestic measures protecting several marine species occurring in Indonesian which are not listed in CITES, especially shells. Under Indonesian national law (Act N°5 of the Republic of Indonesia on Conservation of Living Resources and Ecosystems 1990), it is for instance prohibited to catch, detain, and/or trade the following species: *Trochus niloticus* (top shell, "lola" in Indonesian language) (see pictures Annex III), *Turbo marmoratus* (Great Green Turban, "batu laga"), *Charonia tritonis* (Trumpet Triton), and *Cassis cornuta* (Horned Helmet) (Dance 1992).
The harvest and trade in Black coral (*Antipatharia* spp) (see Annex III) is forbidden under Indonesian law, while this taxa is listed in CITES Appendix II that allows the collection and trade as long as valid export permits have been delivered by the country of origin. The list of protected species under Act N°5 also includes terrapins such as Batagur (*Batagur baska*) and the Malaysian Giant Turtle (*Orlitia borneensis*), and three chelonian species (Jenkins 1995). But many species are captured and exported under a quota system (e.g. Travancore Tortoise (*Indotestudo forstenii*)).
On the other hand, *Chelonia mydas* (Green turtle) is not protected by law in Indonesia, while it is listed in Appendix I of CITES. This species is heavily exploited throughout the country. In the early 1990s, unofficial annual Green turtle landings in Bali were as high as 20,000 adults. On remote beaches villagers collect the eggs before dawn, this harvest also includes eggs from other species (*Eretmochelys imbricata*, Hawksbill turtle; *Dermochelys coriacea*, Leatherback turtle)(Groombridge and Luxmoore 1989; WWF-Indonesia field staff observations 1992-1997). Local authorities often claim that the national regulation only protects young and adult individuals but not the eggs (WWF staff field observations). Lack of awareness, as well as confusion and misunderstanding about regulation increases the depletion of Indonesian turtle populations.

Refering to the Republic of Indonesia Act N°5 on the Conservation of Living Resources and Ecosystems 1990), the forbidden harvest and the ban on domestic trade of any product as is usually very difficult to enforce, not only because of the lack of awareness of the local staff, but also for two additional reasons. First, Indonesia is a vast country, more than 4,800km from east (Jayapura, Irian Jaya) to west (Aceh, Sumatra), and about 17,000 islands some of which are not accessible with small vessels during monsoon season. Secondly, compared to the value of many fisheries products local wages are extremely low, making illegal activities even more attractive.

The Directorate General of Fisheries (DGF) of the Ministry of Agriculture, based in Jakarta, provides the overall directives and guidelines for laws and regulations concerning fishing practices, fisheries products, marine species, etc. Implementation and enforcement of these laws is usually the responsibility of the provincial governments. In addition the provincial governments may implement new or more stringent and specific regulations relevant to their region. Both Indonesian and foreign trawlers must apply for a special fishing licence. The Directorate General of Fisheries in Jakarta issues licences to vessels over 30 tonnes, while those below 30 tonnes apply for a licence at provincial level.
In the late 1970s, the Government of Indonesia realised that shrimp trawl nets are not selective and can cause severe damage to local small-scale fisheries. Several legal measures were taken to decrease the negative impact of trawling operations: a Presidential Decree (No 39) adopted in 1980 restricted shrimp trawling operations to the Arafura Sea (far eastern part of Indonesia, concerning two provinces, Maluku and Irian Jaya); additionally, to prevent bottom trawling accidents, a later law prohibited trawlers to operate close to the coast (limited distance established by law) or in shallow waters (minimum depth determined by law); and finally a regulation was voted in order to decrease by-catch. It is now compulsory for all trawlers operating in Indonesian waters to fit a By-catch Excluder Device (BED: gate like device) in front of the trawl net mouth.
However, for all shrimp trawlers above 30 tonnes[1] fishing in the Arafura Sea, provincial governments, based in Ambon (Maluku) and in Jayapura (Irian Jaya), can only advice DGF which often disregards their recommendation (local officer's reports, since 1990). Moreover, it appears that the Total Allowable Catch (TAC) calculated by the DGF for certain species in the EEZ, is mainly used for determining whether foreign interests should be allowed to fish a resource and are

[1] 1 tonne (t) = 1,000 kg.

not directly enforced by means such as a quota system (Keong 1996). This is probably also valid for Maximum Sustainable Yield (MSY) calculated for shrimp catches.

Indonesia is member of several international fisheries conventions and bodies (e.g. Indo-Pacific Fisheries Commission, IPFC; Indian Ocean Fishery Commission, IOFC; Food Agriculture Organisation of the United Nations, FAO) with regard to the conservation and management of living resources of the high seas (Savini 1991). The GOI is requested to report fisheries landings (Weber 1996) and exports to these bodies, and conventions formulate recommendations for fisheries management in general as well as for particular species.

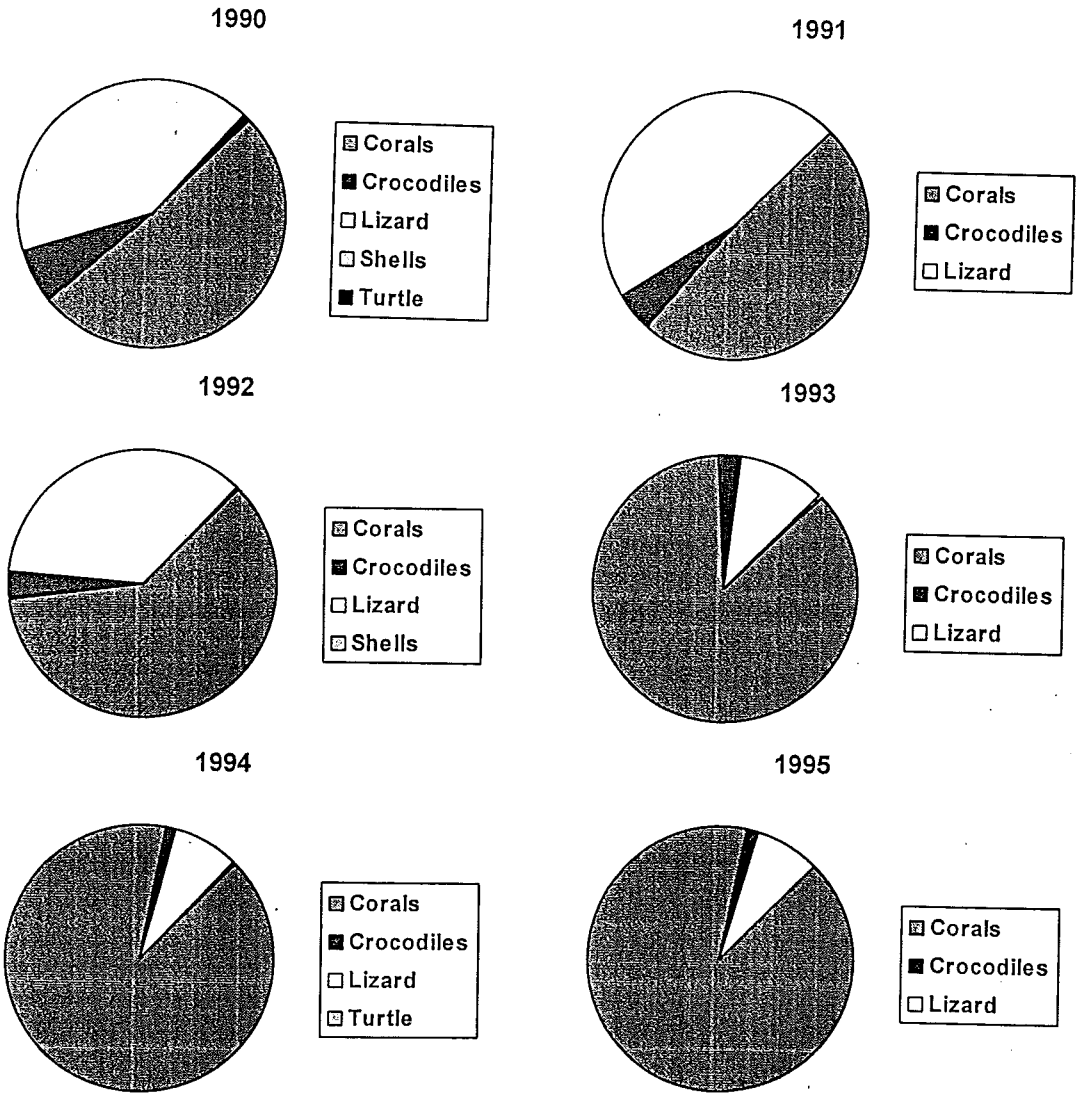
TRADE IN PRODUCTS OF CITES LISTED SPECIES

The present chapter is not limited to marine species, it also includes products and specimens of Indonesian CITES listed species that occur in related ecosystems (coasts and islands). Crocodiles living in estuaries and mangroves, and lizards occurring on (and around, since most species swim) coasts and islands were selected because of their role in the ecosystem (predators of marine species), and their economical value, for suppliers (e.g. Indonesian island and coastal villages) as well as for the EU luxury goods market.

With regard to aquatic species listed in CITES Appendix I, over the six years covered by the study, 1990-1995, Indonesian CITES Management Authorities did not make exemptions or issue export permits to the EU for products from marine mammals (dugongs, dolphins, whales), and terrapins (*Batagur baska*). Only three permits were issued for the freshwater fish: live Arowanas (*Scleropages formosus*) in 1991 and 1992, and none for amphibians (*Rana tigerina*) included in Appendix II.

During the same period of time, of organisms considered in the present study, CITES Appendix II species of hard corals, lizards and crocodiles (live, skins, etc.) were the ones for which most Indonesian export permits were recorded. Diagrams per annum show that export permits for corals have the largest proportion, and that this tendency increased in 6 years.

Figure 1 **Proportions of CITES export permits issued by Indonesia for products of selected taxa (see Annex I) imported into the European Union, 1990-1995**



EU/CITES trade regulations

The European Union (EU) is composed of 15 Member States.
Besides Ireland, all EU countries are member of CITES (Parties).
CITES was ratified in 1975. More than 140 countries, including Indonesia and 14 EU Member States, are now member of CITES. Indonesian species of hard and Black corals, shells and sea turtles are among the 27,000 species of plants and animals that are monitored and controlled by CITES. Species listed in Appendix I may not be exported (exemptions are given exceptionally for specific research or conservation purposes), while the export of species listed in Appendix II and III is allowed as long as their specimens are accompanied by valid export permits issued by CITES Management Authorities of the country of origin. Among species listed in Appendices II and III of CITES, some were listed as "C2" species under the Council Regulation (EEC) 36 26/82. The latter states that the EU can unilaterally decide to ban import of the species listed as "C2", if there is evidence that the country of origin does not control their exploitation properly, and did not improve the management after first notice.
As a consequence, on 24 September 1991, the EU Council banned EU imports of all Indonesian C2 species. Among them were Black coral (*Antipatharia* spp), Monitor lizards (11 species of the genus *Varanus* spp)(see Annex VII), two species of crocodiles (*Crocodylus novaeguineae novaeguineae, C. porosus* (=*raninus*))(see Annex VII), and two species of tortoises (Travancore tortoise (*Indotestudo forstenii*), Asian/Burmese brown tortoise (*Manouria emys*)). The EU ban was progressively lifted, depending on the measures adopted for each species. The last ban was lifted on 17 April 1996, for certain Monitor lizards species. For some species the import has been restricted to an export quota set by Indonesia annually for instance 900 specimens of Sepik Monitor (*Varanus karlschmidti*) for 1997.

Trade routes of products from CITES listed species

According to records from importing countries, over 7 years (from 1990 to 1995), a total of about 1,305 shipments were imported into the EU from Indonesia with valid export permits issued by Indonesian CITES MA for marine and coastal specimens of CITES listed species (WCMC 1997).
During the same 6 years, of the 1,305 shipments accompanied by Indonesian CITES export permits, 1,100 shipments travelled from Indonesia straight to the EU, without transit. Only 205 shipments (16%) transited outside the EU. Fifteen countries are involved in the transit of hard corals between Indonesia and the EU: Switzerland with 65 shipments officially reported, United States of America (USA) 60, Singapore 25, Japan 16, Hong Kong 13, Canada 10, Mexico 3, Mauritius 3, Morocco 3, Madagascar 2, and Australia, South Africa, Surinam, United Arab Emirates, and Czech Republic 1 shipment each.
Over the same period, 935 shipments of hard corals were transported from Indonesia to the EU. Of these shipments of hard corals, 15 transited through Singapore (2,500 pieces (pc) of corals), 7 in the USA (16 pc) and 1 in Canada (20 pc).
Besides Ireland, which is not member of CITES, only four EU Member States were officially not involved in Indonesian hard coral imports from 1990 to 1995: Portugal, Greece, Finland, and Luxembourg.
Regarding imports of lizard articles, 164 (51%) shipments transited outside the EU, 72 transited inside the EU, and 82 shipments travelled straight from Indonesia to the country of destination. Fifteen countries are involved in the transit of lizard articles between Indonesia and the EU: Switzerland (54 shipments), the USA (52), Hong Kong (13), Japan (11), Singapore (10), Canada (10), Mauritius, Mexico, and Morocco (3 each), Madagascar, Surinam, South Africa, Swaziland, the Czech Republic, and the United Arab Emirates (one shipment each).
The number of shipments transiting has not increased from 1990 to 1995.
Of the 43 shipments of crocodile specimens, 22 transited between Indonesia and the EU, 16 went directly from Indonesia to the country of destination, and 5 transited inside the EU. Transit occurred in five countries: Switzerland (12 shipments), Japan (5), the USA (3), Singapore and Madagascar (1 each).

Corals

Of the 900 nominal coral species (3,300 synonyms under systematic revision) recognised worldwide by the Australian Institute of Marine Science (AIMS), some 500 to 700 occur in the Indo-Pacific bio-geographic region (Briggs 1974). To date, 450 hard coral species have been recorded in the Indonesian Archipelagos. Indonesia is at the centre of coral diversity (Veron 1993), and is probably home to endemic species (Tomascik *et al* 1997).
None of the soft coral species -including seafans and gorgonian "corals" (e.g. Red coral, *Corallium rubrum*)- are listed in CITES Appendices, mainly because they are not traded for curios and jewellery. However, unpublished work and recent studies suggest that trade in these species may be of concern (McAllister, IUCN/Coral Reef Fish Species Specialist Group, *in litt.* 4 Dec. 1997). The following trade records analysis only involve hard corals that are listed under CITES.
According to data from CITES member states (Parties) and from the US Fish and Wildlife Service, about 35% of the live hard coral and 80% of the "raw" (dead) coral recorded in world trade from 1989 to 1993 came from eleven species and taxa: *Acropora* spp (Staghorn corals), *Catalaphylia jardinei* (Elegance coral), *Euphyllia* spp (Trumpet corals), *Fungia* spp (Mushroom corals), *Goniopora* spp (Sunflower coral), *Heliopora coerulea* (Blue coral), *Pocillopora* spp (Brush coral), *Pavona* spp (Cactus corals), *Seriatopora* spp (Birds nest corals), *Stylophora* spp (Cauliflower corals) and *Tubipora musica* (Organ-pipe coral), all together at least 205 recognised species (in Shoup 1996).
Because of the nature of corals (stony like colonies of organisms), there is much confusion over what should or should not be considered protected under the CITES legislation (Borel Best, *in litt.* 15 January 1997; Annex II). Therefore P3O-LIPI decided to determine export quotas for non-CITES coral products (e.g. fossil coral of unidentifiable species) as well. Since the late 1980s, large amounts of live hard corals have been imported for the aquarium trade. The development of local and intercontinental transportation, speedboats and air-freight, allows the trade of more fragile species such as live corals, both hard and soft.

CITES addresses only the aspects of hard coral exploitation that relate to international trade. However the numerous local uses of hard coral, for instance for lime production, and building material (such as jetties in harbours of small islands) have far greater impacts on coral reefs than coral collection for export. Reefs and corals are also affected and destroyed by destructive fishing methods, and indirectly by siltation originating from mining, timber extraction, and forest fires, bleaching and storms caused by natural weather conditions and possible climatic changes, and sand mining causing significant changes in marine currents and sediment movements.

Trade of Indonesian hard corals

Appendix I of CITES does not include any coral species. All hard coral species ("karang" in Indonesian language), more than 250 genera, are listed in CITES Appendix II (Shoup 1996). Thus the international trade of hard corals is allowed, but valid export permits are required, as well as import permits for EU traders.
Hard coral export quotas are established annually by the Indonesian CITES Scientific Authorities for marine organisms (Indonesian National Institute of Marine Sciences, P3O-LIPI). The export quotas set per genus of hard corals totalled 765,000 pieces in 1997 (slightly less than 1kg per piece; Anon. 1989 in Bentley 1998)(CITES Secretariat, *in litt.* 2 June 1997), for "base rock" (90,000 pieces), for "corals and similar materials" (45 tonnes) (CITES Secretariat, *in litt.* 2 June 1997), and for live "soft corals" (675,000 pieces).
Figure 2 shows the steady increase in exports of live corals from Indonesia to the European Union. In 1995, the proportion of trade in live and dead coral pieces reached 38 and 62% respectively.

Figure 2 Proportion, in number of pieces, of Indonesian live and dead hard corals imports reported by EU Member States

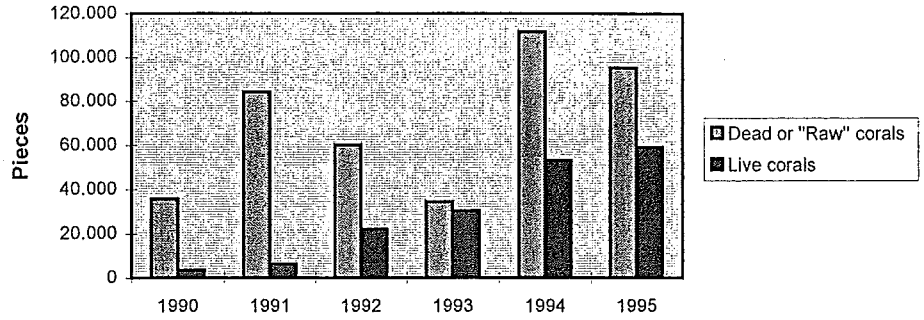


Table 2 EU imports of Indonesian hard corals (number of pieces)

	1990	1991	1992	1993	1994	1995
Dead or "Raw" corals	35,749	84,114	60,045	34,495	111,627	95,323
Live corals	3,629	6,323	22,126	30,457	53,103	59,107
Total	39,378	90,437	82,171	64,952	164,730	154,430

Source: WCMC, January 1997.

In 1990, a shipment of Indonesian live hard coral was seized by Dutch Custom Services. The average price was US$ 2.37/piece of live coral FOB (free on board), and US$ 4.32/piece of live coral COD (cash on delivery). Freight and packaging represented 46% of the cost, highlighting the low unit export price per piece of hard coral, and giving a hint about the very low value paid at the harvesting end for live corals. Retail prices in a shop in Belgium in 1998 ranged from US$ 20 to 115/piece of live coral depending on the species, the size and other parameters.
Curio shops, on the other hand, pay higher import prices for dead corals, in 1990 for instance, the average price was US$ 30/piece of coral FOB.

EU imports of Indonesian hard corals increased by 400% in 5 years, from about 39,378 pieces of coral in 1990 to 154,430 in 1995 (Table 2). In 1995, Indonesia exported a total of 1,155,000 pieces of hard coral to the world. Reports by importing countries show the EU Member States were the second largest importers of hard corals from Indonesia, with an annual average of 122,000 pieces between 1985 and 1995 — far behind the US (677,000) but ahead of Japan (114,000)(Bentley 1998).
For 3 decades, the Philippines dominated the world's hard coral trade. This stopped after considerable international pressure, and by the early 1990s Indonesia had taken over the position of the Philippines on the world market.

While the Philippines exported the greatest volume of raw corals from 1988 to 1993 (6.7 million items reported over the 5 years, most of which was exported in 1992 when the national export ban was temporarily lifted to allow clearance of pre-ban stockpiles (Mulliken and Nash 1993)), Indonesian hard corals exports were more consistent, with about 3.2 million items reported over the same period (640,000 items *per annum*) (Shoup 1996). From 1990 to 1993 (Table 2), the annual EU imports of Indonesian hard corals averaged 69,235 pieces, roughly estimated 10.8% of the average annual Indonesian hard coral exports from 1989 till 1993. This share of the EU in the Indonesian hard corals exports is confirmed by recent WCMC figures showing a share of 13.3% from 1990 to 1995 (WCMC September 1997).

Among the numerous hard coral species in trade, nine taxa represent more than half of the volume in trade between Indonesia and the EU.

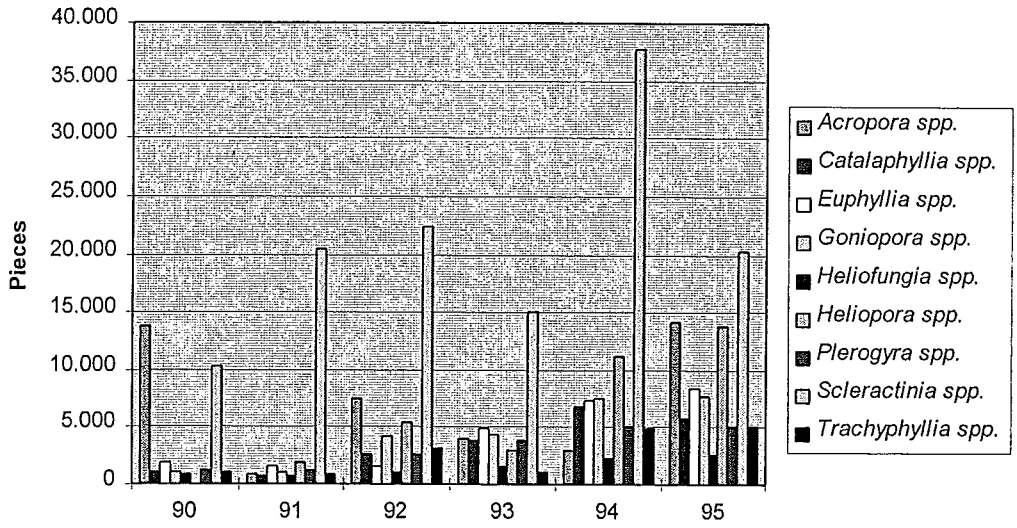
Table 3 Nine main taxa of Indonesian hard corals imported in the EU (n° of pieces)

	1990	1991	1992	1993	1994	1995	97 Quotas (2)
Acropora spp	13,815	950	7,506	3,931	3,030	14,214	**30,600**
Catalaphyllia spp	989	739	2,671	3,763	6,738	5,721	**83,250**
Euphyllia spp	1,974	1,591	1,616	4,872	7,349	8,443	**110,250**
Goniopora spp	1,084	1,044	4,134	4,436	7,505	7,646	**103,500**
Heliofungia spp	817	641	968	1,656	2,276	2,686	**40,500**
Heliopora spp	20	2,000	5,359	2,950	11,097	13,802	
Plerogyra spp	1,223	1,194	2,684	3,765	5,148	5,087	**51,300**
Scleractinia spp (1)	10,286	20,404	22,371	15,056	37,710	20,241	
Trachyphyllia spp	1,099	876	3,086	964	4,965	5,115	**70,650**
TOTAL	**31,307**	**29,439**	**50,395**	**41,393**	**85,818**	**82,955**	**490,050**

(1) *Scleractinia* spp genus, other than *Acropora* spp, *Goniopora* spp, *Plerogyra* spp, and *Trachyphyllia* spp.

(2) 1997 export quotas given by Indonesian CITES Scientific Authorities (P3O-LIPI) for hard corals.

Source: WCMC, January 1997.



According to present and previous years Indonesian hard coral export quotas, it seems that those species most vulnerable to over-exploitation (least abundant and slowest growing) listed in Appendix II of CITES do not always receive the lowest annual export quotas from CITES Scientific Authority. In 1998 for instance, *Acropora* spp and *Pocillopora* spp, genera including a majority of common and fast-growing species, were given very low quotas by the Indonesian CITES Scientific Authorities (PHPA/P30-LIPI), 31,500 and 2,700 pieces (pc) respectively (CITES Secretariat Notification No 1998/07). Yet genera with less abundant species, but with high commercial value, had export quotas from Indonesia two to ten times higher, for instance *Catalaphyllia* spp 89,775 pc, *Euphyllia* spp 124,200 pc, and *Trachyphyllia* spp 72,000 pc (Bentley 1998). Genera like *Goniastrea* spp (34 nominal species) and *Goniopora* spp (39 nominal species), have almost equivalent distributions in the Indo-Pacific, and similar frequencies in single reefs (Massin *in litt.*, 11 May 1998). *Goniastrea* spp are corals with very short polyps, while *Goniopora* spp have a nice effect in aquariums because they display beautiful long polyps both day and night. In 1998, Indonesian export quotas were 450 pc for the first genus, and 111,600 pc for the second one. This suggests that the allocation of annual export quotas for Indonesian corals is based on commercial criteria instead of biological ones. CITES Scientific Authorities of all Parties should give annual export quotas based on biological parameters, and not commercial ones.

At present Indonesian export quotas are fixed per genera. However, there may be variations in distribution patterns and growth rates amongst species belonging to one genus. For instance, *Goniopora culumna* is common and often forms large stands, whereas *G. stokesi* is small and uncommon. Indonesia is also home to endemic species (e.g. *Indophyllia macasserensis*) (Best and Hoeksema 1987, in Bentley 1998). Furthermore, growth rates have been shown to vary within species, depending on parameters such as depth, sedimentation, location, and morphological variants (Van Veghel and Bosscher 1995). Therefore there is a need to determine annual export quotas at the level of species rather than genus, and for management decision to be based at local reef level, rather than region- or nationwide.

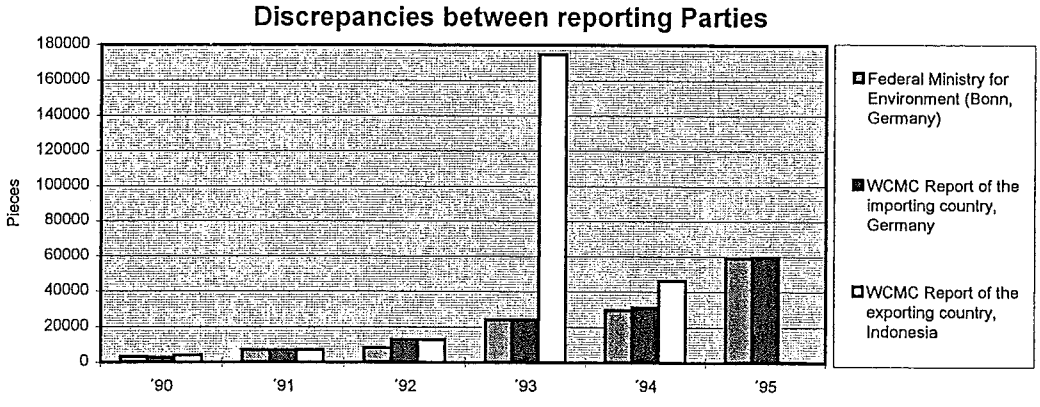
Black coral (*Antipathes* spp) is the only C2 hard coral species. On 24 September 1991, the EU banned its import. The ban was lifted on 9 March 1995, but should not have an important impact on the trade because harvest and trade of Black coral is forbidden by Indonesian law. However, in April 1998 black coral specimens were for sale for IDR 22,000 (US$ 2.8) /piece, in the handicraft area of a fancy department store downtown Jakarta, where large groups of tourists purchase souvenirs. Customers of Chinese offspring buy bracelets made of black coral, because it is believed to help cure rheumatism.

The EU Member States that imported most Indonesian hard corals from, 1990-1995, are in decreasing order of importance, Spain (207,795 pieces in total over the 6 years, 99% of which are dead corals), Germany (137,830 pc, 95% of which are live corals), France (111,646 pc, 100% dead corals), United Kingdom (63,447 pc, 48% live), the Netherlands (37,805 pc, 12% live), Italy (23,540 pc, 1.1% live), Austria (9,970 pc, 57% live), Denmark (3,278 pc, 61% live), Belgium (797 pc, 100% live), and Sweden (172 pc, 100% dead corals) (WCMC January 1997).

An additional survey of the major taxa involved in the German hard coral market from Indonesia shows important discrepancies between the volumes of corals reported by the importing country and by the country of origin, in this case Germany and Indonesia.

Table 5 Imports of Indonesian hard corals in to Germany (number of pieces)

Source	1990	1991	1992	1993	1994	1995
Federal Ministry for Environment (Bonn, Germany)	3,018	6,903	8,277	24,109	29,382	59,280
WCMC Report of the importing country, Germany	2,720	6,977	12,778	24,109	30,884	59,656
WCMC Report of the exporting country, Indonesia	3,768	6,977	12,778	174,740	46,075	335



Further research would undoubtedly reveal similar discrepancies for most CITES Parties (Annex VIII). The causes of discrepancies between quantities reported by the importing Party and the country of origin may be diverse:

a) differences in the units used, e.g. corals may be reported by number of pieces or weight (kg),
b) the country of origin often report the number of export permits delivered. However, export companies may not export the total amount of corals for which they have received export permits;

c) specimens may be exported at the end of the year but not received by the importer until the following year;
d) recording system of CITES Annual Reports by WCMC, and
e) unrecorded and/or illegal trade.

Seizures

In addition to legal trade records, illegal shipments of hard corals from Indonesia have been reported by the CITES Management Authorities of the EU Member States. The sharp increase of hard coral seizures may reflect the higher demand for hard corals in Europe, but it could also be the result of improved attention of custom officers to CITES, special CITES training, and better staff skills (e.g. a marine biologist in Sweden).

Table 6 Seizures of Indonesian hard corals at the borders of EU Member States (N° of pieces)

	1990	1991	1992	1993	1994	1995
Corals	6	1	140	690	1,060	1,380

Source: Custom Services and CITES Management Authorities (Ref. Table 1).

Shells

CITES Parties decided to regulate, the international trade of certain shells. One taxonomic Order of Indonesian marine shells ("kerang" Indonesian name) is listed in CITES Appendix II, the Order Tridacnidae ("kima"), Giant clams group. Seven species of Tridacnidae occur in Indonesia: Giant clam (*Tridacna gigas*), Crocus clam (*T. crocea*), Southern Giant clam (*T. derasa*), Scaly clam (*T. squamosa*), Small Giant clam (*T. maxima*), Bear Paw clam (*Hyppoppus hyppoppus*), and China clam (*H. porcelanus*) (Anon. 1995a).

Their sizes make them easy to spot, and their slow growth are two important factors of the rapid depletion of their populations in areas where collection occurs without proper management. Giant clams are particularly appreciated for the taste of the adductor muscle. They are still collected by traditional fishing communities. The muscle can be removed with a knife during the dive, saving the effort required to bring such a large shell to the surface. Once extracted and packed in cans, vacuum packs, or frozen, the delicate flesh may be sold on the domestic market, but is mostly exported. The rest of the body is consumed locally, by villagers (e.g. in a soup), and by poultry. Although they are protected by law, in 1982, 660 tonnes of Giant clam shells were being brought into Jakarta every month, for ornamental purposes, pottery manufacture glazes and floor tiles (Usher, in Anon. 1995). The large shells are also used for construction purposes, such as dikes to prevent coast and islands from wave destruction. The latter has aggravating impacts on small islands because of reef destruction caused by coral mining and other construction works Similar effects occurred on coasts after mangrove destruction due to the creation of large shrimp farms in brackishwater ponds.

Legal trade

In 6 years, only 21 specimens were recorded as legally imported into the EU, from 1990 till 1995. All shells were live specimens. Twenty were imported in Austria (AU) in 1990 for scientific purposes (S), and one in Germany (DE) recorded as personal effects (P). The two freights were made directly from Indonesia to Europe. At that time, and until 1997, there was no official record of commercial captive breeding of Giant clams in Indonesia. The restricted volume of Giant clams export could be the result of the scarcity of these shells, or rather of good enforcement of Indonesian domestic law, protecting all *Tridacna* spp and *Hyppoppus* spp.

Table 7 Indonesian Tridacna legally imported into the EU

Year	Appendix	Species	Field1	Import	Export	Qty	Term Imp	P Imp
90	2	*Tridacna gigas*	Shells	AT	ID	**20**	LIV	S
92	2	*Tridacna gigas*	Shells	DE	ID	**1**	LIV	P

Source: WCMC, January 1997.

Seizures

Compared to the low number of legal imports, the volume of shells confiscated by seizures reported by four European Member States is high. This may reflect the high number of illegal transactions due to the demand for these shells in the EU, but could also be caused by a increasing awareness of some custom services as a consequence of training programmes. It should however be kept in mind that reliable data were sent by only 4 of the 15 Member States.

Table 8 Indonesian Tridacna seized by EU Member States customs (items)

	1990	1991	1992	1993	1994	1995
Tridacnidae	4	71	12	93	74	34

Source: Custom Services and CITES Management Authorities (Ref. Table 1)

Turtles

All marine turtles species (generic word in Indonesian language "penyu") are listed in CITES Appendix I. The species occurring in Indonesia are: *Chelonia mydas* (Green Turtle), *Eretmochelys imbricata* (Hawksbill turtle), *Lepidochelys olivacea* (Olive Ridley), *Caretta caretta* (Loggerhead), *Dermochelys coriacea* (Leatherback turtle), and *Natator depressa* (Flatback turtle) (Anon. 1995c). Besides rare exemptions, the international trade of turtles and of products made thereof is prohibited if the animals are of wild origin.

Under Indonesian national legislation, the Green turtle is not considered endangered, and between 1990 and 1993 more than 20,000 Green turtles were slaughtered annually in Bali (WWF field observations), where the meat is grilled on sticks ("sate penyu"). Uncontrolled adult catch and egg collection of Green turtle, as well as lack of law enforcement, original turtle populations of all species have been decimated, and the great majority of Indonesian turtle nesting beaches are no longer visited by females.

In the late 1970s, "turtle hatcheries" have been developed, and awareness programmes in coastal villages implemented (Groombridge and Luxmoore 1989). However, 10 years later additional information on turtles embryology, life cycle and behaviour highlighted the negative biological effect of "hatcheries" (e.g. possible loss of instinct with regard to spawning beaches). Furthermore, the feeding of young turtles for a couple of months before release increased pressure on other endangered species: villagers were told to feed the hatchlings with Giant clam flesh (WWF-Indonesia field staff observations, March 1994). Such negative spin-offs highlight the consequences of poorly planned awareness programmes, as well as the damage done by lack of scientific knowledge and misunderstandings.

A wide bibliography on biology, use, hatching, trade, and other related studies on turtles in Indonesia and other countries is available. A special workshop on turtle conservation organised in East Java (Jember) in November 1996. The following paragraphs are limited to an overview of trade between Indonesia and the EU. The eggs of all species of sea turtles are collected anc eaten throughout the country. Meat is eaten in some regions but not in others. Green turtle is the preferred species for eating, but the flesh of Hawksbill turtle slaughtered for their shell is believed to be toxic. Hawksbill turtle is the species most threatened by international trade, because of the incomparable quality of its shell, used in jewellery (see Annex III) (Groombridge and Luxmoore 1989) and in restoration of antiques. Specimens of both Green and Hawksbill are found stuffed in numerous shops and exported.

Legal trade

From 1990 till 1995, four permits, necessarily exemptions, for Indonesian turtle products imports in the EU were recorded: one live marine turtle, 400kg of Green turtle shells, and one shell of Hawksbill turtle. The four transactions were recorded in 4 different EU Member States. When weights are reported (e.g. 300 kg in 1990) it is difficult to estimate the exact number of specimens involved in the trade.

Table 9 Legal imports of Indonesian marine turtles

Year	Species	Import	Export	Qty	Term Imp	P Imp	Qty Exp	Unit Exp	Term Exp	P Exp	S Exp
90	*Chelonia mydas*	IT	SG				300	KG	SHE	T	
90	*Chelonia mydas*	ES	SG				100	KG	SHE	T	
90	Cheloniidae	GB	AU	1	LIV	P					
94	*Eretmochelys imbricata*	NL	SE				1		SHE	P	O

Source: WCMC, January 1997.

After investigation, the shipment imported in Italy in 1990 was declared illegal. Italy was severely penalised at the time, and had to adopt immediate measures to improve CITES implementation and enforcement, in and within its borders. None of the shipments came directly from Indonesia: two transited in Singapore (SG), one in Australia (AU), and one in Sweden (SE). This trade only involves turtle shells (SHE), probably for curio, and jewellery.

Seizures

Compared to the very limited number of CITES permits issued by Indonesia and the EU Member States, the number of seizures of poorly documented shipments of Cheloniidae intercepted at the borders of EU Member States is high. For a total of 2 specimens and 400 kg recorded legally in 6 years (Table 9), the EU custom services reported 112 turtle products (live, shells, stuffed, mounted shell, etc.) seized (Table 10). As mentioned for shells, this may reflect the increasing awareness of custom officers. Although data on seizures are incomplete, and do not allow to draw any further conclusion, they seem to indicate that the demand for marine turtle products (shells or alive) in the EU exists, and that buyers are often not aware of international trade regulations, but also they clearly suggest an on-going illegal trade from Indonesia to Europe of probably mostly tourists shops and souvenirs.

Table 10 Seizures of Indonesian marine turtles reported by EU Member States (No. of items)

	1990	1991	1992	1993	1994	1995
Turtles	13	27	9	0	6	57

Source: Custom Services and CITES Management Authorities (Ref. Table 1).

In April 1998, although they are also protected by Indonesian national law, hundreds of items made from Hawksbill Turtle shell (e.g. small boxes, necklaces (US$ 10-15/piece), earrings, fans) were for sale, in a department store downtown Jakarta famous for its handicraft. Tourists are brought there to purchase souvenirs. Furthermore, the same items were for sale in the duty free zone of Jakarta International Airport. In neither places was the staff aware of CITES provisions, and nor were there signs to inform tourist about the Convention.

EU imports of worked corals and other articles of jewellery and curio

Among turtles, corals (hard and soft, e.g. Gorgonians in India) and shells, CITES and non-CITES listed species, are often used to produce luxury goods such as jewellery or fine art items (e.g. inlays and carved boxes). Such items can be made from CITES as well as non-CITES listed species. Import-export movements of these goods are recorded under specific commodity codes of the Harmonised Commodity Description and Coding System (Combined Nomenclature (CN) Codes: 9601; 0507 and 0508, see Annex IV). It is not sure if such shipments are checked by custom officers, and it is difficult to evaluate the volume of products/items involving CITES listed species (e.g. turtle shell in jewellery).
Eurostat does not show volumes below one tonne, which may lead to omissions because annual imports of valuable goods often do not reach one tonne (e.g. small jewellery).
However, the value of the trade of these products is high, raising from ECU 7.53/kg in 1990 to ECU 16.62/kg in 1995 (Table 16). Thus, even if the tonnage of Indonesian worked corals, and other handicraft articles imported by the EU is small, it may represent a relatively high import value.

Table 15 **Value of EU imports of Indonesian worked corals and other articles (1,000 ECU) (1) CN 9601 only** (see Annex IV)

	1990	1991	1992	1993	1994	1995	1996
Worked coral			15,91	5,61	7,24	9,66	47,93
Other (2)	38,42	97,93	53,12	98,76	136,6	296,18	558
Total	38,42	97,93	69,03	104,37	143,84	305,84	605,93

(1) over the period covered ECU 1,000 = US$ 1,400.

(2) Including jewellery made of turtle shell, mother-of-pearl, etc. and curio trade such as shell products.

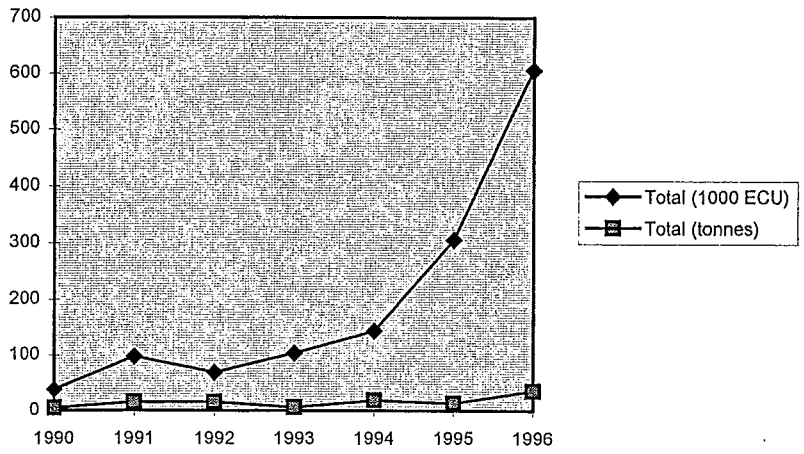
Source: Eurostat 1997.

Table 16 **Volumes of EU imports of Indonesian worked corals and other articles (tonnes) CN 9601 only**

	1990	1991	1992	1993	1994	1995	1996
Worked coral			10.7	0.1			
Other (1)	5.1	15.4	5.2	6.2	18.8	13.9	36.3
Total (tonnes)	5.1	15.4	15.9	6.3	18.8	13.9	36.3
ECU/kg	7.53	6.36	4.34	16.57	7.65	22.0	16.69

(1) Including jewellery made of turtle shell, mother-of-pearl, etc. and curio trade such as shell products.

Source: Eurostat 1997. (over the period covered ECU 1,000 = US$ 1,400)



Seizures of products from CITES listed species introduced in the EU by tourists and cargoes at Frankfurt Airport (Germany)

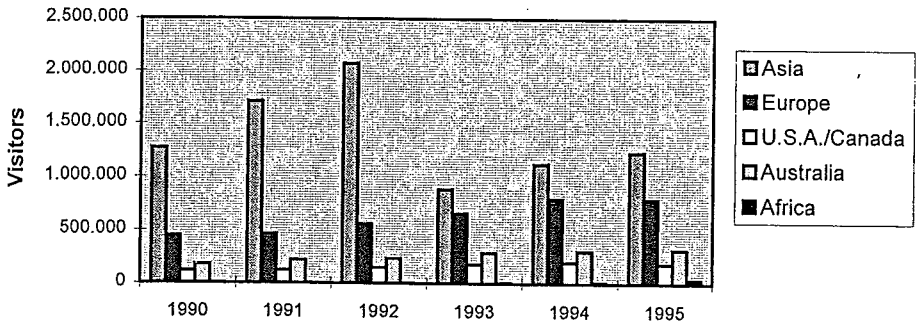
Regarding the confiscation of CITES listed species, due to lack of- or forged documents (e.g. permits or certificates), custom services target two type of shipments: large commercial shipments (freight), and smaller parcels carried by individuals (tourists).
In order to compare each type of shipment, data were collected on the importance of European tourists visiting Indonesia, and on the type of shipment seized in one of the largest European international airports, Frankfurt (Germany).

The annual number of tourists visiting Indonesia has more than double in 6 years, from 1990 to 1995 (Table 17). In 1995, of the total number of visitors, 28% were from Asia, 18% from Europe, 7.5% from Australia, 4% from USA and Canada, and less than 1% from Africa. Together with Asian visitors, the number of European tourists travelling to Indonesia annually shows the sharpest increase in 5 years, 443,518 tourists in 1990, 798,870 in 1994. In 1995 it represented 18.5% of the Indonesian tourism industry.

Table 17 Tourists visiting Indonesia by main countries in the world

	1990	1991	1992	1993	1994	1995
Asia	1,266,651	1.708,443	2,074,653	882,154	1,123,257	1,233,549
Europe	443,518	461,664	561,657	659,728	798,870	793,842
U.S.A./Canada	114,516	122,301	150,015	181,141	199,831	185,811
Australia	175,895	219,306	234,723	287,850	305,209	320,494
Africa	2,260	3,347	3,624	7,113	10,933	39,246
Total	2,028,888	2,569,870	3,064,141	3,403,138	4,006,312	4,324,229

Source: Indonesian Tourist Promotion Office, Frankfurt, Germany, 1997.

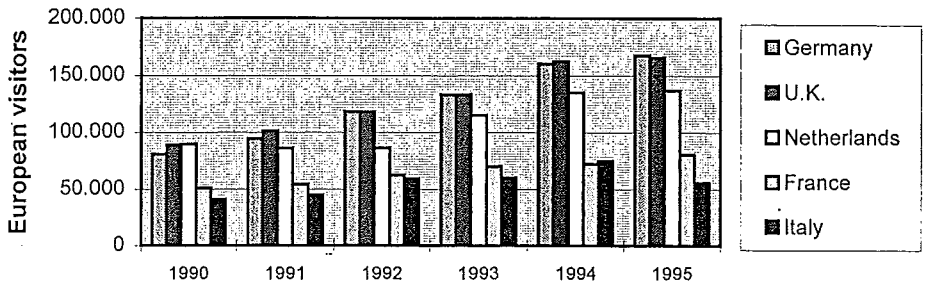


The number of European visitors shows a constant annual increase from 1990 till 1994. In 1995, 27,6% of the total number of Europeans visiting Indonesia were from Germany, 27.3% were from United Kingdom, and 22.5% from the Netherlands.

Table 18 European tourists visiting Indonesia by main countries

	1990	1991	1992	1993	1994	1995
Germany	80,677	94,596	118,244	133,245	160,325	167,653
U.K.	88,709	101,062	117,826	133,209	162,304	165,788
Netherlands	89,419	85,882	86,034	114,916	134,717	136,858
France	50,774	54,227	62,388	69,874	72,314	80,422
Italy	40,833	44,846	58,947	60,132	74,571	55,725
Total	350,412	380,613	443,439	511,376	604,231	606,446

Source: Indonesian Tourist Promotion Office, Frankfurt, Germany, 1997.



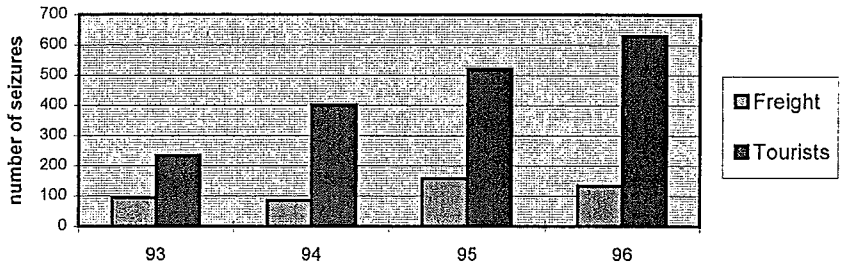
Frankfurt International Airport (Germany) is the European port of entry for most German tourists as well as for tourists from many other EU Member States, such as Belgians and Austrians, because their national airlines do not have direct flights to Indonesia, or other business and holiday destinations.

Custom services do not keep records of seizures per country of origin and destination. The following data are not restricted to seizures of Indonesian goods nor to German tourists, but cover all goods and all passengers entering the EU via Frankfurt (first port of entry).

Table 19 Number of seizures at the Frankfurt International Airport, Germany

	1993	1994	1995	1996
Freight	94	84	157	133
Tourists	234	401	521	630

Source: Customs Office, Frankfurt International Airport, Germany, 1997.



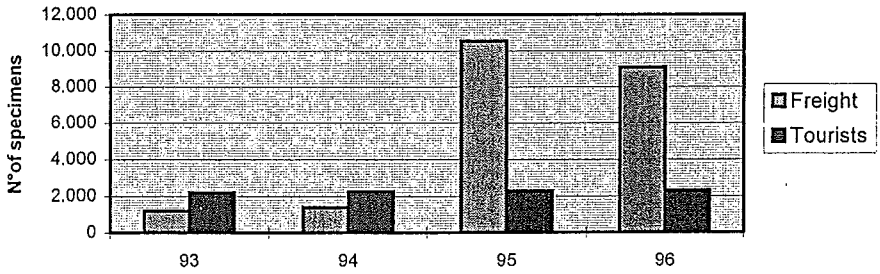
The average number of goods confiscated per seizure for infractions detected among tourists is 3.65 specimens ("souvenirs") per seizure. For commercial shipments it is 68.25 specimens per shipment seized (Table 19 and 20). Thus in terms of productivity, it is 19 times more efficient to focus on commercial shipments, small in number of cargoes but large in volumes of goods shipped, than to concentrate on controlling tourists, numerous in parcels but small in number of specimens traded.

However, custom officers' efforts on "tourists souvenirs" raise public awareness much higher than the control of freight (cargo). In that perspective, both approaches are important.

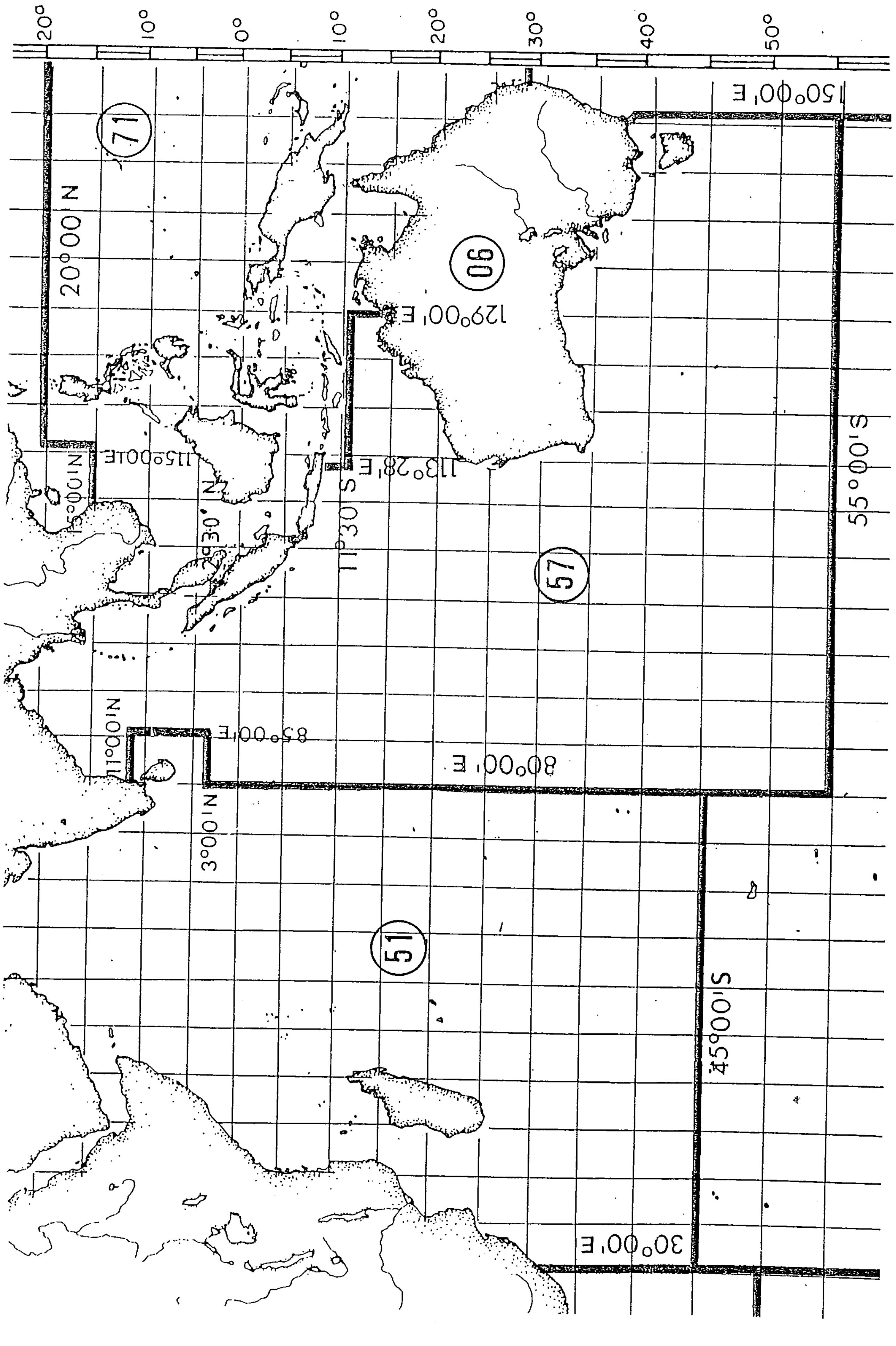
Table 20 Number of specimens confiscated at Frankfurt Airport, Germany

	1993	1994	1995	1996
Freight	1,179	1,390	10,555	9,077
Tourists	2,206	2,249	2,281	2,299

Source: Customs Office, International Airport, Frankfurt, Germany, 1997.



Indonesian fisheries zones: 57 Eastern Indian Ocean, 71 Western Central Pacific Ocean



INDONESIAN FISHERIES PRODUCTS

Most marine natural resources are not protected under national law or international conventions such as CITES. In some countries industrial fishing operations are submitted to regulations concerning, catch size, fishing season, fishing gears (e.g. purse seine, drift gill-net, mesh size) and/or fishing zones. For instance, the Government of Indonesia decided to ban trawling in 1980 (Farid 1986), except for very restricted areas in Eastern Indonesia where trawling is still allowed (Arafura Sea -located East Maluku (Moluccas), and south Irian Jaya-). Non-industrial or "small scale" fisheries may also be submitted to restrictions. The Indonesian authorities took for instance legal measures prohibiting the use of destructive fishing methods such as blasting and poisoning (e.g. "cyanide") that both cause heavy habitat destruction. Except for very few species (tuna and shrimps), Indonesia has not yet established quotas regarding annual catches per species of fish, shellfish or other marine invertebrates, nor have they identified the appropriate size limit per species of fish or mollusc collected. This is actually the case for most countries in the world, although such measures are necessary to better manage for both industrial and "small-scale" (traditional) fisheries, including catches for subsistence in coastal villages where intensive gleaned catches by women and children occur.
Indonesia covers two of the FAO fishing areas: Area No 57 (eastern Indian Ocean: along the west and north coasts of Sumatra), Area No 71 (western central Pacific Ocean for the rest of Indonesia: from the east coast of Sumatra all the way to Irian Jaya). From 1989 till 1993, marine fisheries accounted for 75% of Indonesian fisheries production, freshwater fisheries (including "paddy field aquaculture") for 10.5%, and coastal aquaculture for 14% (Karudeng 1994). However, these figures do usually not include the subsistence fisheries that can be significant in an islands country like Indonesia (Cesar 1996).

Both marine and inland fisheries are major sources of livelihood for a sizeable portion of the Indonesian population (Anon. 1993). It is estimated that fish provides about 62% of the domestic animal protein supply. In 1993, the annual national per capita fish consumption reached 17 kg (Karudeng 1994). As in other tropical waters, Indonesian marine fisheries resources are extremely divers. Indonesian fisheries production records reported to FAO in 1994 (Annex VI), show about 107 different records of fish (species, and genus), 21 records of crustaceans, molluscs, and other invertebrates (e.g. sea cucumbers -Holothuridae-), and one record of seaweed (Rhodophyceae) (Anon. 1995e).

Three major ecological fishing zones can be distinguished: the shallow zone, with coral reefs and seagrass beds systems; the demersal zone (near the bottom) below the reef; and open waters away from the reef (off-shore). Coral reefs and seagrass beds have been mostly exploited by small-scale fisheries (Badrudin 1996). Despite a relatively low biomass, the shallow zone abounds with high marine life diversity (groupers, seahorses, sharks, top shells, octopus, sea cucumbers, seaweed). Women and children are most involved in collecting products from the intertidal zone at low tide (reef and mud flats) as observed in the Philippines (Salamanca 1996). Most of the fauna is represented by sedentary species which makes their populations particularly vulnerable to overfishing. Industrial fishing gears operate mostly in demersal areas (shrimps, snappers, jobfish, sharks), and in open waters. The latter include both plankton-feeders (sardines, garfish), and large predatory fish (tuna, skipjack, trevally). They are pelagic species and offer the highest biomass.

Industrial fisheries
The industrial fishing sector catches the largest volume of marine natural resources in Indonesian seas. The industry focuses on two major products, Tuna and Shrimp (Prawns), for which the total exports in 1994 was 80,000 t (182 million US$) (Table 31, 32), and 90.000 t (925 million US$) (Table 53, 54) respectively.

However, the shrimp and prawn industry relies mainly on Giant Tiger Prawns (*Penaeus monodon*) farming in coastal brackishwater ponds, which reached 125,500 tonnes in 1992 (Anon. 1994). In 1995, the expected catch of the 50 small vessels (number of shrimp trawlers licensed to fish only in the Arafura Sea in 1995) is 938 t per year (Gillet 1996). This figure does not include the catch

of the great number of vessels violating Indonesian fisheries regulations. During 1993, the number of violations recorded by DGF for vessels fishing without license was 500, and for vessels not complying with fishing gear regulation (e.g. the use of BED, By-catch Excluder Device) it was 45 for Indonesian vessels and 97 for foreigner vessels (Gillet 1996).

Small-scale fisheries

Indonesian fisheries are dominated by small-scale or artisanal fisheries, operating simple fishing gears using relatively small boats. Traditional coastal fisheries account for 85% of the total Indonesian fisheries (excluding aquaculture), and support the livelihoods of thousands of coastal communities (Naamin 1992).

Most fish destined to the domestic market (e.g. parrotfish, flatfish) are salted for conservation purposes. A large broad range of marine resources are collected traditionally and exclusively to be exported. The following commodities and species have been reported (excluding CITES listed species) (Pet-Soede *in litt.*, 16 February 1997): Spanish mackerel ("tengiri", *Scomberomorus commerson*), live groupers ("sunu", *Plectropomus* spp; *Cephalopholus* spp; "kerapu", *Epinephelus* spp; "tikus" *Chromileptis altivelis*), dried anchovies ("teri", *Stolephorus* spp), live Napoleon wrasse ("lankoi", *Cheilinus undulatus*), dried, salted and unsalted shark fins, lobster ("udang barong", *Panulirus* spp), pearl oysters ("japing-japing", *Pinctada* spp, *Pteria* spp), ornamental shells (*Placuna* spp; Wood 1995, *Nautilus* spp), sea cucumbers ("teripang", *Holothuria* spp), and seaweed (cultivated on floating racks or in ponds to supply the food and pharmaceutical industry ("rumput laut", *Eucheuma* spp, *Gracilaria* spp).

Environmental, socio-economic, cultural and ethnic diversities create a very complex trade. Fisheries commodities are sold, traded or consumed, depending on local, regional and international demands through various economic and social networks. Each ethnic group appears to occupy a certain status in terms of marine resource use, as the producer, retailer, middleman or exporter, constituting an "ethno-network" (Akimichi 1995). Their status is not only the ethnic division of economic pursuits but also projections of interactions, conflicts, and cooperation among them (Akimichi 1996). A set of rather simple technologies (e.g. post harvest), and a vulnerable, poorly structured, socio-economic organisation combine to produce a petty commodity (McCay 1981). Among rural villages, island and coastal communities have therefore the lowest buying power.

The value of marine resources offered to fisherfolks vary considerably. The price offered by a middleman (or "entrepreneur") for a live grouper for instance depends on the size, the species, the health of the fish, and where it was caught (the distance is taken into consideration because it involves higher costs), but also on the debt situation of the middleman in the city. In the Spermonde Archipelago (offshore Ujung Pandang, in South Sulawesi), the price for the same grouper may range from 10,000 Indonesian Rupiah (IDR) to IDR 45,000 (US$ 1 = IDR 2,500). The middleman gets about 70-100% more from his "boss" in the city. Middlemen are the main investors in islands or in remote coastal villages. In the large majority of cases, the middlemen take the risk, while fishermen borrow the gear (fishing, diving) and the engines from them (Meereboer, *in litt.* 11 April 1997). This also represents a risk for fisherfolks, who then depend on the businessman's goodwill concerning their debt.

Fish such as sharks, seahorses, and numerous reef fish, as well as sea cucumbers also represent an important income for coastal and island fishing communities. However, data on landings of most reef fish are not readily available. Domestic and foreign food trade, the market for Traditional Chinese Medicine (TCM), and the ornamental industry (aquarium, curio) absorb these groups of marine organisms. The role of international trade in the over-exploitation of many marine resources has been extensively documented, for instance for sharks (Keong 1996). Data and information on fisheries, processing, and international trade of sea cucumbers ("teripang") are detailed and widely available (Conand 1983, 1996, and 1997). Field projects for sustainable exploitation of seahorses have started (Vincent 1996).

Destructive fishing techniques

There is a wide range of fishing practices that cause long term damage to marine ecosystems, both in term of habitat and concerning wild population of numerous organisms (Annex III): blast fishing, "cyanide" fishing, Muro-ami fishing, etc. (Erdmann, In Press)

In 1994, reported landings of groupers (e.g. *Epinephelus* spp) in Indonesia were 25,000 t. No specific records are available for Napoleon wrasse. In the early 1990s, groupers and Napoleon wrasse (*Cheilinus undulatus*) became the target of Hong Kong based fisheries (Annex III), particularly in the eastern part of the country (Erdmann 1996). They supply the important "live fish" consumption in Chinese restaurants in Asia, Australia and even America (Richardson 1997; R. Johannes, *in litt.* 15 August 1995). Overfishing and destructive fishing techniques, involving chemicals such as potassium cyanide (KCN), have caused rapid population declines. WWF, using its TRAFFIC Network, started a study to collect information on the importance of the "live food fish" trade in Asia, and the impact of cyanide fishing on groupers and Napoleon wrasse populations. Other conservation NGOs such as The Nature Conservancy (TNC, NGO based in the United States) have already published results of their research (Johannes 1995). For groupers, long years of research and development projects (Tiengsongrusmee 1988c) have not yet allowed to start economically viable farms. Some traders claim that Napoleon wrasse come from captive breeding, but in fact very little is known about the life cycle of the species.

Another major destructive fishing method commonly used in Indonesia and the Philippines is bombing or dynamite fishing (Nash 1996). This method kills the fish, and is thus not used for live fish markets such as ornamental fish for aquaria or live food fish. Large schools of fuseliers ("ekor kuning", *Caesio* spp) are the usual target. Dynamite and real bombs, available from army sources, mining companies, and remains of explosives of the second world war, were used in the early 1960s. Nowadays, "bombs" are similar to "Molotov cocktail" i.e. empty beer bottle filled with fertilisers and other chemicals. They are not difficult to make, but the limiting factor is the detonator. Moreover, unexpected explosions are not rare and cause numerous disabilities (e.g. legless cripples, blinds) in villages specialised in bomb manufactory, such as in the Eastern Sumbawa islands (Charles Cook, *pers. com.* March 1995). Explosions are commonly witnessed in various archipelagos, for instance Sulawesi, and particularly around Buton and Banggai islands (Indrawan, *in litt.* 8 June 1998). Over the years "dynamite fishers" have improved the efficiency of the technique. In order to kill a maximum number of fish, the bomb must blow close to reef (about 20m) in full water where the impact of the shock is the widest, and not on the bottom. As a consequence, and unlike the widespread idea, the damage of the explosion is not so much affecting the coral itself, but rather all species of reef fish. One explosion wipes-out the entire fish population within 100 to 200m range, from the smallest reef fish (e.g. damselfish) to the larger ones (e.g. snappers and emperors) (observations made by world coral experts at the International Coral Reef Biodiversity Workshop, in Banda (Moluccas) 1994, and by participants of Operation Wallacea in October 1995, Annex III). "Dynamite fishers" are not only fishermen, but also come from young unemployed city boys. It is the case in the Spermonde archipelago, South Sulawesi, offshore the city of Ujung Pandang (Erdmann, *pers. com.* July 1994).

Both the use of chemicals and of explosives are prohibited under Indonesian law. However, countless islands and vast territorial waters make enforcement extremely difficult. Moreover, the economic situation in cities and fishing villages leads to high tensions between the violators and enforcement bodies. Confidential sources reported that explosives are used by both parties to defend themselves. Enforcing the prohibition of blast fisheries is dangerous. Fishermen are defensive, and in several occasions they have been reported to throw bombs at the police boat that had come to check on them. This could be one of the reasons why the number of violations recorded by DGF increased for the use of "cyanide", 12 in 1992 vs. 57 in 1993, while it has decreased for the use of explosives, 25 in 1992 vs. 15 in 1993 (Annex V; Gillet 1996).

Aquaculture

Besides Milkfish (*Chanos chanos*) reared in brackishwater ponds, the Giant Tiger Prawn (*Penaeus monodon*)(Annex III) and seaweed (especially *Eucheuma* spp, McHugh 1996)(Annex III) are the main products of the Indonesian aquaculture industry in brackish- and seawater. In 1992, Indonesia was the fourth producer of aquaculture products in the world. In constant increase since

the mid-eighties, the total aquaculture production in 1992 was 560,000 tonnes (1 t = 1,000kg), with 142,820 t of Milkfish, 125,150 t of Tiger prawn, and 130,000 t (FAO estimates) of seaweed (Anon. 1994). The latter is based on very simple and low investment equipment, and is most easily accessible to traditional communities (Darjamuni 1988; Elsy 1987). Various other species are being produced in smaller quantities, for instance Mangrove -or Mud- crab (*Scylla serata*) (758 t in 1986 and 1,480 t in 1992), and Pearl oysters (*Pinctada* spp). They are the subject of large investments from Indonesian and foreign (Korean and Japanese) private sectors.

Pearl oyster hatcheries exist in Indonesia (Sant 1995), and particularly in the numerous small archipelagos of the Molluccas (Aru- and Kai islands) where Pearl oyster diving is a tradition. However, little data is available on the Indonesian annual production which does not target food consumption, but rather jewellery market and luxury goods. Although there has been interest and attempts (Nezon 1988; Tiengsongrusmee 1988c) to develop oyster (*Crassostrea* spp), mussel (*Perna viridis*), or cockle (*Anadra* spp) (Tiensongrusmee 1988a) culture, geographical and climatic conditions have been identified as main obstacles to their marketing (Lovatelli 1988).

Sea cucumbers ("teripang") are still harvested from the wild, but increasing population depletion has stimulated research and investment in "teripang" farming (Tiengsongrusmee 1988b). Successful production of juveniles have been reported (in Conand 1997), but most mariculture activities in Indonesia still depend on juveniles collected from wild populations (in Conand 1996).

Traditional use of marine resources

Nowadays, fishing communities often overexploit and destroy their marine environment, but paradoxically they know the value of natural resources better than anyone else. In Indonesia, numerous marine organisms were, and still are, used in folk medicine as well as in agriculture. Traditional use of various species has been documented in the Philippines (Alino *et al.* 1990). The list of genera, species and other natural material includes big jellyfish (Rhizostomae), sea fan (Anthozoa), gastropods (*Patella* spp, *Trochus* spp, cowry - *Cypraea* spp-), bivalves (Giant clams - *Tridacna* spp, Venus clam -*Venus* spp-), cephalopods (Chambered nautilus -*Nautilius pompilius*), echinoderms (sea urchins -*Echinometra* spp, sea cucumbers -Holothurioidae-), fish (Stingray - *Dasyatis* spp-, Moray eel -*Gymnothorax* spp-, grouper -*Cephalopholis* spp-, Rabbit fish -*Siganus* spp-), reptiles (Green- Hawksbill- and Leatherback turtle, crocodiles), seaweed (Green seaweed - *Caulerpa* spp-, Sea lettuce -*Ulva lactuca*-, brown seaweed -*Sargassum* spp-, red seaweed - *Gracilaria verrucosa*-), coastal plants (bark of the mangrove trees -*Rhizophora* spp, *Avicenia* spp-, seagrass -*Enhalus acoroides*-), as well as sea water, hot mud from fishponds, and white sand from the sea on wounds. A survey in Malaysia revealed that, in the Strait of Malaka, islanders use extracts of a species of sea cucumber (*Stichopus hermani*) to cure a great variety of pains. The stinking liquid contains Salicic Acid, the pricipal component of Aspirin (Massin, *pers. com.* October 1998). For centuries coastal villagers used oyster, starfish, seaweed (red and brown), and shells to fertilise and improve the quality (e.g. pH) of the soil (Alino *et al.* 1990). Intrusion of foreign values, disappearance of social structures, and other socio-economical factors has led to increasing loss of traditional knowledge as well as believes. Nevertheless, villagers are aware of the dramatic destruction of their resources and many appear willing to invert the trends, providing that their goodwill gets supported.

In addition to their traditional use, marine organisms produce and contain substances which are being increasingly studied by pharmaceutical companies for their medicinal characteristics, such as for instance prostoglandins, toxic chemicals produced by sea fans, and that are used to treat cardiovascular disease, asthma and gastric ulcers; pseudopterosins contained in sea whips and of potential value as pain-killers; antibiotics are produced by gorgonians (Dubinsky 1990 (482 pp.) in McAllister, *in litt.* 12 April 1997); the compound *isohomolhalichondrin-B* recently discovered in the Yellow Slimy Sea sponge (species found only in deepwaters off the Kaikoura coast of New Zealand, belonging to the genus *Lissodendoryx* spp), and investigated by a National Cancer Institute as a cure for skin and ovarian cancers; and a species of algae found to possess a chemical compound shown to be effective in the treatment of cerebral and cardiovascular diseases (Anon. 1994a).

Trends of Indonesian fisheries exports to the European Union (EU)

With a total of 438,000 tonnes in 1994, the Indonesian exports of fisheries products represented a national income of 1.5 billion US$ (Table 21). The latter has increased by 58% in 7 years, from 1988 to 1994. In 1994, freshwater fisheries products brought less than 3.5% of the national income from fisheries products exports. The largest share came from shrimps and prawns exports (58% of the income and 20.5% of the volume; Table 53, 54), tuna exports (1.5%, with 18% of the volume; Table 31, 32), and unidentified fish exports (frozen, fresh or chilled, fillets, dried, smoked, canned, and preserved)(12%, with 48.8% of the volume).

Table 21 Total annual volume and value of Indonesian fisheries products exports

	1988	1989	1990	1991	1992	1993	1994
Total (1,000 US$)	664,483	767,422	933,622	1,186,062	1,178,552	1,419,492	1,583.416
Total (tonnes)	157,977	189,304	275,838	348,799	348,068	427,998	437,982
US$/kg	4.21	4.05	3.38	3.40	3.39	3.32	3.62

Source: FAO Fishstat, 1995.

The European Union absorbed only 3.4% (in tonnes) of the Indonesian exports of fisheries products in 1994, and 5.56% of the value.
Only shipments imported directly and officially from Indonesia to the EU are recorded as of Indonesian origin. Products of Indonesian fisheries that are being processed abroad, are thus reported as products originating from the country where they are processed. The estimation therefore probably underestimates the role of EU consumers in Indonesian fisheries export industry.
The total volume of Indonesian fisheries products imported by the EU, as well as their total value have decreased by almost 30% and 20% respectively from 1990 to 1996 (Table 22). However, the unit value of the Indonesian fisheries products entering the EU has increased by 12.3% during the same period of time. Indeed there appears to be an improvement in the quality of the Indonesian fisheries products exported, and figures compiled in the present document seem to indicate that the shift from frozen towards fresh or chilled as well as prepared (shrimps) products is a major factor of this change. The appearance of surimi imported from Indonesia is another symptom of the development of more elaborated processing techniques in the country (Table 51).

In 1996, tuna products represented the largest part of the volume of Indonesian fisheries products imported by the EU with 49% (only 21% of the total value)(Table 31, 32), while shrimps and prawns had the biggest deal of the total value with 53% (31% of imported volume) (Table 56, 57).

Table 22 Total annual volume and value of Indonesian fisheries products imported by the EU

	1990	1991	1992	1993	1994	1995	1996
EU imports (tonnes)	21,203.40	20,849.40	20,344.50	15,519.10	13,917.70	14,938.80	14,866.00
EU imports (1,000 ECU)	78,654.63	82,589.80	65,533.31	60,885.32	62,782.16	62,858.12	62,899.33
ECU/kg	3.71	3.96	3.22	3.92	4.51	4.21	4.23

Source: Eurostat, 1997. (the average exchange rate for the period covered is, ECU 1= US$ 1.4)

In 1996, tunas and shrimps make the largest proportion of EU imports of Indonesian fisheries products, 80% in volume (11,900 tonnes). Among other commodities, "snails, other than sea snails" hold an important part of the trade (4.2% in 1996, 2.5% of the total value)(Table 73), and various fish species (without specific commodity code) (4% in volume and 3.2% of the total value). Crab products from Indonesia play a particular role in the trade. They represent only 0.6% of the volume but 14.5% of the total value (Table 64).
However, these percentages are based on weights, which does not mean much for certain products. For instance, one tonne of live marine fish, or elvers (glass eels -juveniles-) includes thousands of small fish, and have a much higher impact on wild populations than one tonne of tuna or shrimp.

Live Fish

As of June 1997, after the 10th meeting of the Conference of the Parties (CoP 10), only 19 species of marine fish, including anadromous (e.g. sturgeons) fish, were listed under CITES, 18 species of sturgeons and paddlefish (excluding the 9 species of sturgeons and paddlefish that spend all their live in freshwater)(Anon. 1997b), and the Coelacanth (*Latimeria chalumnae*).

Indonesian waters count over 1,500 species of reef fish (Lieske 1994), many are caught for villagers subsistence, others are fished to be sold, dead or alive, on the domestic or the international market. Except for Napoleon wrasse (*Cheilinus undulatus*), banned from Indonesian exports since 1995, none of the marine reef fish species involved in live fish trade are protected by the Government of Indonesia or under CITES. The trade in marine aquarium fish and invertebrates differs in one main aspects from that in freshwater species: while the majority of the latter are now captive-bred, the great majority of marine fish species are still taken from the wild. Only a few species of clownfish are regularly bred in captivity (Woeltjes 1995).

In order to temporarily immobilise the fish to ease the catch of live fish, the collectors use cheap chemicals such as cyanide (NaCN or KCN) and hypochlorite, that have the effect of anaesthetics. Typically, excess of anaesthetic kills. Cyanide squirted into the hiding places between rocks and corals, and diluted in sea water causes mortality among many species on the reef, target and non-target, including sessile organisms such as the corals themselves (Robinson 1985; Johannes 1995; Erdmann 1996). The real threat from marine aquarium fisheries comes from habitat damage which may take decades to recover (especially after the use of destructive chemicals) after the use of harmful techniques has stopped. Aside from a few species -that get depleted because of their high commercial value and limited biological distribution- small fish species recovery can occur within a decade if overfishing is stopped. Habitat damage is very complex and affects a multitude of species, invertebrate, vertebrate and vegetal.

With the use of "cyanide", the larger the fish the higher the concentration in chemical needed to tranquillise it. This explains why the start in the early 1990s, of cyanide hunting for live groupers (500gr), and live Napoleon wrasse (3,000gr and more) for food supply to Chinese restaurants around the world (domestic market in Jakarta and export market mainly in Hong Kong, but also on the west coast of North America)(Annex III), increased the volume of chemicals used in live fish catch by hundred or thousand. Some sources estimate that hundreds of tons of cyanide are now pumped on reefs in Indonesia and in neighbouring countries annually (Richardson 1997).
A survey of "live food fish sources" is currently been undertaked by TRAFFIC Southeast Asia and TRAFFIC East Asia. The study will compile information on geographical location of cyanide fisheries, involvement of local communities, and trading practices applied by suppliers. Preliminary observations show that the trade in live groupers and Napoleon wrasse is not sustainable because: firstly, it encourages overfishing due to the very high price offered for each fish caught; secondly, the big fish fetch higher prices but lay more eggs per kilo than small fish, so their capture makes bigger inroads in populations; and third, some species, like wrasses, change sex as they get bigger and older... Selective capture of old specimens may mean less males to fertilise eggs.

Indonesian ornamental fish exports to the world

Until the mid-1980s the Philippines provided 70% of marine ornamental fish to the world's largest markets, western Europe and the USA. Since the mid-1980s, the trade supply has shifted largely to Indonesia, Singapore, and Sri Lanka (Woeltjes 1995). Apparently, there is a shift in aquarium products consumption from Europe and the USA, to East and Southeast Asia. Further surveys are required to ascertain this trend.

Indonesia offers a large assortment of ornamental fish (several hundred species) and invertebrates of very variable quality. Indeed, fish collected with cyanide suffer heavy mortality both during transport, and after they reached their destination and are sold.

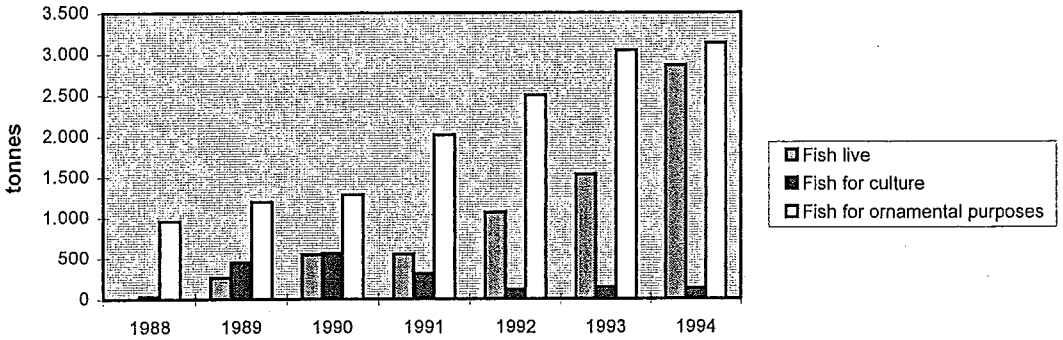
In 1997, according to customs data of EU Member States compiled by Eurostat, Indonesia was the biggest supplier of marine aquarium market to the EU. In 1991, Indonesia was already the first supplier of marine aquarium fish market in the Netherlands, accounting for approximately 35% of Dutch imports. Singapore has rapidly risen in importance and its share of the market reached 13% in 1990 (Woeltjes 1995). Although difficult to evaluate, there could be a proportion of ornamental fish collected outside Singapore waters, officially exported from Singapore, but in fact "re-"exported after being imported from neighbouring countries, particularly Indonesia. Similarly 10% of Dutch imports come from other EU countries re-exports, mainly Belgium (Woeltjes 1995).

Among the three different classes of fish exported live from Indonesia (Table 23), "live fish" supply the food market, "fish for culture" are juvenile fish sold to farms, and "fish for ornamental purposes" supply the aquarium trade.

Table 23 Indonesian live fish exports to various markets (tonnes)

	1988	1989	1990	1991	1992	1993	1994
Fish live	0	265	546	550	1,065	1,531	2,862
Fish for culture	32	449	562	310	119	147	129
Fish for ornamental purposes	955	1,191	1,282	2,016	2,495	3,044	3,128
Eels and elvers alive	9	3	5	34	74	33	
Total	987	1,905	2,390	2,876	3,679	4,722	6,119

Source: FAO Fishstat, 1995.



Statistic reports of the volume of live fish (Table 23) are based on data from shipments that usually do not separate weight of the fish from weight of water and containers. This is misleading the reading of figures, of which only 1.5 to 3% of ornamental fish shipments is fish the rest being mostly water (McAllister, *in litt.* 4 December 1997).

Table 23 indicates that until 1993 live fish were mainly exported from Indonesia for ornamental (aquarium) purpose, 955 tonnes in 1988, and 3,044 t in 1993 (2.5 million and 8.25 million fishes respectively since the wet weight of marine aquarium fishes range from 7 to 10gr each (Keith Davenport, Ornamental Aquatic Trade Association (OATA, "ex-OFI"), *pers. comm.* November 1997)). In 1994, the volume of live fish exported for food doubled, from 1,531 t to 2,862 t. This change may be due to the supply of live groupers and Napoleon wrasse to Chinese restaurant in Hong Kong, Taiwan, Singapore and even San Francisco (Richardson 1997).

After a sharp drop in 1990 and 1991, the annual export value of ornamental fish reported by Indonesia to FAO, both from fresh- and seawater, has been stable (Table 24).

Table 24 Live fish (fresh- and seawater) for ornamental purposes exported by Indonesia

	1988	1989	1990	1991	1992	1993	1994
Values (1,000 US$)	4,904	7,070	4,590	5,668	7,058	8,527	8,847
Volumes (tonnes)	955	1,191	1,282	2,016	2,495	3,044	3,128
US$/kg	5.13	5.94	3.58	2.81	2.83	2.80	2.83

Source: FAO Fishstat, 1995.

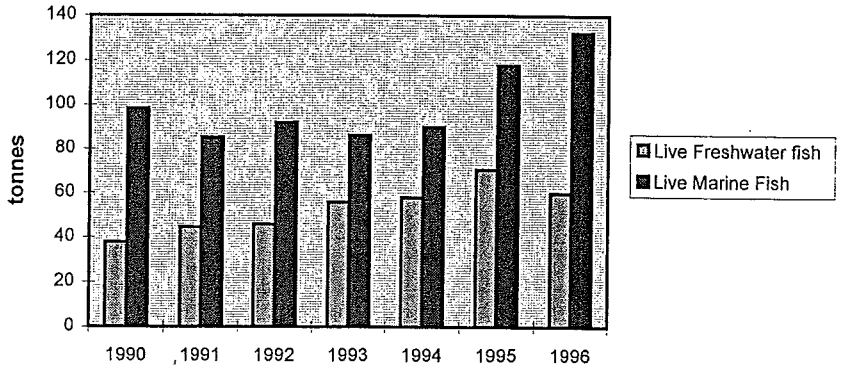
European Union imports, Volumes and Values

According to customs data compiled by Eurostat, the total volume of EU imports of marine aquarium fish increased by 35% from 1990 till 1996. Indonesia's supply represented 29% of EU marine ornamental fish imports in 1990 and 40% in 1996. On the other hand, a comparison of figures made available (Table 24 and 25; see Methods) indicates that EU probably imported only 10% of Indonesian exports in 1990, and maybe 5% in 1994.

Table 25 Volumes of ornamental fish from Indonesia imported in the EU (tonnes)

	1990	1991	1992	1993	1994	1995	1996
Freshwater fish	37.8	44.5	45.9	55.8	58	70.7	60.1
Marine Fish	98.2	85.2	91.9	86.2	90	117.8	132.3

Source: Eurostat, 1997.



In 1996, the EU volume of Indonesian ornamental fish imports was composed of 70% marine fish (350,000 specimens - see page 24) and 30% freshwater fish (160,000 specimens) (Table 25).
Since 1995, the demand and value (FOB, Free On Board) of marine aquarium fish on the EU market are higher than those of freshwater fish: ECU 28.9/kg (US$ 40.5/kg or US$ 4.7/fish) for marine fish, and ECU 21.42/kg (US$ 30/kg, or US$ 3.5/fish) for freshwater fish (Table 26, 27).

Table 26 Value of Indonesian Live Fish imported in the EU (1,000 ECU)

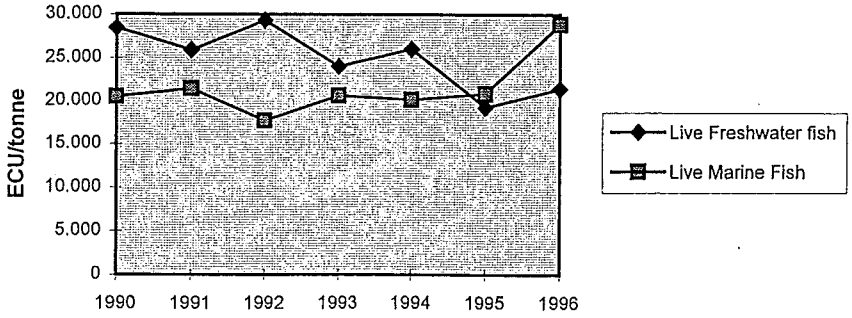
	1990	1991	1992	1993	1994	1995	1996
Live Freshwater fish	1,075.76	1,153.23	1,346.35	1,340.23	1,510.47	1,362.43	1,287.19
Live Marine fish	2,013.69	1,826.25	1,628.75	1,779.55	1,815.42	2,459.09	3,820.96

Source: Eurostat, 1997. (the average exchange rate for the period covered is, ECU 1= US$ 1.4)

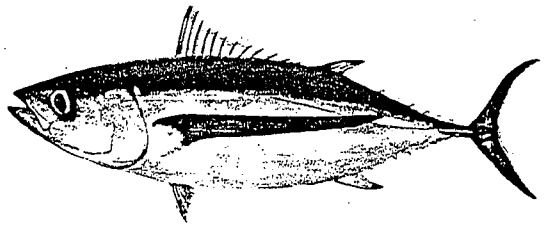
Table 27 Import price of Indonesian Live fish to the EU (ECU/tonne)

	1990	1991	1992	1993	1994	1995	1996
Live Freshwater fish	28,460	25,915	29,332	24,018	26,042	19,270	21,417
Live Marine Fish	20,506	21,435	17,723	20,644	20,171	20,875	28,903

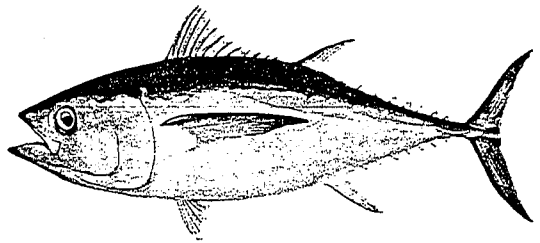
Source: Eurostat, 1997 (the average exchange rate for the period covered is, ECU 1= US$ 1.4)



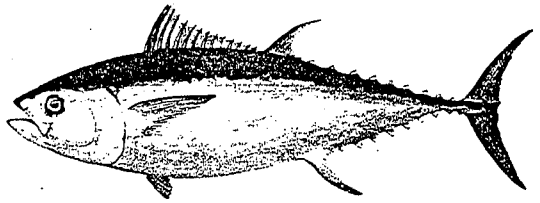
Pictures of the tunas and billfishes considered.
(Paintings by G. Mattson reproduced from Joseph, J., Klawe, W. and Murphy, P., 1988)



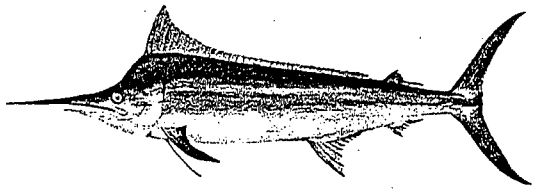
albacore *(Thunnus alalunga)*



bigeye tuna *(Thunnus obesus)*

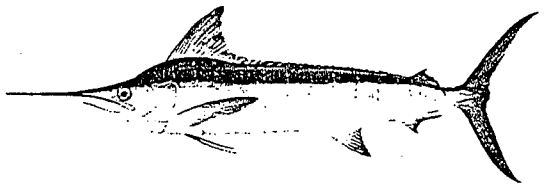


northern bluefin tuna *(Thunnus thynnus)*

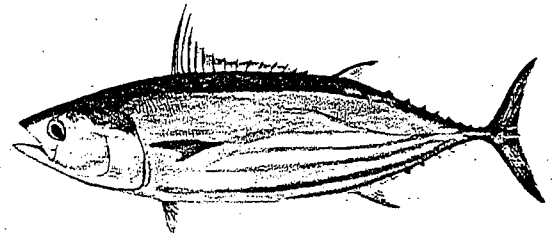


black marlin *(Makaira indica)*

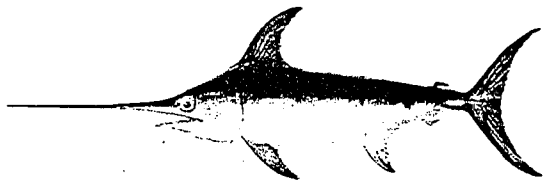
Indo-Pacific blue marlin *(Makaira mazara)*



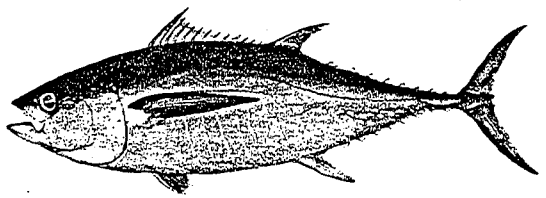
striped marlin *(Tetrapturus audax)*



skipjack tuna *(Katsuwonus pelamis)*

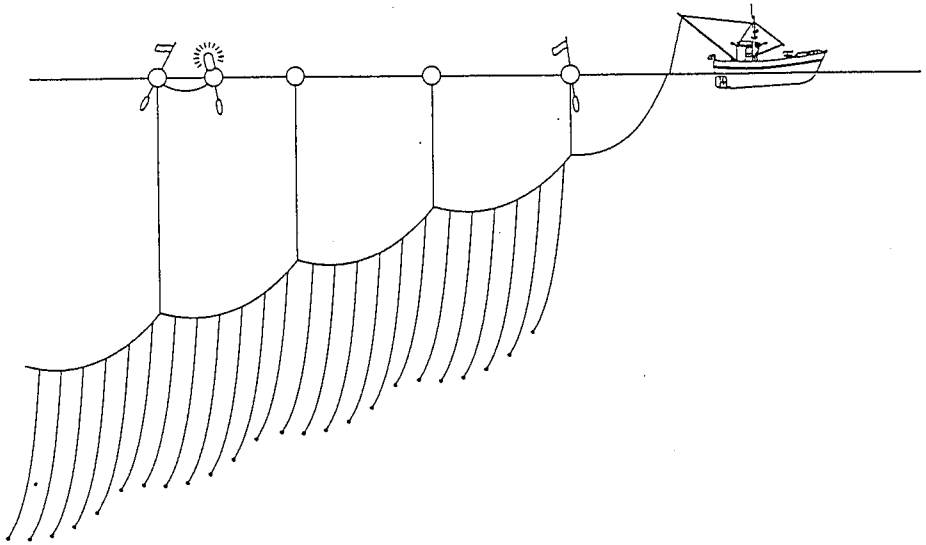


swordfish *(Xiphias gladius)*

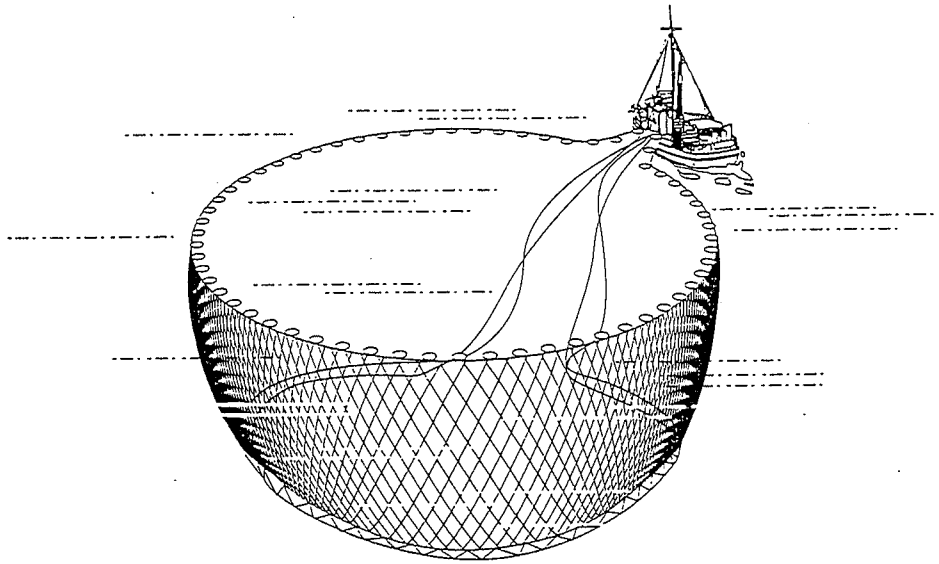


yellowfin tuna *(Thunnus albacares)*

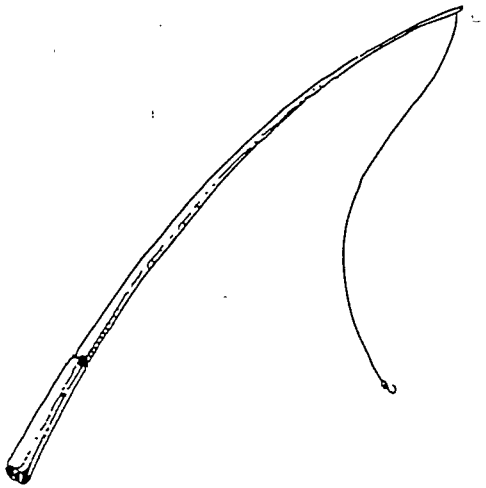
Illustrations of the fishing methods considered (Carocci and Majkowski 1996)



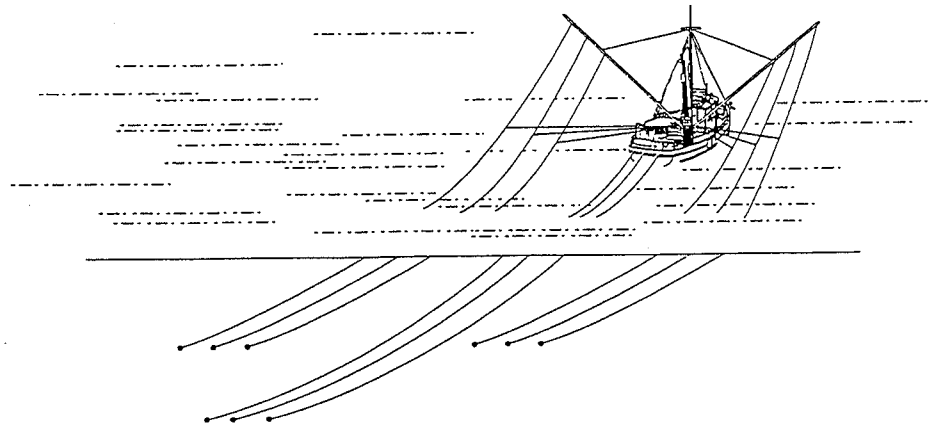
Longline



Purse seine



Pole and line



Troll line

Tunas

The following Tuna species and related species are important in trade: Albacore (Longfin tuna, *Thunnus alalunga*), Yellowfin tuna (*T. albacares*), Bigeye tuna (*T. obesus*), Northern Bluefin tuna (NBT, *T. thynnus*), Southern Bluefin tuna (SBT, *T. maccoyii*), Skipjack or stripe-bellied bonito (*Euthynnus pelamis*), Bonito (*Sarda* spp), and other species of the genera *Thunnus* spp and *Euthynnus* spp.

Compared to the Gulf of Thailand, where mostly gillnet and purse seine are used, more selective gears, such as pole on line, hand line, and long line (Ishida 1988), are commonly used in Indonesia, especially in the eastern part.
However, long line tuna fishery has an important by catch of shark. This gear rapidly developed since the mid-1980s, following the high demand for fresh tuna from Japan (Anon. 1988). There is a great link between small-scale fisheries and the tuna industry, because small-scale traditional fisheries supply live bait fish that are needed for long line tuna catch. Fish aggregating devices ("rumpon") used by the villagers to catch smaller fish are a long tradition in the Eastern islands of Indonesia (Monintja 1988).

Southern Bluefin Tuna (SBT) is mainly caught as bycatch of the bigeye/yellowfin fishery. As bigeye is now at a premium in Japanese gastronomy, there is a risk that higher catches of this species will lead to greater catches of SBT on the deeper set longlines on the SBT spawning ground (Hayes 1997).

Indonesian exports to the world

The Indonesian exports of tuna products are shifting from frozen products (73% of the total volume in 1988 and 38% in 1994), towards fresh or chilled products (9.6% of the total volume in 1988 and 31.5% in 1994) (Table 28).

Table 28 Volumes of Indonesian tuna exports (tonnes)

	1988	1989	1990	1991	1992	1993	1994
Skipjack tuna, fresh or chilled	0	118	112	186	11	1,386	1,999
Albacore, fresh or chilled	0	102	23	67	97	162	46
Yellowfin tuna, fresh or chilled	0	7,854	12,230	14,934	9,927	13,290	10,702
Other tunas, fresh or chilled (1)	4,746	555	1,653	3,809	10,509	17,630	12,403
Skipjack tuna, frozen	0	7,794	14,843	22,836	15,218	17,089	15,910
Albacore, frozen	0	643	636	1,397	1,973	2,682	1,485
Yellowfin tuna, frozen	0	10,024	8,691	11,322	6,444	8,680	6,032
Other tunas, frozen (1)	36,019	8,965	15,918	7,756	10,245	8,775	6,890
Bonitos, canned	0	0	32	16	938	5,386	4,739
Tunas, canned (2)	8,504	20,621	18,619	41,043	18,077	17,683	19,524
Total (tonnes)	**49,269**	**56,676**	**72,757**	**103,366**	**73,439**	**92,763**	**79,730**

(1) Including Bluefin tuna (*Thunnus thynnus*) and the genus *Euthynnus* spp.
(2) Including all tuna and tuna like species (Skipjack, Albacore, Yellowfin, etc.) except for bonito (*Sarda* spp).
Sources: FAO Fishstat, 1995.

In 1994, the average export price for fresh and chilled tuna products was 3.370 US$/t, or about twice the average export price of frozen tuna products (1,660 US$/t)(Table 28 & 29).
Better cooling facilities, better packaging, and quick transportation (air cargo) allows to export more fresh and chilled fisheries products, and plays a major role in the constant increase of Indonesia tuna product export prices, from 1,490 US$/t in 1988 to 2,150 US$/t in 1994 (Table 29).

The Japanese custom service reported their imports of Indonesian Bluefin tuna (*Thunnus thynnus*), as follows: for fresh products, Indonesian exports of tuna products only started in 1987 with 1.37 tonnes, and 45.49 t in 1990, with average volume of 25.90 t/year; for frozen products, between 1976 and 1990 the average volume was 7.98 t/year (Gaski 1993). These small volumes explain why there is no separate records for this species in Fishstat (FAO), Bluefin tuna is mixed with other species in "Other tunas".

Table 29 Value of Indonesian tuna exports (1,000 US$)

	1988	1989	1990	1991	1992	1993	1994
Skipjack tuna, fresh or chilled	0	200	195	539	17	1,210	2,346
Albacore, fresh or chilled	0	286	103	137	119	368	104
Yellowfin tuna, fresh or chilled	0	24,263	37,983	59,307	45,505	67,562	49,244
Other tunas, fresh or chilled (1)	14,841	1,919	4,119	8,461	32,756	52,401	33,092
Skipjack tuna, frozen	0	5,399	11,798	16,841	11,482	14,584	14,473
Albacore, frozen	0	927	527	1,240	3,904	6,629	4,759
Yellowfin tuna, frozen	0	16,664	9,738	11,677	6,592	11,052	8,098
Other tunas, frozen (1)	38,091	13,678	16,816	8,524	13,480	13,514	10,892
Bonitos, canned	0	0	63	29	1,438	9,726	9,822
Tunas, canned (2)	20,706	39,332	43,400	77,656	30,675	36,772	49,371
Total (1,000 US$)	**73,638**	**102,668**	**124,742**	**184,411**	**145,968**	**213,818**	**182,201**
US$/kg	1.49	1.81	1.71	1.84	1.98	2.20	2.15

(1) Including Bluefin tuna (*Thunnus thynnus*) and the genus *Euthynnus* spp.
(2) Including all tuna and tuna like species (Skipjack, Albacore, Yellowfin, etc.) except for bonito (*Sarda* spp).
Sources: FAO Fishstat, 1995.

From 1988 to 1994, among the four tuna species recorded by Indonesian national statistics and reported to FAO, Yellowfin tuna (*Thunnus albacares*) has the largest share in tuna export volumes, 17,161 tonnes average per year (Table 30). According to Japanese Customs data, with 11,170 t fresh or chilled and 4,020 t frozen in 1994 (10,300 t and 2,570t respectively in 1996) Yellowfin tuna was only the second most important tuna-like species supplied by Indonesia. Discrepancies exist between Indonesian exports of Skipjack tuna reported to FAO in 1994 (17,900 t total exports), and Japanese Customs data (23,800 t imported from Indonesia in 1994).

Table 30 Comparative volumes of tuna species exported by Indonesia (tonnes)

	1988	1989	1990	1991	1992	1993	1994	Average/y
Skipjack tuna	0	7,912	14,955	23,022	15,229	18,475	17,909	**13,929**
Albacore	0	745	659	1,464	2,070	2,844	1,531	**1,330**
Yellowfin tuna	0	17,878	20,921	26,256	16,371	21,970	16,734	**17,161**
Bonito	0	0	63	29	1,438	9,726	9,822	**3,011**
Other tunas (1)	49,269	30,141	36,190	52,608	38,831	44,088	38,817	**41,421**

(1) Including Bluefin tuna (*Thunnus thynnus*) and the genus *Euthynnus* spp.
Sources: FAO Fishstat, 1995.

European Union imports of tunas from Indonesia

The EU imports huge quantities of fresh and frozen tuna. These imports have almost doubled over the past decade. New supply has come from the Western Indian Ocean (e.g. Seychelles), mainly from trans-shipments of Yellowfin tuna caught by French and Spanish vessels. Fresh/Frozen tuna imports of the four main importers, Italy, Spain, France, and Portugal, was almost 300,000 tonnes in 1990 (Josupeit 1992), of which only 350 tonnes (0.2%) came from Indonesia (Table 31). Regarding canned products, although Asia supplied 52% of the EU tuna cans imports in 1989, Indonesia represented only 6% of the Asian supply, Thailand 70%, and the Philippines 23% (Josupeit 1992). However, tuna products exported to the EU by Southeast Asian suppliers may

come from tuna fish caught and exported by Indonesia, and processed and re-exported in neighbouring countries.

In 1994 the EU market absorbed only 4% (in tonnes) of all Indonesian fresh or frozen tuna exports (mainly Yellowfin tuna), and 20% of all canned tuna (Table 28 &31 -see Methods-).

Table 31 Volumes of Indonesian tunas imported in the EU (tonnes)

	1990	1991	1992	1993	1994	1995	1996
Albacore, fresh or chilled	0	0	0	5	0	0	0
Yellowfin, tuna fresh or chilled	42	0	0	0	0	22	8
Albacore, frozen	23	0	0	0	0	0	0
Yellowfin tuna, frozen	254	6	1,004	1,640	36	53	191
Other tunas, frozen (1)	23	0	0	0	0	0	108
Tuna fillets, frozen (1)	9	26	145	100	156	183	474
Canned (2)	9,528	8,973	10,108	5,664	5,696	6,268	6,363
Minced (2)	30	20	37	0	148	248	129
Total	**9,907**	**9,026**	**11,293**	**7,408**	**6,035**	**6,773**	**7,273**

(1) Including Bluefin tuna (*Thunnus thynnus*) and the genus *Euthynnus* spp. (2) All tunas, together with skipjack, and bonito.
Source: Eurostat, 1997.

Table 32 Values of Indonesian tunas imported in the EU (1,000 ECU)

	1990	1991	1992	1993	1994	1995	1996
Albacore, fresh or chilled	0	0	0	28	0	0	0
Yellowfin, tuna fresh or chilled	63	0	0	0	0	101	43
Albacore, frozen	30	0	0	0	0	0	0
Yellowfin tuna, frozen	300	10	1,095	1,771	77	100	290
Other tunas (1)	28	0	0	0	0	0	135
Tuna fillets, frozen (1)	25	60	336	282	471	438	1,379
Canned (2)	16,297	16,266	16,278	9,438	10,448	10,788	11,053
Minced (2)	54	42	68	0	281	402	209
Total	**16,797**	**16,378**	**17,778**	**11,520**	**11,277**	**11,829**	**13,110**

(1) Including Bluefin tuna (*Thunnus thynnus*) and the genus *Euthynnus* spp. (2) All tunas, together with skipjack, and bonito.
Source: Eurostat, 1997. (the average exchange rate for the period covered is, ECU 1= US$ 1.4)

Indonesian fresh or chilled tuna products have by far the highest import value, 10 times higher than canned products, and about 5 times higher than frozen products, whether Albacore or Yellowfin (Table 33). In 1996, volumes of Yellowfin tuna imported from Indonesia by the EU (199 t) represented only 1.5% of what Japan imported (12,870 t), and only 0.4% in value (US$ 355,000 for EU imports and US$ 83,253,500 for Japanese imports).

Table 33 Comparative prices of Indonesian tuna products imported into the EU (ECU/tonne)

	1990	1993	1996
Other tunas, frozen (1)	1,217		800
Canned, Tunas, Skipjack, and bonito	585	600	575
Albacore fresh or chilled		5,600	
Albacore frozen	1,304		
Yellowfin tuna, fresh or chilled	1,500		5,375
Yellowfin tuna, frozen	1,181	1,079	1,518

(1) Including Bluefin tuna (*Thunnus thynnus*) and the genus *Euthynnus* spp.
Source: Eurostat, 1997. (the average exchange rate for the period covered is, ECU 1= US$ 1.4)

Swordfish

Among tuna like species are billfish such as marlin (*Makaira* spp), sailfish (*Isthiophorus* spp) and swordfish (*Xiphias* spp). Roaming in the open-sea waters, swordfish (Xiphiidae) are pelagic fish particularly abundant in cold waters. Indonesian deep straits, for instance along "Wallace's Line" (between Borneo and Sulawesi), or between Sulawesi and the Molluccas, are crossed by strong cold water currents, where billfish occur.
The gears commonly used to target swordfish are longline and troll line (Carocci 1996).

European Union imports of Swordfish (Xiphias gladius) products from Indonesia

Swordfish is the only billfish species that appears in the national statistics of EU Member States (Eurostat). No separate data are kept in Fishstat (FAO 1995) for swordfish products trade, this explains why EU imports can not be compared with total Indonesian exports.

The total volume of Indonesian swordfish products imported by the EU has been constantly raising from 21 t in 1991 to 301.2 t in 1996. Probably as a result of better storage facilities or more sophisticated vessels, Indonesian swordfish exports are clearly switching from frozen (229.1 tonnes in 1995 to 191.7 t in 1996, at US$ 4.02/kg) towards the higher value fresh or chilled fillets (46 t in 1995 to 106.1 t in 1996, at US$ 5.97/kg).

Table 34 Volumes of Indonesian Swordfish imports into the EU (tonnes)

	1990	1991	1992	1993	1994	1995	1996
Fresh or chilled	0	0	0	0	0	2.1	0
Frozen	0	21	150.9	194.9	160.2	229.1	191.7
Fillets (1)	0	0	0	3.1	19.9	46	106.1
Other	0	0	0	3	13.2	0.2	3.4
Total	0	21	150.9	201	193.3	277.4	301.2

Source: Eurostat, 1997. (1) Fresh or chilled.

Table 35 Values of Indonesian Swordfish imports into the EU (1,000 ECU)

	1990	1991	1992	1993	1994	1995	1996
Fresh or chilled	0.00	0.00	0.00	0.00	0.00	11.00	0.00
Frozen	0.00	64.19	481.29	593.71	430.67	572.78	550.85
Fillets (1)	0.00	0.00	0.00	14.49	90.02	189.83	452.25
Other	0.00	0.00	0.00	14.26	43.65	0.94	17.38
Total	0.00	64.19	481.29	622.46	564.34	774.55	1.020.48

Source: Eurostat, 1997. (the average exchange rate for the period covered is, ECU 1= US$ 1.4) (1) Fresh or chilled.

Sharp increases of exports of monospecific fisheries products usually indicate the increase of targeted fishing efforts. In 1995, five years only after the appearance of swordfish trade between Indonesia and the EU, in Jayapura, the capital of Irian Jaya Province, fishermen were already reporting an alarming decrease of swordfish catch per unit effort (per fishing vessel) (van der Wal, *pers. comm.* December 1995). This assertion could be the symptom of over-exploitation of swordfish wild populations.

Sharks

Indonesia has the richest chondrychthian (sharks, rays, chimeres) fauna in the world, with at least 350 species. Elasmobranchs (sharks -"ikan hiu"- and rays -"ikan pari") have been caught in Indonesia for thousands of years. Between 1992 and 1993, shark and ray landings rose by 6,999 tonnes (8,73%), and Indonesia took the lead of the world's elasmobranchs fishery with 87,138 t (Keong 1996).

Much of Indonesia's shark fisheries are small scale fisheries with relatively small canoes (e.g. dugout canoes) and simple gear (gillnet, hook on line). Sulawesi ethnic groups (Bugis, Makassarese, and Butonese), have wide ranging fleets and well organised trading structures. The boundaries of their activities spread tremendously in the mid-sixties when engines were introduced in the archipelago. The presence of these ethnic groups and Bajo people ("sea nomads" of Indonesia, Malaysia and the Philippines) has been reported from Kalimantan (Borneo) to Australia, where numerous sharks and sea cucumbers fishing boats have been confiscated for entering the Australian territorial waters without permit, and for fishing illegally (De Ramm, *pers. com.* July 1994, PACON, Australia).
Sharks are also caught by industrial fisheries. There are the by-catch of longlines targeting tuna (Bigeye, Southern Bluefin tuna). Information from Australian and New Zealand observers on Japanese vessels in the Tasmanian winter season reveal that the shark by-catch constituted 3.8% of the total retained tuna catch (Stevens, in Hayes 1997). The percentage frequency of Elasmobranch species caught (No/1,000 hooks) has been documented for SBT on Japanese vessels in New Zealand waters (Hayes 1997).

While some shark species are caught for their meat (e.g. Dogfish caught in the North Atlantic), the main product of the Indonesian shark fisheries are shark fins and tails ("ekor ikan hiu" (see Annex III) in Indonesian language), fresh and dried salted or unsalted (see Annex III). Sharks most preferred for fins are, in order of preference: sandbar (*Carcharhinus plumbeus*), bull (*C. leucas*), hammerhead (*Sphyrna* spp.), blacktip (*C. limbatus*), porbeagle (*Lamna nasus*), mako (*Isurus oxyrinchus*), thresher (*Alopias vulpinus*), and blue shark (*Prionace glauca*) (Anon. (National Marine Fisheries Service) 1989b, in Keong 1996). Trade data show that three cities, Jakarta, Surabaya (East Java), and Ujung Pandang (South Sulawesi) dominate fin exports, and that ethnic Chinese traders own the export business. According to one exporter the fin may be bought and sold up to 10 times before it actually leaves the country (Keong 1996).

Processing and size are determinant of the shark fin price. For instance, small blacktip shark fins are sold fresh in Muara Angke (Jakarta fishing harbour) for IDR 4,000/kg (US$ 1.80/kg), small dried blacktip shark fins are quoted IDR 15,000/kg (US$ 6/kg), and large dried fins, suspected to be from a hammerhead shark, were priced IDR 300,000/kg (US$ 132/kg). By contrast, fully processed fins are sold dried and packaged in supermarkets for up to IDR 750,000/kg (US$ 330/kg) (in Keong 1996). Shark meat is not priced, and villagers usually use it dried for their own consumption (Annex III).

There is evidence of a growing exploitation, of some deep sea shark species for liver oil and squalene, using demersal longlines. Suitable species of sharks for the production of oil and squalene (*Centrophorus squamosus*, *C. uyato*, *Hexanchus* spp., and *Dalathias licha*) live in waters between about 300m and 1,000m (in Keong 1996). The origin of liver oil exports also corresponds with some of the harbours that are adjacent to such deep waters.

Regarding other species, the white spotted guitarfish (Family Rhynchobatidae) is being targeted specifically for its fin. During a survey of 15 shark fishing boats around the Aru Islands (East Maluku -Molluccas-), an average price of IDR 72,270 (US$ 31) per individual of this species was reported (in Keong 1996).

Indonesian exports to the world

Dried shark fins have been exported from Indonesia in large quantities for at least two decades. They raised to a peak of 547 t in 1987. This is equivalent to catches of about 40,000 to 60,000 t total shark catch (dried shark fins represent about 1% of sharks' live weight) (Keong 1996). Shark liver oil is a very valuable product in Indonesia and abroad (Table 38). However, traditional fishing boats are too small and not equipped to keep or process the shark livers, and the entire body is thrown back to the water. Data on fish liver and body oil are available (Table 48), but shark liver oil may be misclassified as "cod liver oil" for instance (Keong 1996).

Table 36 Volumes of Indonesian shark products exports (tonnes)

	1988	1989	1990	1991	1992	1993	1994
Frozen	0	0	0	0	3,066	8,293	5,366
Fins, dried, unsalted	473	475	422	376	316	367	498
Fins, dried, salted, etc.	0	41	136	118	148	193	145

Sources: FAO Fishstat, 1995.

Table 37 Value of Indonesian shark products exports (1,000 US$)

	1988	1989	1990	1991	1992	1993	1994
Frozen	0	0	0	0	1,420	3,646	2,466
Fins, dried, unsalted	6,422	10,473	9,949	10,680	17,338	11,900	9,491
Fins, dried, salted, etc.	0	586	1,232	868	2,631	2,159	2,297

Sources: FAO Fishstat, 1995.

In 1992, exports of shark flesh (frozen) started to be reported by Indonesia to FAO. They almost doubled in two years (Table 39), but the export value is still negligible, US$ 0.46/kg in 1994, compared to dried unsalted shark fins, US$ 19.06/kg in 1994 or US$ 54.87/kg in 1992 (Table 38).

Table 38 Unit value of Indonesian shark products exports (US$/kg)

	1988	1989	1990	1991	1992	1993	1994
Frozen					0.46	0.44	0.46
Fins, dried, unsalted	13.58	22.05	23.57	28.4	54.87	32.43	19.06
Fins, dried, salted, etc.		14.29	9.06	7.36	17.78	11.19	15.84

Sources: FAO Fishstat, 1995.

European Union imports from Indonesia

Dried (salted or unsalted) shark fin are appreciated in Asia (see Annex III), but the European gastronomy does not share this attraction.
Besides potential imports of shark liver oil, the only Indonesian shark product recorded in EU countries customs data is frozen flesh. The trade started in 1991 with 84.8 tonnes and decreased immediately after, reaching less than half a tonne in 1996.

Table 39 Frozen shark meat imported from Indonesia by the EU Values, Volumes, and Import prices

	1990	1991	1992	1993	1994	1995	1996
1,000 ECU	0	112.59	221.46	25.19	10.61	3.02	0.73
tonnes	0	84.8	67.1	18.1	9.9	2	0.4
ECU/kg		1.33	3.30	1.39	1.07	1.51	1.82

Source: Eurostat, 1997. (the average exchange rate for the period covered is, ECU 1= US$ 1.4)

Seahorses

The four names commonly cited for the most heavily fished IndoPacific species of seahorses are *Hippocampus kuda*, *H. histrix*, *H. kelloggi* and *H. trimaculatus*. They belong to the Order of Sygnathidae. None of them is a clear species, for instance *H. kuda* has become a default name bestowed on at least 10 different species (Vincent 1996).

Neither FAO, nor Eurostat keep separate records of seahorses trade. The only available data are collected in the field: fishing villagers, cities, and abroad (e.g. Taiwan, Hong Kong).
Indonesia exports apparently hundreds of thousands of live seahorses per year for the marine aquarium trade. In contrast, only small exports of dried seahorses for Traditional Chinese Medicine (TCM) (about 200kg/year) were reported in 1995, after a short field survey (Vincent 1996). However, seahorses are collected in Indonesia for the large market of domestic traditional medicine, "jamu", and some curio. They are caught by target artisanal fisheries (often women and children on seagrass beds), or as and incidental by-catch, particularly by some unofficial trawlers (Vincent 1996). These very strange fish are also kept traditionally as talismans by communities in the Moluccas, or in cities for gambling instead of money (Vincent 1996).

The rainy season is a peak season for seahorses fisheries in most Indonesian provinces. In Java and Bali, two main islands of marine aquarium fish exports in the country, the wholesale value of seahorses in 1995 was about 100 times higher for live specimens compared to dead and dry ones (IDR 3,000-4,000 (US$ 1.4-1.8) each live, versus IDR 20 to 40 each dead and dry (average of US$ 0.014 each) - with 260 dry seahorses/kg (Vincent 1995) it means IDR 5,000-10,000/kg (US$ 2.27 to 4.55/kg)). But in April 1998, a Jakarta department store displayed dry specimens at IDR 7,000 and 9,000 each (IDR value had dropped from 2,200 to 8,800 to the US$). Data on seahorses trade are not readily available, and traders are not inclined to give their sales figures. For instance, in one survey site, information from lower levels of the trade indicated that a businessman handled 40,000 seahorses annually (i.e. weekly mean of about 750 individuals), against his claimed figure of 50 in an earlier interview (Vincent 1996).

Chinese imports of Indonesian dried Syngnathidae (including pipefish) in 1991, are 84kg at US$ 202/kg. Records of Indonesian dried seahorses imported by Taiwan are not much higher: 43kg in 1988, 168kg in 1989, 3kg in 1990, 14kg in 1991, 50kg in 1993, and 39kg in 1994. By comparison, Thai and Philippine supplies to China and Taiwan are huge, 8,069kg and 1,830kg respectively in 1994 (Vincent 1996).

Europe primarily consumes seahorses as curios (sold for instance at the seaside in souvenir shops) and aquarium fishes. Demand for dried seahorses could increase as interest for TCM grows, but production of TCM has yet to start in Europe. The average size of shipment imported is small, but total imports amounts to hundreds of thousands of seahorses annually. Europe's own seahorses are also being caught and dried for curios (Vincent 1996). Indonesia is the second largest supplier of live seahorses in the Europe, after the Philippines, with a range of free on board (FOB) prices of US$ 1.5 to 2.5/specimen (this export price does not include shipping and handling, so retail prices will be considerably higher) (in Vincent 1996). In 1994 and 1995, exporters in Bali (as well as in Manila) reported selling live seahorses to Europe (Germany, the Netherlands, and the UK), but noted that the USA and Japan were larger markets (Vincent 1996).

Captive breeding of seahorses is under trial at the Seafarming Development Center in Lampung (South Sumatra), with a species in the *Hippocampus kuda* complex (10 species). It currently manages to reach 53% survival of the young, by feeding them on copepods till 10 days, and then on brine shrimp nauplii (*Artemia salina*) (Vincent 1996).

Eels

Anguillidae are catadromous fish (i.e. they live their adult life in freshwater rivers and streams, and/or wetlands, and migrate to the sea to spawn). The most remarkable fact is that, according to present knowledge, all eels occurring in East and Southeast Asia seem to migrate to the same location to breed in very deep waters (e.g. more than 200m deep in the Marianes Strait, north-east of the Philippines). Similarly all species of eels (*Anguilla* spp) occurring in Atlantic range states breed in the Sargasso Sea. This complicated life cycle is the major obstacle to the aquaculture of eels. Until now, scientists and engineers have not succeeded in breeding these species in captivity. The entire eel farming industry, very important in the Republic of Korea and Japan, is relying on wild elvers (juvenile eels) for the stocking of tanks and ponds. For instance, from 1978 to 1981 the total Japanese imports of "live eel" raised from 12,101 to 17,800 tonnes (Kitson 1983).

Indonesian exports to the world

Both exports of Indonesian fresh or chilled eels and of frozen eels increased sharply in 1993 and 1994. Until 1990, trade in live eels and elvers was not recorded separately in Fishstat (FAO). Data were mixed with other species of "live fish", or recorded under "fish for culture".

The volume of Indonesian "eels and elvers live" exports reached a peak in 1993 (74 tonnes), but at a low value of 1.04 compared to US$ 2.03/kg in 1994. Nevertheless, using a weight unit (kg) for mixed "eels and elvers" is not appropriate because of the great weight difference between "live eels" (more than 100gr) and "live elvers" (less than 10gr). Moreover, the price is fixed per live individual and not per gr or per kg. For instance, in 1981 import prices (including freight) in Taiwan and Hong Kong were 7.000 times higher for live elvers than for live eels (Kitson 1983). In Japan, live eels are imported principally for production of grilled eel, "kabeyaki".

Table 40 Volumes of Indonesian eel products exports (tonnes)

	1988	1989	1990	1991	1992	1993	1994
Eels, fresh or chilled	0	4	0	1	0	76	113
Eels, frozen	0	18	1	0	0	1	27
Eels and elvers live	*	*	3	5	34	74	33

Source: FAO Fishstat, 1995. (* Not yet reported separately, mixed with other live fish exports)

Table 41 Values of Indonesian eel products exports (1,000 US$)

	1988	1989	1990	1991	1992	1993	1994
Eels, fresh or chilled	0	7	1	4	0	105	215
Eels, frozen	0	40	3	0	0	0	226
Eels and elvers live	0	32	16	5	58	77	67

Source: FAO Fishstat, 1995. (* Not yet reported separately, mixed with other live fish exports)

European Union imports of eels from Indonesia

Eels being a traditional dish in several European countries, local supplies and markets are well organised (e.g. the famous Belgian "paling in't groen"). There is not a high demand for Indonesian eels (Table 42), but their import value is relatively high, US$ 8.25/kg frozen in 1994 (Table 43) compared to US$ 2.4/kg for frozen Yellowfin tuna for instance.
In 1994, Japan imported a total of 15,850 tonnes of eels, 99% were live eels (average import price US$ 16.5/kg) of which only 10.3 tonnes came from Indonesia, at a value of US$ 17.6/kg (Japanese Custom Statistics).

Table 42 Volumes of Indonesian eel (*Anguilla* spp.) imports into the EU (tonnes)

	1990	1991	1992	1993	1994	1995	1996
Fresh or chilled	0	0	0	0.5	0	0	0
Frozen eels	0	0,1	0	0	22.9	28.3	6.9

Source: Eurostat, 1997.

Table 43 Values of Indonesian eel (*Anguilla* spp.)imports into the EU (1.000 ECU)

	1990	1991	1992	1993	1994	1995	1996
Fresh or chilled	0	0	0	6.21	0	0	0
Frozen eels	0	1.77	0	0	169.94	214.83	38.17

Source: Eurostat, 1997. (the average exchange rate for the period covered is, ECU 1= US$ 1.4)

Groupers

Since the early 1990s, groupers are the target of fish hunting with chemicals. Various genus supply the Chinese restaurants with live fish for food, (*Plectropomus* spp - "sunu", *Cephalopholus* spp, *Epinephelus* spp - "kerapu", *Chromileptis altivelis* - "tikus"),

In Eurostat the EU imports of groupers are not recorded separately. However, volumes and values of Indonesian exports of frozen and fresh or chilled groupers are indicated in Fishstat.

Table 44 Volumes of Indonesian grouper products exports (tonnes)

	1983	1984	1985	1986	1987	1988
Grouper, fresh or chilled	9	7	17	19	17	53
Grouper, frozen	0	0	2	2	2	4

Source: FAO Fishstat, 1995.

Table 44 bis Volumes of groupers' official landings in Indonesia (tonnes)

	1988	1989	1990	1991	1992	1993	1994
Area No 57	3,346	3,597	4,475	4,574	5,766	8,712	10,230
Area No 71	13,319	11,242	11,322	11,623	16,001	21,303	24,420

Source: FAO Fishstat, 1996

(1) FAO fishing zone: Eastern Indian Ocean

(2) FAO fishing zone: Western Central Pacific Ocean

Table 45 Value of Indonesian grouper products exports (1.000 US$)

	1983	1984	1985	1986	1987	1988
Grouper, fresh or chilled	4	7	8	21	34	112
Grouper, frozen	0	0	1	1	2	8

Source: FAO Fishstat, 1995.

In 20 years, 1976 till 1994, Indonesia has reported exports of groupers products to FAO for 6 years only, from 1983 till 1988 (Table 44 and 45). The export value for fresh or chilled groupers range from US$ 0.4/kg in 1983 to US$ 2.1/kg in 1988. The export value of frozen products follow the same increase: US$ 0.5/kg in 1985 and 1986, to US$ 2/kg in 1988.

The exports of grouper reported by Indonesia's national bureau of statistics to FAO do not reflect the constant increase of grouper (e.g. *Epinephelus* spp) landings reported recently (Table 44bis). Official landings in the Western Central Pacific Ocean zone (from the east coast of Sumatra to Irian Jaya) are twice the landings in the Eastern Indian Ocean zone (limited to the west coast of Sumatra).

Other fish species

Among the 107 fish, species and genera, recorded in Indonesian official fisheries landing data sent to FAO (Anon. 1995e), only few appear in export data reported to FAO (Anon. 1996a). Sardines, mackerels, mullets, halibuts, plaices, soles, jacks, herrings, cods, pomfret, snappers, and anchovies, appear separately in Indonesian fisheries products exports. Except for anchovies (7,600 tonnes average anchovies (dried, salted or in brine) exports, in 1993 and 1994, with an increase of export price from US$ 3.4/kg in 1993 and US$ 7/kg in 1994), their official export tonnage is small (Anon, 1996a), and their imports are only occasionally reported by EU Member States.

According to the Indonesian DGF, in 1987, 40% of landed fish were dried and salted, because it was, and still is, the only way to preserve fish in remote villages. Numerous species, mostly reef fish, are targeted by traditional fishers: Emperors (Lethrinidae), Parrotfish (Scaridae), Rabbitfish (Siganidae), Goatfish (Mullidae), Jack/Trevally (Carangidae), Exocetidae, Fuseliers (*Caesio* spp), Hemiramphidae, Snappers (Lutjanidae), etc. Fries of different species (local names exist for each one), especially Milkfish (*Chanos chanos*) are the object of intense labour and trade. They are salted and dried, and consumed fried, in fried rice for instance.

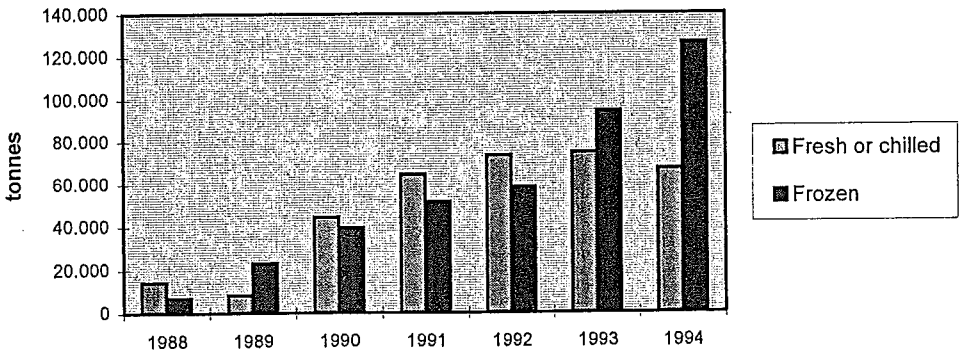
Indonesian exports to the world

Specific export records for each species of fish would involve important administrative work. Numerous species of fish are therefore grouped under a few headings. They can be separated by type of product: fresh or chilled, frozen, fillets, dried, salted, etc.

Table 44 Volumes of Indonesian mixed fish products exports (tonnes)

	1988	1989	1990	1991	1992	1993	1994
Fresh or chilled (1)	14,302	8,316	44,468	64,607	73,335	74,779	67,014
Frozen (1)	6,963	23,072	39,457	51,549	58,462	94,374	126,424
Fillets, fresh or chilled (1)	0	7	12	147	373	723	1,612
Fillets, frozen (1)	124	722	1,704	3,433	5,461	8,842	11,636
Fish, dried, unsalted	0	114	121	256	420	1,111	3,265
Fish, salted	0	920	1,628	1,113	870	330	796
Fish products (not fillets) (2)	46	0	0	0	0	0	0
Fish fillets (2)	0	37	224	309	583	1,400	838
Fish, smoked	184	72	760	187	1,101	1,238	1,368
Fish, canned	0	34	32	0	1	43	0
Fish preparations	0	10	3	27	9	59	14
Total (tonnes)	21,619	33,304	88,409	121,628	140,615	182,899	212,967

Source: FAO Fishstat, 1995. (1) Marine fish. (2) Dried, salted or in brine.



Under these mixed species categories, the export of frozen fish products increases constantly from 1988 to 1994. Showing a sharper raise than the fresh or chilled products during the same period. However, the value of frozen marine fish (US$ 0.41/kg in 1994) is lower on the Indonesian export market than the value of fresh or chilled marine fish (US$ 1.23/kg in 1994) (Table 44 & 45).

Table 45 Values of Indonesian mixed fish products exports (1,000 US$)

	1988	1989	1990	1991	1992	1993	1994
Fresh or chilled (1)	12,323	9,200	42,148	72,357	85,762	88,478	82,544
Frozen (1)	5,013	8,926	15,090	20,899	21,807	36,780	52,114
Fillets, fresh or chilled (1)	0	18	41	423	851	1,996	4,994
Fillets, frozen (1)	348	2,075	4,806	11,143	16,043	27,034	39,109
Fish, dried, unsalted	0	66	331	834	570	756	1,577
Fish, salted	0	1,509	2,842	2,511	1,648	592	2,453
Fish products (not fillets) (2)	50	0	0	0	0	0	0
Fish fillets (2)	0	133	926	1,286	2,079	4,351	2,717
Fish, smoked	547	205	838	618	2,827	1,376	2,123
Fish, canned	0	83	55	0	5	33	0
Fish preparations	0	46	19	72	11	197	77
Total (1.000 US$)	18,281	22,261	67,096	110,143	131,603	161,593	187,708

Source: FAO Fishstat, 1995. (1) Marine fish. (2) Dried, salted or in brine.

European Union imports from Indonesia

Similarly to tuna and shrimp & prawn products, the EU imports of mixed fish products clearly shifted from the frozen products (287 t in 1995, and 122 t in 1996) towards the higher quality fillets (226 t, and 273 t respectively).

Table 47 Indonesian fish products of non-classified species imported by the EU (tonnes)

	1990	1991	1992	1993	1994	1995	1996
Fish frozen	77.90	9.10	322.90	269.20	120.60	287.30	122.00
Fish fillets, and others (1)	37.50	86.10	30.70	33.10	112.40	226.70	272.70
Fillets, fresh or chilled	0.00	0.00	0.00	2.40	22.90	69.30	58.60
Dried fish	2.20	7.70	9.60	6.80	2.70	3.20	0.50
Other fish (2)	31.00	0.00	1.30	34.00	47.60	16.10	157.30
Total (tonnes)	148.60	102.90	364.50	345.50	306.20	602.60	611.10
ECU/kg	2.57	3.87	2.67	1.4	3.29	2.98	3.29

Source: Eurostat. (1) Fish flesh (whether or not minced), fresh, chilled, or frozen. (2) Whole or in pieces.

Table 48 Indonesian fish products of non-classified species imported by the EU (1,000 ECU)

	1990	1991	1992	1993	1994	1995	1996
Fish frozen	171.32	17.56	627.39	374.37	307.48	605.33	276.95
Fish fillets, and others (1)	130.31	312.82	281.84	111.28	436.20	825.36	1,145.07
Fillets, fresh or chilled	0.00	0.00	0.00	8.33	117.04	307.29	332.72
Dried fish	24.90	68.12	57.67	49.03	63,07	31.33	3.95
Other fish (2)	55.36	0.00	5.74	58.61	82.67	28.87	249.29
Total (1.000 ECU)	381.89	398.50	972.64	601.62	1,006.46	1,798.18	2,007.98

Source: Eurostat 1997. (the average exchange rate for the period covered is, ECU 1= US$ 1.4)
(1) Fish flesh (whether or not minced), fresh, chilled, or frozen. (2) Whole or in pieces.

Fish meals, oils, roes and surimi

As mentioned in the above chapter on shark products, fisheries products do not only include fish flesh (fillets, frozen, fresh or chilled), but also commodities such as oils, roes and fishmeals. The latter may be fit for human consumption, but are usually produced for animal fodder (N° 2301, in the Harmonised Commodity Description and Coding System, for Eurostat figures). In Indonesia, from the late 1960s till the early 1980s, the livestock (pig, chicken, and duck) went from 78,234 number of heads, to 140,841 (Mills 1983), and shrimp farming production increased six folds in the last decade. The domestic processing of fishmeal raised accordingly, and it was soon exported.

Indonesian exports to the world

Meals for animal consumption is exported in large quantities. However, volumes have decreased by half between 1988 (2,882 t) and 1994 (948 t). Meanwhile, fishmeal fit for human consumption have appeared on the Indonesian export market. This is probably the result of a more efficient industry allowing the production of higher value-added products. In 1994, the export price of meals for animal feed was US$ 0.17/kg, while fishmeal used for human consumption was exported at US$ 1.32/kg (Table 49 & 50).

Table 49 Volumes of Indonesian exports of other fish products (tonnes)

	1988	1989	1990	1991	1992	1993	1994
Fit for human consumption (1)	5	24	1	0	687	889	455
Unfit for human consumption (1)	2,882	1,080	547	861	680	1,118	948
Fish liver oils	326	787	710	741	380	177	91
Fish body oils	476	18	37	35	45	1	130
Marine mammal oils	2	24	166	145	60	0	0
Fish livers, fresh or chilled	0	1	0	0	0	2	0
Fish roes, fresh or chilled	0	0	0	0	0	0	0
Fish livers, frozen	0	0	0	0	0	0	31
Fish roes, frozen	0	26	24	43	67	23	24
Dried, salted or in brine (2)	191	228	122	346	136	174	258
Fish, smoked	184	72	760	187	1,101	1,238	1,368
Livers and roes, smoked	0	30	3	0	63	15	0

Sources: FAO Fishstat, 1995. (1) Fishmeal. (2) Fish roes.

Table 50 Values of Indonesian exports of other fish products (1,000 US$)

	1988	1989	1990	1991	1992	1993	1994
Fit for human consumption (1)	3	46	2	0	375	623	603
Unfit for human consumption (1)	267	118	58	492	123	255	166
Fish liver oils	1,543	2,242	4,643	7,521	3,985	1,642	931
Fish body oils	620	97	299	246	388	2	45
Marine mammal oils	10	164	1,351	1,567	4	0	0
Fish livers, fresh or chilled	0	8	0	0	0	8	0
Fish roes, fresh or chilled	0	0	6	0	0	0	0
Fish livers, frozen	0	0	0	0	0	0	289
Fish roes, frozen	0	99	13	77	195	18	91
Dried, salted or in brine (2)	6,064	5,678	3,881	6,210	1,437	2,762	3,397
Fish, smoked	547	205	838	618	2,827	1,376	2,123
Livers and roes, smoked	0	55	26	0	14	4	0

Sources: FAO Fishstat, 1995. (1) Fish meals. (2) Fish roes.

By far the highest value-added product is fish liver oil (US$ 10.23/kg in 1994), while fish oil extracted from all other organs of the fish has a low added-value (US$ 0.35/kg in 1994). Maybe some shark livers were used to produce oil, but data are not recorded species by species. Still, for unknown reasons, fish liver oil exports dropped from 7,521 tonnes in 1991 to 931 tonnes in 1994. Oil extracted from cetaceans were not officially exported by Indonesia in 1993 and 1994. CITES Appendix I listing of whales and several dolphins occurring in Indonesian waters, stopped all legal trade of these products.

Another processing technique raising the export price of fisheries products is smoking. Indonesia smoked fish exports have increased from 184 tonnes in 1988 to 1,368 tonnes in 1994, when it was purchased at US$ 1.33/kg.

Dried, salted or smoked roes are traditionally extracted from Flying fish (Exocetidae) called "ringgi tutue" by Bajau people (sea-nomads who now have settle mostly in Sulawesi) (Akimichi 1996; Kitson 1983). From 1988 to 1994 their export value fluctuated from US$ 32 to 10/kg respectively.

European Union imports from Indonesia

No records of Indonesian smoked fish, oils or roes have been reported by EU Member States, from 1990 to 1996. In 1996, imports of Indonesian fishmeal or pellet fit for human consumption has been recorded in the EU for the first time at an import price of ECU 9.1/kg (US$ 12.74/kg).

Table 51 Volumes of other Indonesian fish products (1) imported by the EU (tonnes)

	1990	1991	1992	1993	1994	1995	1996
Meals or pellets (2)	0.00	0.00	0.00	0.00	0.00	0.00	0.10
Surimi	0.00	0.00	0.00	0.00	0.00	20.30	19.50

(1) Other than frozen, and fresh or chilled.
(2) Fit for human consumption.
Source: Eurostat, 1997.

Imports of Indonesian surimi started in 1995, 19.5 tonnes at ECU 2.4/kg (US$ 3.4/kg). Until 1990, the largest suppliers of surimi to the EU were the Republic of Korea (13,991 t), Japan (7,087 tonnes), and Thailand (1,477 t). For the same year, the 5 main EU importing countries were France, Spain, the UK, Italy, and Germany (Josupeit 1992).

Surimi is a traditional product in Japan. It is an imitation of seafood produced from different parts of specific fish, in special processing factories. Technology transfer, particularly from Japan, allowed to develop such processing plants, and export high value-added surimi.

The purchase of these two commodities could be the start of EU imports of Indonesian value-added fisheries products.

Table 52 Values of other Indonesian fish products (1) imported by the EU (1,000 ECU)

	1990	1991	1992	1993	1994	1995	1996
Meals or pellets (2)	0.00	0.00	0.00	0.00	0.00	0.00	0.91
Surimi	0.00	0.00	0.00	0.00	0.00	45.00	46.80

(1) Other than frozen, and fresh or chilled.
(2) Fit for human consumption.
Source: Eurostat, 1997.

(the average exchange rate for the period covered is, ECU 1= US$ 1.4)

Shrimps and Prawns

Shrimps represent by far the most valuable commodity of all Indonesian fisheries exports. Although the largest part of the national production does not come from catches (63,500 tonnes in 1992) (Anon. 1995e) but from coastal brackishwater ponds of Giant Tiger Prawns (*Penaeus monodon*, "Udang windu" in Indonesian language)(125,500 t in 1992)(Anon. 1994b), the direct and indirect damage done by both fisheries and intensive shrimp aquaculture are well documented (Barraclough 1996) (Annex III). Legal measures have been adopted to improve fishing techniques, for instance the use of a by-catch excluder device (BED) is now compulsory for shrimp trawlers in Indonesian waters. Projects are implemented to protect, mangrove and other wetland coastal areas (Gujja 1996). However, recent signs of shrimp farmers awareness about environmental impacts of intensive shrimp aquaculture have been reported (Anon. 1998). Target species of the shrimp fisheries industry are *Penaeus* spp, Green tiger prawn (*P. semisulcatus*, Udang bago), Giant tiger prawn, and Banana prawn (*P. merguiensis*, Udang putih). Small-scale fisheries catch and sell , Indian white prawn (*P. indicus*) and *Metapenaeus* spp on the local markets.

Non-selective fishing gears, such as shrimp trawlers used in the Arafura Sea, have a by-catch that averages 80% (Chee 1997) going up to as much as 92% (Harris 1997)(1 tonne of shrimps for 18 tonnes of wasted natural resources). Tonnes of marine organisms (numerous species of fish and finfish, shellfish, and sometimes turtles and dugongs) are killed in the net, and 95% of them are discarded as "trash" in the sea (Alverson *et al.* 1994). Because of their insufficient commercial value, they are wasted and pollute coastal waters as well as beaches (Schultz, *pers. com.* 1993). Although the use of BED compulsory in Indonesian waters (Annex III), most vessels do not comply to this regulation. Since the fishing vessels are too small to keep the lower value catch, the wasted bycatch is often thrown back to the sea immediately. Small pelagic fish make the largest part of it. They represent the main source of food subsistence for the local fishing villages, where fishing communities reported a severe drop in fish catch for local subsistence (van der Wal, *pers. com.* June 1994). Since the early 1990s, alarming observations mention that pearl oysters (*Pinctada* spp) populations could soon be depleted. One of the causes of oysters mortality could be habitat destruction (i.e. change in water quality where sediments are put into suspension by bottom trawlers). Pearl oysters have been exploited locally for centuries (e.g. in the Aru Islands), pearls are exported at very high prices. The depletion of pearl oyster stocks would create a additional socio-economic problem for islanders. Moreover, since 1980 the Directorate General of Fisheries (DGF) reports that the shrimp stocks are fully exploited and no more vessels should be allowed into the fishery (Anon. 1980). The MSY (Maximum Sustainable Yield) used by the DGF, 14,000 tonnes, is about the same as that suggested in the 1995 FAO estimates (Gillet 1996). However, the shrimp and prawn landings in 1994 were 64,000 t, exceeding by almost 5 times the MSY (Anon. 1995e).

The effort to maximise production of shrimp ponds has led to intensive culture technology. The latter implies high stocking density, high feed concentration, and use of anti-biotics, with rapid eutrophication, high probability of disease and appearance of resistant pathologies (Martosubroto 1990). From a socio-economical point of view, the land used for shrimp pond are often paddy fields. This land is often bought by investors from the nearby city or the capital, from small farmers. Without land, farmers and their family are forced to migrate to the city. In 1984, brackishwater ponds in Indonesia covered about 225,000ha, of which less than 50,000ha were shrimp ponds, while the rest produced Milkfish (Cholik 1986). ICLARM (International Centre for Living Aquatic Resources Management) reported that the total coastal area dedicated to shrimp ponds in Indonesia went up from 200,000ha in 1993 to 300,000ha in 1994. Related socio-economic and environmental disruptions caused by the rapid and unplanned expansion of intensive shrimp aquaculture have been described (Barraclough 1996).

Table 53 Shrimp farming production in two Southeast Asian countries (tonnes)

		1986	1987	1988	1989	1990	1991	1992
Indonesia	Giant Tiger prawn (1)	15.424	25.202	44.450	63.676	67.355	96.811	125.150
	Banana prawn (2)	13.575	16.981	17.793	18.520	17.590	19.337	21.530
	Total	***28.999***	***42.183***	***62.243***	***82.196***	***84.945***	***116.148***	***146.680***
Philippines	Giant Tiger prawn (1)	27.980	32.380	41.458	43.539	47.591	45.740	75.996
	Banana prawn (2)	2.481	2.690	2.727	3.459	779	1.445	761
	Indian white prawn (3)	620	670	682	864	5.619	4.249	1.640
	Total	***31.081***	***35.740***	***44.867***	***47.862***	***53.989***	***51.434***	***78.397***

Source: FAO Fishstat 1994

(1) Penaeus monodon (2) P. merguiensis (3) P. indicus

Investments in the shrimp production and fisheries industry are nevertheless promoted by Southeast Asian governments (Indonesia, Malaysia, Philippines, Thailand, Cambodia, Vietnam, etc.) as sustainable development projects (Anon. 1991).

Indonesian exports to the world

Indonesian shrimps is the most important fisheries exports commodity both in quantity (90,014 t in 1994) and in total value (US$ 924.4 million in 1994). From 1988 to 1994, Indonesia was the main source of shrimps for Japan (Suzuki 1996), and it probably still is. However, since the drop of the Japanese currency in October 1997, trade between some Southeast Asian countries and Japan have decreased while exports to the EU gradually increased. This is the case for shrimps from Vietnam (Nguyen 1998).

Table 54 Volumes of shrimps and prawns exported by Indonesia (tonnes)

	1988	1989	1990	1991	1992	1993	1994
Pandalidae, fresh or chilled	0	0	0	1	9	407	315
Penaeidae, fresh or chilled	2,960	2,723	2,665	4,149	7,289	5,081	5,626
Penaeidae, frozen	53,002	67,568	85,,15	85,180	82,265	85,232	83,788
Dried or salted	212	199	46	0	0	0	0
Airtight containers	228	175	525	401	318	266	247
Prepared, not in airtight containers	14	65	6	74	74	30	38
Shrimp meal	664	94	62	87	330	3	0
Total	57,080	70,824	88,619	89,892	90,285	91,019	90,014

Sources: FAO Fishstat 1995.

Frozen Penaeids represent 96% of all Indonesian shrimp and prawns products exported. Their export price show a consistent rise, from 1990 (US$ 7.5/kg) to 1994 (US$ 10.6/kg).

Table 54 bis Values of shrimps and prawns exported by Indonesia (1,000 US$)

	1988	1989	1990	1991	1992	1993	1994
Pandalidae, fresh or chilled	0	0	0	3	33	843	478
Penaeidae, fresh or chilled	9,445	4,493	6,487	11,921	27,567	24,077	32,995
Penaeidae, frozen	485,662	515,471	643,928	715,909	687,791	789,006	889,408
Dried or salted	509	979	57	0	0	0	0
Airtight containers	470	1,162	2,765	996	926	1,309	1,319
Prepared, not in airtight containers	2	86	1	27	151	92	191
Shrimp meal	447	47	6	22	156	0	0
Total	496,535	522,238	653,244	728,878	716,624	815,327	924,391

Sources: FAO Fishstat 1995.

Table 55 Indonesian exports of frozen shrimps and prawns

	1988	1989	1990	1991	1992	1993	1994
tonnes	53,002	67,568	85,315	85,180	82,265	85,232	83,788
1000 US$	485,662	515,471	643,928	715,909	687,791	789,006	889,408
US$/tonne	9,163	7,628	7,548	8,405	8,360	9,257	10,615

Sources: FAO Fishstat 1995.

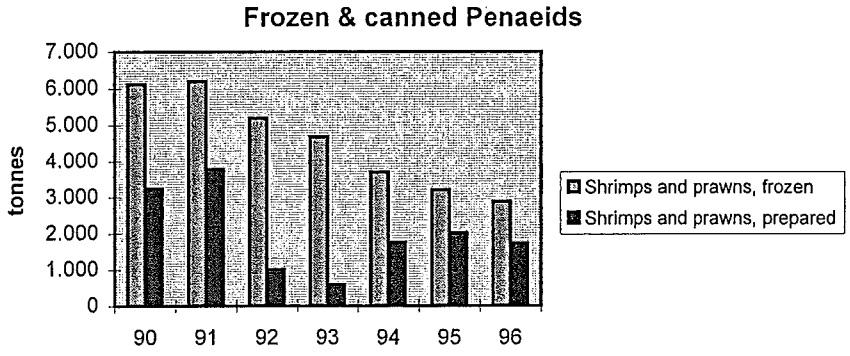
European Union imports of shrimps and prawns from Indonesia

In 1997, the main suppliers of tropical water shrimps to the EU were: Asia, 91,000 t, Africa, 51,500 t, and Latin America, 50,500 tonnes (Eurostat). In 1994, the EU imports absorbed about 6% of the volume of Indonesian shrimp exports (Table 54 and 56, see Methods), and 8.2% of the value (ECU 0.2 million=US$ 56.3). From 1994 to 1996 the EU imports are shifting from frozen to prepared products (Table 56). In 1996, the 4 main EU importers of shrimp and prawns were France (960 t), Belg./Lux. (770 t), and the UK (568 t) (Eurostat 1997).

Table 56 Volumes of Indonesian shrimp & prawns imported into the EU (tonnes)

	90	91	92	93	94	95	96
Shrimps and prawns, frozen (1)	6,114.6	6,195.9	5,184.4	4,675.4	3,691.8	3,209.9	2,881.1
Others (2)	5.2	16.7	4.5		12.9	0.8	
Shrimps and prawns, not frozen*	1.2	3.2	98.7	3.1	0.1	2.3	13.2
Pandalidae, not frozen	0.2		1.1	0.1			11.5
Other families, not frozen	1.0	3.2	0.5	3.0	0.1	2.3	1.7
Shrimps and prawns, prepared	3,243.2	3,780.6	1,014.2	584.2	1,755.5	2,019.0	1,723.6
Total	9,365.4	9,999.6	6,303.4	5,265.8	5,460.4	5,234.3	4,631.1

Source: Eurostat. (1) Mainly Penaeids. (2) including meals and flours for human consumption.



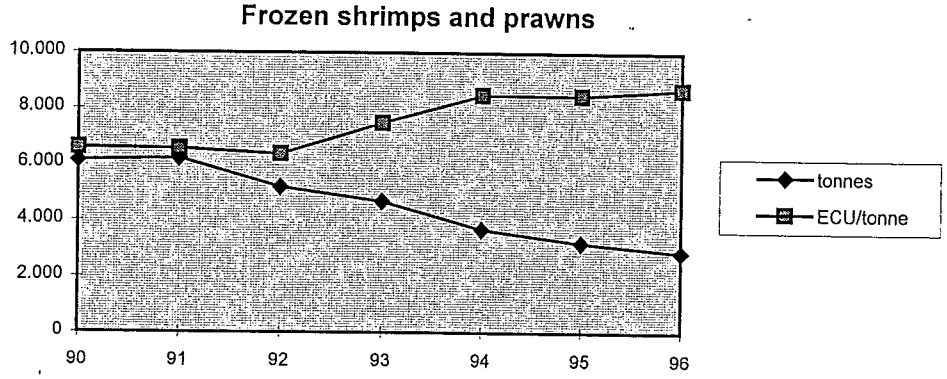
While the volume of shrimps imported into the EU decreased from 1990 to 1996, the import price increased significantly for frozen products (Graphic combining Table 56 and 57)

Table 57 Values of Indonesian shrimp & prawns imported into the EU (1,000 ECU)

	90	91	92	93	94	95	96
Shrimps and prawns, frozen (1)	40,222.42	40,526.02	32,977.75	34,989.57	31,336.99	27,188.74	25,038.06
Others (2)	24.60	96.19	25.67		75.22	9.50	
Shrimps and prawns, not frozen (1)	14.96	18.26	156.29	24.27	11.96	43.71	107.75
Pandalidae, not frozen	0.97		14.75	1.20			63.06
Other families, not frozen	13.98	18.27	5.43	22.56	11.44	42.34	44.70
Shrimps and prawns, prepared	13,402.36	17,547.86	4,580.58	2,794.50	8,748.59	9,290.42	8,239.04
Total	53,679.29	58,206.60	37,760.47	37,832.10	40,184.20	36,574.71	33,492.61

Source: Eurostat, 1997. (the average exchange rate for the period covered is, ECU 1= US$ 1.4)

(1) mainly Penaeids (2) including meals and flours for human consumption



Lobsters

One main genus of lobsters occur in Indonesia, the Tropical Spiny lobster ("udang barong", *Panulirus* spp). Other lobsters are commonly observed by divers, for instance Slipper lobster (Scyllaridae). Usually fishermen catch lobsters in traps made of bamboo ("bubu"). In Eastern Indonesia, a live lobster market has developed supplying restaurants in Darwin in nearby Australia for instance (van der Wal, *pers. com.* 1995). As with the live fish hunting for groupers and Napoleon wrasse, divers spray chemicals ("cyanide" -Na or KCN-, or bleaches -HCl-) in the cave in order to stun the hiding lobster. The same damages are caused to small reef fish populations, to corals and all other living organisms as for the live fish collection.

Indonesian lobster exports to the world

Lobster exports reached a peak in 1991 (3,033 t), with a high average export price of US$ 4.40/kg. Two third of the exports are Spiny lobsters (whole, frozen) of the genus *Panulirus* spp. In 1993, this genus filled 80% of the lobster products.
There are discrepancies between Indonesian reported landings and exports (Anon. 1995e and 1996a). In 1990, 1991, and 1993, the exports are higher than the landings (825 t, 1,398 t, and 1,208 t respectively).

Table 58 Volumes of Indonesian exports of lobsters (tonnes)

	1988	1989	1990	1991	1992	1993	1994
Whole, fresh or chilled	33	1,451	469	165	436	171	202
Spiny lobsters (1) whole, frozen	0	821	1,150	1,808	1,214	1,198	1,205
Tails or meat, canned	0	11	0	42	24	8	3
Spiny lobsters (1), fresh or chilled	0	47	66	47	123	506	50
Frozen (other species)	293	1,235	1,042	971	401	266	347
Total (tonnes)	326	3,565	2,727	3,033	2,198	2,149	1,807

Source: FAO Fishstat, 1997. (1) *Panulirus* spp.

Table 59 Value of Indonesian exports of lobsters (1,000 US$)

	1988	1989	1990	1991	1992	1993	1994
Whole, fresh or chilled	222	1,665	1,431	817	1,034	1,065	1,336
Spiny lobsters (1), whole, frozen	0	5,945	5,396	7,952	5,058	4,455	3,881
Tails or meat, canned	0	91	0	92	34	63	28
Spiny lobsters (1), fresh or chilled	0	98	359	445	1,142	698	551
Frozen	3,405	9,837	9,494	9,901	4,363	2,419	3,310
Total (1000 US$)	3,627	17,636	16,680	19,207	11,631	8,700	9,106
US$/kg	11.12	4.95	6.12	6.33	5.29	4.05	5.04

Source: FAO Fishstat, 1997. (1) *Panulirus* spp.

European Union imports of lobster from Indonesia

In 1994 and 1995, the EU market absorbed only 1 and 2.8% of the Indonesian lobster products exports (Table 58 and 60, see Methods). In 1995 the value of the EU imports (ECU 1.02 million=US$ 1.43 million) represented 35% of the value of Indonesian exports (US$ 4.05 million). Indeed, the import price of Indonesian lobster products entering the EU are very high (US$ 21.6/kg in 1994, 23.4 in 1995, and 22.4 in 1996).

Table 60 Volumes of Indonesian lobster products imported by the EU (tonnes)

	1990	1991	1992	1993	1994	1995	1996
Spiny lobster, frozen*	7.20	5.20	39.40	4.80	4.30	48.10	2.70
Lobster, frozen	0.00	0.20	0.40	10.80	17.30	12.30	2.70
Spiny lobster, not frozen*	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total (tonnes)	7.20	5.40	39.80	15.60	21.60	60.40	5.40

Source: Eurostat, 1997. (**Panulirus* spp)

Table 61 Values of Indonesian lobster products imported by the EU (1,000 ECU)

	1990	1991	1992	1993	1994	1995	1996
Spiny lobster, frozen*	90.08	64.98	300.02	56.22	84.00	842.45	52.43
Lobster, frozen	0.26	0.00	0.93	0.00	0.00	0.00	0.00
Spiny lobster, not frozen*	0.00	3.03	4.23	140.35	249.25	181.38	33.48
Total (1000 ECU)	90.34	68.01	305.18	196.57	333.25	1,023.83	85.91

(**Panulirus* spp)
Source: Eursotat, 1997. (the average exchange rate for the period covered is, ECU 1= US$ 1.4)

Crabs

There are essentially two crab species of importance in Indonesian fisheries: the Mangrove -or Mud- crab ("kepiting", *Scylla serrata*), and the Blue swimming crab ("rajungan", *Portunus pelagicus*) (Anon. 1996a). It is possible to breed mangrove crabs in brackishwater ponds. The annual production fluctuates irregularly. In 1992 it was 1,480 t (Anon. 1994) compared to 5,727 t of reported landings (Anon. 1995e). Trials of Mud-crab aquaculture started recently, but little information is available about commercial investments.
Although more terrestrial than marine, living on islands and not in the water, the Coconut crab ("ketam kelapa", *Birgus latro*) could be some of the most critically endangered "marine" species in Indonesia. The level of its harvest is not documented because the species is protected by Indonesian law, and thus it is illegal to catch, sell and kill specimens of this crab. Populations are probably so depleted that volumes would never reach significant levels to be incorporated in national statistics, and data on the status of Indonesian Coconut crabs wild populations are rare.

Indonesian exports to the world

In 1994, almost one third of the Indonesian crab landings (21,265 tonnes -Anon. 1995e-) were exported. From 1992 to 1994, Indonesian crab exports increased from 4,526 t to 6,884 t, while the value of the exports doubled due to the increase of exports of high priced frozen crabs.

Table 62 Volumes of Indonesian exports of crabs (tonnes)

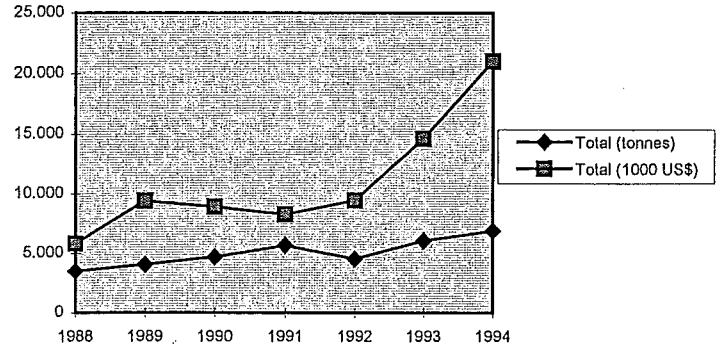
	1988	1989	1990	1991	1992	1993	1994
Peeled or not, fresh or chilled	2,633	2,342	3,325	4,250	2,954	3,890	3,729
Frozen	195	604	358	480	321	443	1,096
Salted, in brine or dried	4	44	13	34	69	21	258
Crab meat canned	660	1,085	982	875	1,182	1,688	1,801
Total (tonnes)	3,492	4,075	4,678	5,639	4,526	6,042	6,884

Source: FAO Fishstat, 1995.

Table 63 Values of Indonesian exports of crabs (1,000 US$)

	1988	1989	1990	1991	1992	1993	1994
Peeled or not, fresh or chilled	2,815	2,060	3,778	3,152	3,194	5,999	7,196
Frozen	543	2,293	774	1,097	739	1,042	2,753
Salted, in brine or dried	2	104	48	84	112	100	1,001
Crab meat canned	2,466	4,959	4,353	3,920	5,389	7,460	10,077
Total (1,000 US$)	5,826	9,416	8,905	8,253	9,434	14,601	21,027
US$/kg	1.66	2.31	1.90	1.46	2.08	2.42	3.05

Source: FAO Fishstat, 1995.



European Union imports of crab from Indonesia

The price of EU crab products imported from Indonesia (7.7 US$/kg), is the highest of all Indonesian seafood products imported. It consists almost exclusively of canned crab,

Table 64 Volumes of Indonesian crab products imported by the EU (tonnes)

	1990	1991	1992	1993	1994	1995	1996
Frozen (1)	0.6	0.0	0.0	36.1	0.8	0.0	1.5
Salted, in brine or dried (1)	4.1	0.0	0.0	0.0	0.0	23.1	0.9
Crab meat, canned	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prepared or preserved	529.5	381.8	277.2	495.6	411.3	295.7	389.0
Total (tonnes)	534.2	381.8	277.2	531.7	412.1	318.8	391.4
ECU/kg	3.58	3.82	3.5	4.38	4.82	5.57	5.47

Source: Eurostat, 1997. (1) Crab.

Table 65 Value of Indonesian crab products imported by the EU (1,000 ECU)

	1990	1991	1992	1993	1994	1995	1996
Frozen (1)	5.85	0.00	0.00	366.75	1.97	0.00	3.90
Salted, in brine or dried (1)	25.83	0.00	0.00	0.00	0.00	114.90	8.51
Crab meat, canned	0.69	0.00	0.00	0.52	0.00	0.00	1.03
Prepared or preserved	1,881.26	1,457.92	969.94	1,961.39	1,982.59	1,659.55	2,126.73
Total (1,000 ECU)	1,913.63	1,457.92	969.94	2,328.66	1,984.56	1,774.45	2,140.17

Source: Eurostat, 1997. (the average exchange rate over the period covered is, ECU 1= US$ 1.4) (1) Crab.

Seaweed

Seaweeds, also called macroalgae, are marine and coastal organisms that grow in sea- and brackishwater. In coastal zones of Southeast Asia archipelagos, three main groups of red seaweed are collected and cultivated: *Eucheuma*, *Kappaphycus Gracilaria*, and *Gelidium*. These genera comprise only a handful of the 100 species of seaweed of economic value occurring in the Indo-Pacific region (Anon 1995g).

In the intertidal areas of Indonesian coasts and islands, three main genera of seaweed are collected or cultivated, *Eucheuma* and *Kappaphycus* (Carrageenophytes), *Gracilaria* and *Gelidium* (Agarophytes). They are red seaweeds or Rhodophyceae.
The three first genera are most abundant and their cultivation is widely spread, especially in the eastern part of the country. In Bali and Lombok *E. spinosum* and *Kappaphycus alvarezii* (ex-*E. cottonii*) are grown off-bottom on fixed structures (tight on a rope which is stretched between two poles near the bottom on the shallow reef flat) (Annex III) or on floats (bamboo rafts are used) (Darjamuni 1988). In Sulawesi 2.000 farmer produce *Gracilaria* in ponds (McHugh 1996).

Seaweeds have been used for centuries, as human food, feed for livestock, fertilisers and as soil conditioners. Nowadays they are also used to produce substances known as colloids. A colloid is a non-crystalline substance, with very large molecules, that dissolves in water to give thick or viscous gel-like solutions: these form the primary material for the production of a wide range of pharmaceutical and food products (Elsy 1987). Agar extracted from *Gracilaria* and *Gelidium*, for instance, is a colloid processed into gel (media) for the growth of bacteria in laboratories. Carrageenan, from *Eucheuma* and *Kappaphycus*, is used as thickener in many food products (toothpaste, yoghurt, ice-cream, flan, etc.), in dairy products where it has suspending effect (e.g. cocoa suspended in chocolate milk), and in local desserts such as the popular Indonesian jellies. Gelatines from agar offer an alternative to the large volumes of gelatines derived from animal products — particularly from cow and sheep bones. The pharmaceutical industry has very high needs both for the research and development (R&D) sector and in the composition of their products (Elsy 1987). Raw dry seaweed is exported to specialised companies around the world for processing, particularly in Europe and North America. Recently, producing countries have started to develop their own refining and extracting industry. Ten tonnes of wet Carrageenophytes produce about one tonne of dry seaweed (9 to 10% of the wet weight for *E. spinosum* and 12 to 15% for *K. alvarezii* (Wanda Kambey, *pers. com.* April 1998)), from which 2 kg of carrageenan can be extracted. A colloid that is incorporated in food products at a rate below 1% in weight.

Table 66 **Seaweed culture production, processing and use (tonnes)**

		1986	1987	1988	1989	1990	1991	1992
Indonesia	*Wet weight* (1)*	77,462	80,000	85,000	80,000	100,000	90,000	130,000
	Dry weight (2)	7,746	8,000	8,500	8,000	10,000	9,000	13,000
	Carrageenan (3)	15.49	16.00	17.00	16.00	20.00	18.00	26.00
	Food (4)	1,549	1,600	1,700	1,600	2,000	1,800	2,600
Philippines	*Wet weight**	168,868	220,839	256,405	268,701	291,176	283,783	349,505
	Dry weight (2)	16,887	22,084	25,640	26,870	29,118	28,378	34,950
	Carrageenan (3)	33.77	44.17	51.28	53.74	58.24	56.76	69.90
	Food (4)	3,377	4,417	5,128	5,374	5,824	5,676	6,990

** Source: FAO Fishstat 1994*

(1) From 1987 to 1992: FAO estimates based on information available

(2) Dry weight of seaweed represents 9 to 15% of the wet weight (here estimates were made based on 10%)

(3) Carrageenan: 1 tonne of dry Eucheuma gives 2 kg of colloid

(4) Food: total weight of food that can be produced with 1% in weight of carrageenan added as thickner, suspender, etc.

Indonesia produces large quantities of natural seaweed. Certain islands that depend exclusively on the exploitation of marine resources are now expanding seaweed farming. Because of the potential role of international trade in promoting seaweed farming as an alternative economic income for these villagers, a study of Indonesian marine products imported into the European Union (EU) was undertaken. The present brief gives an overview of the feasibility of seaweed development, possible threats to the environment, specific as well as general management measures, and future perspectives.

Seaweed farming

Eucheuma and *Gracilaria* are the most abundant genera in Indonesia and are widely cultivated, especially in the eastern part of the country. In Bali and Lombok, *E. spinosum* and *Kappaphycus alvarezii* (new taxonomic name of *E. cottonii*) are grown off-bottom in shallow waters (at least 20 cm from the bottom) on fixed structures with seaweed seedlings (about 50gr) tied to ropes stretched between two wooden sticks, or on floats using bamboo rafts for instance (Darjamuni 1988). In Sulawesi, 2,000 farmers produce *Gracilaria* in ponds (McHugh 1996).

In Southeast Asia, according to official fisheries data reported to FAO, all recorded marketed seaweed come from cultures. The Philippines is the largest producer of seaweed in the region, with 349,505 tonnes wet *Eucheuma* recorded in 1992. Large volumes come from the Philippine waters in the Sulu Sea, close to the border with Indonesia. Increasingly successful, seaweed farming has spread among coastal and island communities, and across the border in North Sulawesi. The same is true in Bali and Lombok, where large areas of seaweed culture have expanded in shallow waters on top of coral flats or seagrass beds. In 1992, according to FAO estimates, Indonesia produced 130,000 tonnes of wet algae, representing a maximum of 19,500 tonnes of dry products.

Seaweed farming needs little investment: several hundred metres of nylon wire, a few initial seedlings — which can also be collected from the wild if locally available or imported from other regions (e.g. *K. alvarezii* in Bali imported from the Philippines), numerous small floats (fisherman usually recycle plastic bottles), and a small boat (often a locally-made dugout canoe).
Seedlings are attached to lines every 30 to 40 cm. Care of the seaweed is relatively simple, requiring only line-checking and replacement of seedlings that become dislodged or damaged by disease. The seaweed is harvested 45 days after attachment of seedlings to the wires. Most of the harvest is dried for sale, the remainder being retained as seed stock (Anon. 1996e).
In 1995, in Indonesia, the average farm gate price for dry *E. spinosum* and *K. alvarezii* was IDR 505/kg (US$ 0.23/kg — US$ (or USD) 1 = IDR 2,200, Indonesian rupiah). The average annual production of 3,206 kg represented an annual income of IDR 1.7 million per farmer. This was fairly high, given that government officers often earn less than IDR one million per year. In 1998, paradoxically, the Indonesian monetary crisis had positive spin-offs for seaweed farmers and for all producers of commodities destined for the export market. With the devaluation of the Indonesian rupiah, the price of dry seaweed in North Sulawesi rose from about IDR 800/kg to IDR 1,500 and 2,000/kg. While most economic sectors in Indonesia suffered severe loss of buying power, in the seaweed farming sector, dealing with an export commodity, prices could be adjusted to almost entirely compensate for this loss.

In certain circumstances, seaweed culture could become a useful alternative income-generating activity. Target areas include those where villagers are struggling for their livelihood, and where fishermen are driven into the use of destructive fishing practices (blast and cyanide fishing), and over-exploitation of depleted marine resources (Erdmann 1995). A survey of seven villages in Bunaken National Park (North Sulawesi, Indonesia) indicates that, by February 1996, 44% of the villagers who converted to seaweed farming completely abandoned their previous occupation, and 64% of them were fisherman (Anon. 1996d). A socio-economic study on the effects of seaweed culture adoption in the coastal villages of Bali suggests that, together with other favorable economic aspects of seaweed farming, it tends to reduce inequality of income (Firdausy and Tisdell 1993).

While small-scale seaweed farms probably have a limited ecological impact, threats to the environment may still arise. Indeed, when local communities take an interest in seaweed farming, spontaneous development expands at an uncontrollable pace. This potentially causes unexpected damage to both habitat and species. In North Sulawesi, just offshore the city of Manado, several square kilometres of coral flats around the island of Nain are now covered with cultured seaweed. This lucrative activity has encouraged people to move to islands suitable for its development. Little is known about the possible impacts of this unplanned and extensive human activity on naturally occurring coral, seagrass, and other marine organisms growing on reef flats. Less sunlight, for instance, underneath vast areas of seaweed culture, might be a factor causing the decrease in photosynthetic growth. Moreover, experience has shown that other coastal habitats may be harmed. For example, the mangrove forest was affected when wooden sticks made of mangrove trees were used to support seaweed lines (Anon. 1996e). This problem was solved locally by promoting the use of floats.
Thus, before investors or officials decide to support the development of seaweed farming, it is important to take into consideration all potential consequences, particularly with regard to coastal environment. If authorities and investors decide to support seaweed culture development, it seems important that environment impacts are assessed and prevention measures integrated into a detailed plan for the region. Marketing of seaweed products should be well prepared as well.

Indonesian exports to the world

Records of Indonesian seaweed exports were not found in FAO Fishstat 1995. However, for 1991 Globefish reports (McHugh 1996):

Total Volume: 11,304.6 tonnes dry weight of seaweed
Total Value: US$ 5,675.20
Average Export price: US$ 1.04/kg

In 1991, 14 countries import seaweed from Indonesia, and among them half are European Member States. The EU Member States (Denmark, France, Ireland, Spain, Finland, Italy, and Germany) absorb 43.7% of the volume. Four countries in the world import more than thousand tonnes: Denmark imports 4,226.77 tonnes, Hong Kong 2,454.74 tonnes, Singapore 1,632.96 tonnes, and USA 1,431.90 tonnes (McHugh 1996).
This reveals the important role plaid by the EU for Indonesian seaweed trade.

Compared to the total production of seaweed reported in 1991, 97,815 tonnes (1995e), 11.6% was exported raw.
In 1986, when the USA and the EU imported dry seaweed at 300 to 350 US$/kg, the producers (villagers) were paid 250 to 350 IDR/kg for their production of dry seaweed (about US$ 0.19/kg) (Elsy 1987), and in 1993 the price was 600 IDR/kg (US$ 0.29/kg) (WWF-Indonesia Programme field reports, 1994).

European Union imports of agar from Indonesia

Raw seaweed imports are recorded separately by European countries Customs (compiled by Eurostat) under the Combined Nomenclature, "Seaweeds and other algae" CN No 1212 20 00 (excluding "Seaweed ash and kelp"), and agar (processed seaweed) imports under "Agar-agar" CN No 1302 31 00 (see Annex IV).
In 1991, EU Member States were the most important buyers of Indonesian dry seaweed, importing half of the country's total exports (4,944 tonnes worth US$ 2.26 million), of which 85% went to Denmark (Sumpeno 1995, in McHugh 1997 -Globefish-) to supply one of Europe's largest colloids processing factories.
At the time of the study, the existence of separate EU trade data on raw seaweed was not known. There is an enormous difference between volumes and values of imported raw seaweed (reported by Globefish), and the ones on value-added processed agar (reported by the European Member

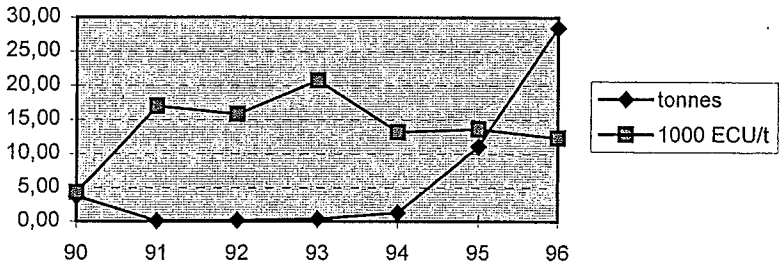
States). In 1991 for instance, more than 4,000 tonnes of raw seaweed at US$ 0.5/kg versus 0.1 tonne of agar at US$ 24.2/kg.
With regard to Indonesian exports of agar (extracted from dry seaweed by local processing companies), according to customs data compiled by Eurostat, the volume imported by the EU from Indonesia almost tripled in one year, from 11.1 tonnes in 1995 to 28.5 t in 1996, when 95% was imported by Germany.
Extracted agar has a much higher commercial value than dry seaweed (raw material). In 1991, for instance, the import price of Indonesian-extracted agar was 40 times that for dry seaweed, US$ 18,960 and US$ 457 respectively for one tonne. Therefore, following the example of the Philippines, the seaweed processing industry has started to develop in Indonesia.

However, it seems that seaweed processing industry is developing in Indonesia, because the volume of agar imports has increased from 400kg in 1993 to 28.5 tonnes in 1996, and the total annual income from agar was 42 times higher (ECU 8,310 (US$ 11,635) in 1993 to ECU 351,810 (US$ 492,530) in 1996)(Table 66 bis).

Table 66 bis Agar imports from Indonesia into the EU

	1990	1991	1992	1993	1994	1995	1996
tonnes	3.70	0.10	0.20	0.40	1.30	11.10	28.50
1000 ECU	15.90	1.73	3.16	8.31	17.15	151.35	351.81
ECU/kg	4.30	17.00	15.80	20.77	13.19	13.64	12.34

Source: Eurostat, 1997. (the average exchange rate for the period covered is, ECU 1= US$ 1.4)



Cephalopods

Cuttlefish ("sotong", *Sepia* spp, probably *S. latimanus*) are molluscs, with squid ("cumi-cumi", *Loligo edulis*, *L. duvaucelli*, *Lepioteuthis lessoniana*, *Lepiella inermis* and *Euprymna beryi* - Sodikin 1991-), and octopus ("gurita", Octopodidae) are the three main groups of cephalopods.

Cephalopods fisheries represent in volume and value one of the most important commodity for artisanal fisheries. Both squid and cuttlefish landings come from coastal small-scale operations, whilst octopus catches are limited to the reef itself. *Loligo* spp and *Sepia* spp are usually fished with lift nets built on fixed bamboo structures or wooden floats (both called "bagan"), equipped with oil or electric lamps to attract the animals at night. Octopus is mostly caught on the reefs by hand using torches. Best fishing grounds for squid and cuttlefish are inter-island waters, such as in Taka Bone Rate Atoll (3d largest in the world) in the Flores Sea (WWF-Indonesia Programme field reports 1994). Fishing seasons depend on the monsoon. In the Flores Sea where squid fisheries are operating intensively, the best season is the west monsoon running from September to March (Hotta 1983).

Technical assistance has been given to the small-scale fisheries in order to increase the productivity and diversify the fishing methods used, with squid traps and "stick-held cast net" (Anon. 1990), but this intervention had little effects because fishers are used to their century old techniques.

In 1987, Indonesian recorded landings of cephalopods represented 0.7% (15,500 tonnes) of the world's landings. The country was the 18th among the 54 countries listed (Anon. 1989). In 1993, cephalopods landings in Indonesian were about 24,000 t of which almost 50% were fished in the eastern islands (27.5% in Sulawesi and 19% in the Molluccas and Irian Jaya). Genus-wise 77.5% were squids, 19.5% cuttlefish, and 3% octopus. The offshore/ocanic squid of which many are economically important, seem to be under-utilised by the industrial fisheries (Badrudin 1996). In 1994, cephalopods represent only 5% of the world's total volume of fisheries products trade (5.56 million tonnes) with about 278,000 tonnes (Anon. 1995).

Indonesian exports of cephalopods to the world

A great deal of cephalopods are consumed domestically. Indeed, in 1993 less than 15% (3,538 t) of Indonesian cephalopods landings were exported (FAO Fishstat: Anon. 1995e, Anon. 1996a).

Table 67 Volumes of Indonesian exports of cuttlefish, squids and octopus (tonnes)

	1988	1989	1990	1991	1992	1993	1994
Cuttlefish, fresh or chilled	1	55	25	38	218	247	509
Octopus, fresh or chilled	0	0	0	0	4	10	0
Cuttlefishes, frozen	647	85	101	394	1,602	3,085	2,409
Octopus, frozen	0	47	48	99	142	135	570
Dried, salted or in brine (1)	33	30	30	183	88	61	698
Canned (1)	0	0	0	0	0	0	0
Cephalopods preparations	1	0	0	0	0	0	0
Total (tonnes)	682	217	204	714	2,054	3,538	4,186

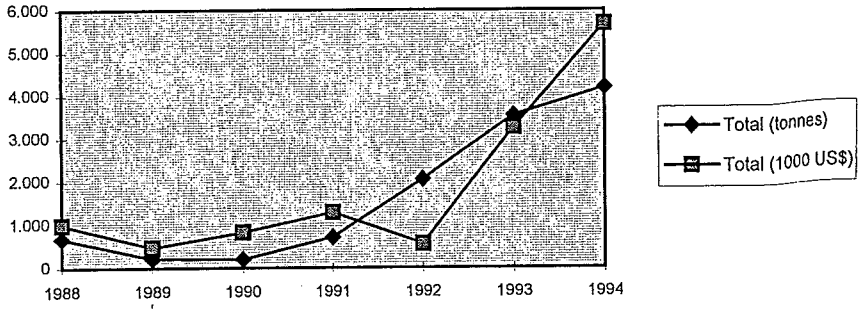
Source: FAO Fishstat, 1995. (1) Other cephalopods.

The volume and the value of the Indonesian exports of cephalopods has increased constantly from 1992 to 1994 (Table 67, 68). However, the export price of Indonesian cephalopods is more than two times smaller than that of crab products, and 3.5 times smaller than that of lobster products.

Table 68 Value of Indonesian exports of cuttlefish, squids and octopus (1,000 US$)

	1988	1989	1990	1991	1992	1993	1994
Cuttlefish, fresh or chilled	1	110	70	35	161	142	643
Octopus, fresh or chilled	0	1	0	0	4	16	0
Cuttlefishes, frozen	903	173	410	580	2,137	2,554	2,811
Octopus, frozen	0	100	256	408	263	405	740
Dried, salted or in brine (1)	91	93	89	262	125	142	1,478
Canned (1)	0	0	0	0	0	0	0
Cephalopods preparations	2	0	0	0	0	0	0
Total (1000 US$)	997	477	825	1,285	2,690	3,259	5,672
US$/tonne	1,462	2,757	4,044	1,800	269	921	1,355

Source: FAO Fishstat, 1995. (1) Other cephalopods.



European Union imports from Indonesia

Total EU imports of cephalopods were about 250,000 t in 1990 (Josupeit 1992), of which only 1.8t came from Indonesia. Thailand was the first supplier, and Italy and Spain the main importers.

Table 69 Volumes of Indonesian cuttlefish, squids and octopus imports by the EU (tonnes)

	1990	1991	1992	1993	1994	1995	1996
Live, fresh or chilled (1)	0.3	0	3.4	0	0	0	0
Frozen or not (1)	1.5	5.6	1.6	81.7	78.1	19.9	4.7
Octopus, frozen or not	0	0.1	0	0	0	21.7	0
Total (tonnes)	1.8	5.7	5	81.7	78.1	41.6	4.7

Source: Eurostat, 1997. (1) Cuttlefish and squid.

Table 70 Values of Indonesian cuttlefish, squids and octopus imports by the EU (1,000 ECU)

	1990	1991	1992	1993	1994	1995	1996
Live, fresh or chilled (1)	2.44	0	14.08	0	0	0	0
Frozen or not (1)	8.82	21.94	5.15	165.06	199.43	48.32	13.1
Octopus, frozen or not	0	1.95	0	0	0	64.38	0
Total (1,000 ECU)	11.26	23.89	19.23	165.06	199.43	112.70	13.1
ECU/kg	6.25	4.19	3.85	2.02	2.55	2.71	2.79

Source: Eurostat, 1997. (1) Cuttlefish and squid. (the average exchange rate for the period covered is, ECU 1= US$ 1.4)

Other Marine Invertebrates

Small size species do not represent significant landings or export volumes. However, tonnage is not always representative of the impact of collection on the natural resource, because for small species, very large numbers of individuals (young and adult) are caught per tonne. Heavy pressure can be put on wild populations of such species, that are often an important commodity for remote fishing communities. The latter react dynamically towards the demand of the domestic and international markets, and management measures can not be established at the same speed. Indeed, by the time scientists are aware of potential over-exploitation and regulations are adopted, numerous populations can already be depleted (e.g. Tridacnidae)

Indonesia's marine fisheries are characterised by the rapid adoption of new production technologies and new target species in a context of finite resource availability (in Bailey 1992).

Small-scale fisheries products with low tonnage that were described in previous paragraphs included dry seahorses, dry shark fins (1% of wet body weight), and eel elvers. Additional small species are targeted by Indonesian artisanal fisheries. Although, the EU market does not consume most of these species, they are under heavy pressure in Indonesia. The following paragraphs analyse particularly the Indonesian production and exports.

Sea cucumbers ("teripang")

Sea cucumbers, are grouped in one class, the Holothurioidae. They belong to the phylum of echinoderms, as sea stars, brittle stars, sea urchins, etc. (Cannon 1987)

Holothurians are low in the food chain. They sift sediments (sand or mud), or vacuum hard substrates such as coral or rock, and digest mainly sessile diatoms, organic detritus, small molluscs, copepods, and marine seaweed (in Tiensongrusmee 1988). They may reproduce either asexually or sexually. The sexes are separate and sexual reproduction occurs by a synchronous release of eggs and sperm into the surrounding water, where upon hatching a free swimming larvae forms and later settles on an appropriate substrate to grow into an adult sea cucumber.
With regard to sea cucumbers farming, the reproductive biology is well known for many species, but growth and mortality need more study (in Conand 1993).

Sea cucumber fisheries are based on a few deposit-feeding species belonging to two families and five genera: *Actinopyga* and *Holothuria* (Holothuridae), and *Parastichopus*, *Stichopus*, and *Thelenota* (Stichopodidae) (Conand 1993). The species exploited are about a dozen of the thousand existent species. The species of highest commercial value include the White teatfish (*Holothuria fuscogilva*), Sandfish (*H. scabra*), and White sandfish (*H. scabra* var. *versicolor*) (Sant 1995). Species of sea cucumbers harvested in Indonesia are, among others, Black teatfish (*H. nobilis*) commercially classified as "category one", and the less valuable Prickly redfish (*Thelenota ananas*).

Holothurians are collected by hand, usually by women and children, on tidal flats and in pools, while individuals in deeper water are collected by free-diving or the use of SCUBA reserved to men (Sarjanaputra, in litt. December 1994). Sea cucumbers are eaten either raw, boiled or pickled. The most important product is the dried body wall which is marketed as "bêche-de-mer", "hai-som" or "teripang". Processing methods for bêche-de-mer are believed to be introduced centuries ago by Chinese traders. They comprise six stages: boiling, slitting the dorsal side, second boiling, gutting, smoke drying, and sun drying (in Conand 1993). The processing may differ slightly from region to region.

In the Indonesia fishery boats may travel to distant reefs for periods of up to several months, often with the whole family. For preservation purposes Indonesian fishermen soak the animals in salt

before boiling an incise the body of larger species. This practice may result in a lower quality and less valuable product (Conand 1993).

Nowadays Indonesia is the major world producer and exporter of bêche-de-mer products (Conand 1993). Reported landings from 1990 till 1994 averaged 2.800t/year (Anon. 1995e). Fishstat mix canned sea cucumbers with other marine invertebrates, but Indonesian National statistics report 3,438t as total exports of "teripang" in 1990 (probable overestimation; Conand 1993). Few species yield more than 10% of their wet body weight, and some, such as Greenfish (*Stichopus chloronotus*), may yield as little as 3% (Preston 1990). Assuming a generous 10% rate, Indonesian 1990 exports (3,438 t) represent 34,380 t of fresh sea cucumbers.

In Barang Lompo Island (Spermonde archipelago, South Sulawesi) two species seem to be collected predominantly: *Actynopyga* spp and *Thelenota anax*. Paradoxically, for the second, the villagers get 10 to 15 times less money than for high priced species such as *H. fuscogilva* (Conand 1996). Since the early 1990s, fishermen have started to harvest increasing numbers of specimens of sea cucumber species of lower commercial value, and smaller individuals of high value species to keep a constant income, but this is usually a symptom of heavy stock depletion.

In 1988-1989, Indonesian bêche-de-mer products had about a 40% share of all Hong Kong imports (Sant 1995). From January till March 1996, Indonesia was still the first of 30 suppliers of "teripang" to Hong Kong with 452.9 t (35%)(Annex III), but with one of the lowest import value, US$ 5/kg (in Conand 1997). Nevertheless, compared to all other Indonesian fisheries products (average price, US$ 3.62/kg, Table 21) bêche-de-mer is a high value product.

Table 71 Volumes of Indonesian sea cucumbers and other invertebrates exports (tonnes)

	1988	1989	1990	1991	1992	1993	1994
Canned (1)	0	893	1,223	1,659	6,616	2,889	2,593
Preparations (1)	0	64	30	70	63	140	41
Dried, salted or in brine (2)	3,480	0	0	0	0	0	0
Total	3,480	957	1,253	1,729	6,679	3,029	2,634

Sources: FAO Fishstat 1995. (1) Sea cucumbers and other invertebrates. (2) Sea cucumbers only.

Table 72 Values of Indonesian sea cucumbers and other invertebrates exports (1,000 US$)

	1988	1989	1990	1991	1992	1993	1994
Canned (1)	0	2,334	2,780	3,734	14,405	6,191	5,795
Preparations (1)	0	152	86	263	296	488	239
Dried, salted or in brine (2)	8,267	0	0	0	0	0	0
Total	8,267	2,486	2,866	3,997	14,701	6,679	6,034

Sources: FAO Fishstat 1995. (1) Sea cucumbers and other invertebrates. (2) Sea cucumbers only.

Among EU Member States, France is the only country involved in sea cucumber trade (Conand 1997). This is a consequence of the French "Dom-Tom" (overseas departments and territories), for instance New-Caledonia and French Polynesia.

Bivalves and Gastropods

Together with cephalopods, bivalves and gastropods constitute the three large groups of molluscs. Similarly to sea cucumbers they are collected and processed in an artisanal way by members of fishing villages, men as well as women and children. These products supply the market for mother of pearl, ornamental shells and shellcrafts. Shells supplying for instance the food market, such as oysters, cockles, and hard clams, mostly involve larger scale fisheries and industrial processing activities.

Mother of pearl, ornamental shells and shellcraft

As mentioned in the first chapter, many shells are protected under Indonesian law. Scientists did not come to an agreement on the population status of certain species (Annex III). Populations may be clearly depleted in one reef or archipelago, being still abundant in a neighbouring area.
Enforcement is not easy in remote island and coastal areas, and is made more difficult by the high commercial value of certain shells bringing important financial income to local fishing communities.

Mother-of-pearl
Mother of pearl is used for the production of quality buttons (in Sant 1995). Shells are usually harvested in a traditional way (diving with or without SCUBA). Shellcraft is another important output, such as for instance Capiz (*Placuna* spp) for bangles.

Between 1979 and 1985, Indonesia was the first exporter of mother of pearl in the world, with about 2,300 t/year. The main shell species involved in this trade are: Top shell (*Trochus niloticus*) (Annex III), Green snail (*Turbo marmoratus*), Gold-lip pearl oyster (*Pinctada maxima*), and Black-lip pearl oyster (*P. margaritifera*) (Wood and Wells, in Anon. 1995d). Southeast Asian countries and small island countries in the Pacific are the main suppliers of unworked mother of pearl. The major importers are Japan, South Korea and Singapore.

Trochus and Green snails are gastropods occurring on reef crests and deeper slope areas, but the latter ranges deeper to at least 20m. The demand for Green snail has raised faster than for other button-producing species, this put the shell under heavier harvesting pressure than other species. In Indonesia, since the fishery was closed in 1987 no export data per species is available. Importers (Japan, Singapore and South Korea) records seem to indicate that outside the South Pacific, Indonesia is the second major supplier. From 1980 till 1990, exports of Green snail dropped constantly in Papua New Guinea, while they increased in Vanuatu (Sant 1995). The value of Trochus varies between countries. Indonesia used to produce the highest quality Trochus, known as "Makassar" (old name of Ujung Pandang, capital of south Sulawesi, one of the Indonesian centres of marine products trade), US$ 9.4/kg in 1990 compared to US$ 7/kg from other supplying countries. However, in Indonesia the Trochus fisheries has been officially closed since 1987, and it is unclear whether the reported 754.5 t of Trochus imported by Japan between 1988 and 1990 is stockpiled, or whether it comes from newly collected Trochus (Sant 1995).

Black pearl
Black pearl oysters are cultured from Black-lip pearl oysters. Japanese import statistics indicate that the production value of Indonesian pearls in 1989 was 11.5 million US$ (9% of the total value of the world's five main suppliers, Australia, French Polynesia, Indonesia, the Philippines, and Cook Islands). From 1990 to 1993, Indonesian Gold-lip and Black-lip pearl oyster exports to Japan averaged 250 t, for a decreasing export price of 8,400 to 4,288 US$/kg (Sant 1995). There is extreme pressure on wild stocks of pearl oyster, resulting from their use as seed stock for pearl farms. The supply of stock for farms is collected as spat (juvenile oysters when they first attach to a substrate) on an artificial support (wood, nylon rope, etc.). Once transferred in a farm they are hung or strung from a platform and immersed. At 2 years of age, shells are seeded with a bead or nuclei and after another 18 to 24 months they are harvested when the coating of nacre is approximately 2mm thick (Sant 1995). In Indonesia, oyster spat is particularly abundant in the

eastern islands (Aru Islands) and since the early 1990s investors have started numerous farms in those waters (from Ambon to Sorong and southwards, e.g. Kai Islands) (WWF field report, 1995).

Ornamental shells and shellcraft

The EU was the world's fifth importer of ornamental shells with 453 tonnes in 1985 (Wood and Wells, in Anon. 1995d). United Kingdom was by far the largest importer, 102 tonnes (Anon. 1995d). Concerning shellcraft, the EU is the major importer of shell articles from worked Capiz (*Placuna placenta*). In 1985, the Philippines reported 1,110,675 items exported to EU Member States, of which 625,657 items were exported to West Germany (Wood and Wells, in Anon. 1995d). In 1986, EU imports of lampshades and windchimes raised to 1,779,480 items (1,485,140 imported by West Germany alone) (Wood and Wells 1988).

Indonesian export data for Capiz were not collected for this study, but Capiz trade from Indonesia has been reported (Gayatri Lilley, *in litt.* 17 March 1997).

Food

Among gastropods and bivalves harvested exclusively for food consumption, landings are reported for the following species, in 1994 Blood cockles (*Anadara* spp) 43.045 t, Cupped oyster (*Crassostrea* spp) 320 t, Hard clams (*Meretrix* spp) 11.650 t, Scallops (Pectinidae) 370 t. Except for oysters for which the landings have dropped drastically since the late 1980s, the landings of the other species stabilised (Anon. 1995e). Development project focusing on cockle (Tiensongrusmee 1988) and oyster culture were not followed by active investments, mainly because of the low market demand (Lovatelli 1988).

The main species involved in the increasing trade of terrestrial snails between Indonesia and the EU, reported by EU Member States (Table 73), could be *Achattina fulica*. This Giant African snail was introduced in Asia in the 1920s, and since then spread across Southeast Asia, the Pacific, to Florida. This species is reported to mature in less than a year, and its potential offspring could number about 7 billion in 3 years (Kay in Anon. 1995d). It is an successful species, competing with the local fauna and eventually causing the disappearance of some species. During the early 1980s, EU manufactures sold mislabelled cans of *Helix aspersa* and *H. pomatia* ("escargot") containing pieces of the cheaper, and less delicate *Achattina fulica* (source: restaurants).

Table 73 Volume and value of Indonesian snails (other than marine) imported by the EU

	1990	1991	1992	1993	1994	1995	1996
tonnes	622	392	942.4	429.7	239.9	431.4	625.8
1,000 ECU	952.42	658.97	1.585.11	943.26	551.56	1,026.90	1,480.80
ECU/kg	1.53	1.68	1.68	2.19	2.3	2.38	2.37

Source: Eurostat, 1997

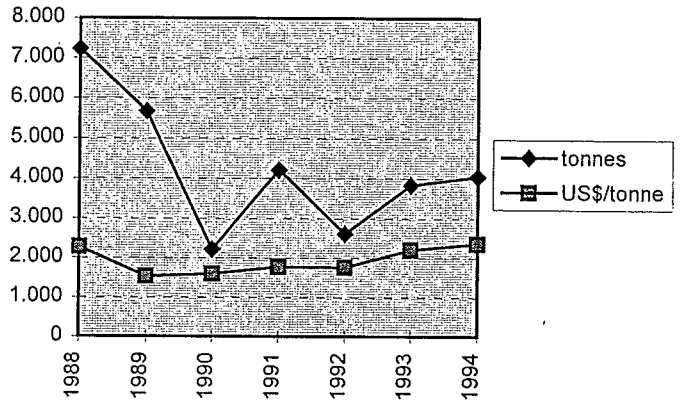
Jellyfish

Taxonomically and evolutionary (phylogenesis), jellyfish belong to the same phylum as corals, the Cnidarians. Corals are in the class Anthozoa and Jellyfish ("ubur ubur") are Hydrozoans. In Indonesia they are traditionally harvested and processed by coastal communities.

Reported jellyfish landings in Indonesia are of the genus *Rhopilema* spp. They increased from 1,346 t in 1990, to 31,630 t in 1994 (Anon. 1995e). Japan is the main importer of jellyfish products, which are part of the Japanese traditional cuisine. In 1981, Malaysia was the main supplier to the Japanese market (4,700 t at US$ 3/kg) (Kitson 1983). Since then, the Indonesian production has sharply increased. In the 1980s, jellyfish processing was in the hands of coastal villagers, providing additional income to numerous households.

Table 74 Indonesian exports of jellyfish (dried, salted or in brine) to the world

	1988	1989	1990	1991	1992	1993	1994	Aver./y
tonnes	7,220	5,668	2,222	4,210	2,609	3,834	4,038	4,257
1,000 US$	16,453	8,669	3,552	7,458	4,577	8,442	9,531	8,383
US$/kg	2.28	1.53	1.60	1.77	1.75	2.20	2.36	1.93



Sources: FAO Fishstat 1995.

CONCLUSIONS

Exploitation of marine resources for trade, whether domestic or for export, is only one of the numerous threats to marine and coastal wildlife in Indonesia. The damage of coral reefs and coastal habitats, by sedimentation, pollution, destructive fishing methods (explosives, poison - "cyanide"-, trawling, etc.) and their use for building, as well as for the production of lime and cement for instance, is a more significant threat than direct exploitation and fisheries.
The impact of trade on wild population of marine species should however not be neglected. Better monitoring and trade control must be applied to support management and conservation of marine and coastal resources.

CITES species
The first part of the report describes the trade in Indonesian marine species listed in CITES (Convention on International Trade in Endangered Species of wild fauna and flora). Some species of corals, shells (mainly clams), turtles, and marine mammals are marine species currently included in the CITES Appendices. Lizards and crocodiles were included in the study because they occur on islands and coasts, which are habitats linked to marine ecosystems.
The data suggest that the trade in CITES listed marine species from Indonesia to the European Union (EU) is very limited for shells and turtles, while there is a high demand for Indonesian coral, lizard and crocodile specimens. From 1990 to 1995, only 21 export permits were issued for Giant clams, and four for shipments of "turtle products". Meanwhile, for one year only, in 1994, EU countries reported a total of 164,730 pieces of hard corals imported from Indonesia. This represented only 13% of the total Indonesian hard coral exports to the world.

Enforcement and implementation of EU/CITES trade Regulations
The limited trade in CITES listed species of shells from Indonesia, and the relatively high number of seizures (Table 7 and 8) suggest that Regulations are well implemented for shells. However, concerning the 2 shipments of Indonesian *Tridacna* spp. performed in 1990 and 1992 respectively, these specimens originated from the wild. Captive breeding of Giant clams in Indonesia is still at experimental stage. It is to recent (mid-1990s) to comply with requirements of CITES and the EU Regulation ((EC) No 338/97) for instance licensed farms must prove that sold specimens are from F2 generations (second generation born in the farm to be recognised captive bred).

Import of Turtle specimens from Indonesia into Italy in 1990 was a clear illegal shipment. Italy was heavily penalised for its lack of CITES enforcement. The country was requested to take appropriate decisions, and subsequent efficient legal and control measures were adopted by the Italian government.

The EU decided to ban import of all Indonesian CITES Appendix II C2 listed species between 1991 and 1995. This list includes Indonesian black corals (*Antipathes* spp), crocodiles and lizards. However, this ban was apparently not very well enforced since legal imports were officially recorded during the entire period. In 1994, for instance, WCMC data record legal exports from Indonesia to the EU of 22.805 articles of lizard (*Varanus* spp), and 685 of crocodile. The causes of this poor enforcement from both Indonesian and European CITES Management Authorities and Customs Services are not known. Lack of training and information are thought to be involved.

A study limited to one European International Airport, in Frankfurt (Germany), suggests that control measures focusing on commercial shipments are more productive than the ones concentrating on passengers' luggage. Compared to passengers' parcels, infractions detected among commercial cargoes are smaller in number, but larger (i.e. 19 times in Frankfurt) in terms of number of specimens seized. However, customs efforts to control "tourists souvenirs" not only have a role of enforcement, but also raise public awareness. Thus both approaches seem important. But additional and regional studies are necessary to draw accurate conclusions.

Corals

The research involved for the present study has been an opportunity to inform custom services of court decisions made by neighbouring countries, and of scientific publications related to the complexity of coral products classification (Best 1997, Annex II).

With regard to corals, the Indonesian CITES Management and Scientific Authorities establish annual export quotas per coral genus. These quotas are reported at the beginning of each year to the CITES Secretariat by the Indonesian CITES Management Authorities. Export quotas are fixed at the genus level, which does not take into account different growth and distribution rates of species that belong to the same genus (Bentley 1998). Biological parameters (growth and distribution) also seem to vary within one species depending on local factors such as depth and sedimentation (Veghel and Bosscher 1995 in Bentley 1998). This highlights the importance of management decisions, such as collection and trade quotas, to be made at reef level.

Export quotas should be based on biological parameters, such as the potential vulnerability of the genus to over harvest due to specific distribution and or reproduction pattern(s). Indonesian quotas for 1997 and 1998 suggest however that coral genera for which there is a high demand (e.g. live ornamental corals for aquarium with attractive colours and long polyps), are given high annual export quotas. Data on their population status and distribution in Indonesia would however recommend significantly lower quotas. This is the case for the species *Catalaphyllia jardinei* (Massin, *in litt.* 11 May 1998).

Shells and Turtles

Seven species of marine shells that occur in Indonesian waters are included in CITES Appendix II, and six species of sea turtles are listed in Appendix I. Between 1990 and 1995, 21 specimens of shells, and 400 kg plus 2 specimens of sea turtles were officially shipped to the EU. Custom seizures during the same period, 48 specimens of shells and 19 specimens of sea turtles, suggest however that illegal imports occur either voluntarily or by ignorance. One EU Member States was blamed for allowing the import of a large shipment of turtle shells. The country had to rapidly improve its implementation and enforcement of CITES. Important efforts were made to develop *Tridacna* spp and *Hyppoppus* spp culture in Indonesia. However, according to official data, captive breeding facilities (F2 generation) of Giant clams are not yet operational. Concerning sea turtles, during the 1980s various so-called "ranching" activities have taken place in Indonesia. Most have been abandoned, some had negative impacts and none received proper scientific and technical follow-up.

Species targeted by Industrial fisheries

Industrial fisheries involve companies, large vessels and modern fishing gear. In Indonesia, the main target species are tuna, swordfish, and shrimps (or "prawns"). In 1993, the total Indonesian marine fish catches were the eighth largest in the world, with 2.73 million tonnes (FAO). This figure only includes fish and not the high commercial value products harvested by small-scale fisheries (e.g. molluscs, other marine invertebrates, seaweed), nor of lobster and shrimps. The latter have a particularly large share in Indonesia's exported value-added fisheries products, increasing from US$ 496,500 in 1988, to US$ 924,391 in 1994. During the same period, the total value of all Indonesian fisheries products exported annually increased by 58%, from US$ 664,483 in 1988 to US$ 1.5 billion in 1994.

The unit value of Indonesian fisheries products imported in the EU increased from US$ 5.2 /kg in 1988, to US$ 6.3/kg in 1994, and stabilised at US$ 5.8/kg in 1995 and 1996. These figures suggest that since the early 1990s, EU Member States tend to import higher value fisheries products from Indonesia. Added value of Indonesian fisheries industry exports to the EU may originate from the increase of local processing industry (e.g. production surimi), and/or local cooling facilities (i.e. export of fresh or chilled products), and/or also from higher priced species (e.g. swordfish). Shrimp and tuna represented 80% of the volume (74% of the value) of all EU imports of Indonesian fisheries products in 1996.

Species targeted by artisanal fisheries

In most coastal and island villages in Indonesia, fishing is the primary source of subsistence (food) and income (Erdmann 1995). Marine species targeted by small-scale village fisheries are numerous, from various reef fish and sharks, to sea cucumbers and seaweed.

Live corals and marine ornamental fish for aquarium, seaweed, and articles for curio and jewellery markets (e.g. corals, shells), are commodities for which the EU demand has a significant impact on the exploitation of Indonesian marine resources. Being traditionally harvested by local fishing communities, they play a major socio-economic role, as well as a widespread, strong and uncontrolled impact on marine wildlife, particularly on coral reefs.

In 1994, the EU imported 13% of Indonesia's total exports in hard corals (both raw for curio and live for aquarium), 6% of crab meat products exports, 5% of live aquarium fish (marine and freshwater) exports, 1.9% of cephalopod (squid and cuttlefish) products exports, 1.4% of frozen lobster exports, and 0.2% of frozen shark exports. No imports of Indonesian sea cucumbers ("bêche de mer"), jellyfish, shark fins and seahorses, were reported by EU Member States. They are usually sold dry, mostly destined to accommodate Chinese and Japanese dishes. The EU demand for products from small-scale fisheries has a significant impact on the production of seaweed (importing 43.7% of the total exports of Indonesian dry seaweed in 1991) and an increasing influence on live marine ornamental fish catch (60% increase in imports from Indonesia between 1991 and 1995.

Control of domestic consumption and international trade of commodities such as jellyfish, "bêche de mer", seahorses, shark fins, worked corals for curio, and live fish for food is weak. With regard to domestic use, the products are usually sold by local fishing villagers on local markets, and therefore do not appear in records of the Indonesian Bureau of Statistics. Not all commodities have a specific code. The latter can thus not be recorded separately by Custom Services or National statistics. This may be a reason for not appearing clearly in trade records (e.g. shellcraft). Other goods are light and/or high-value items sold in small quantities (e.g. pearls). For most EU Member States annual import volumes of these goods may total less than one tonne, minimum volume indicated in Eurostat report (whether from industrial or small-scale fisheries), and thus do not appear in Eurostat tables.
From a conservation point of view, trade volumes expressed in tonnes and in thousands of US$ or ECU do not reflect the impact of trade on wild populations of small size species (e.g. ornamental fish and shells), nor do they reflect the impact of trade on species sold dry such as for shark fins, sea cucumbers ("teripang"), and seahorses (e.g. 1 tonne of dried seahorses contains 260,000 fish (Vincent 1996)).

The role of the European Union market
The study identified four main commodities for which the trade from Indonesia to the EU, and the import policy by the EU, could potentially induce modifications in Indonesian fisheries. One commodity belongs to the production of industrial fisheries: shrimp (or "prawns"), and three commodities are small-scale fisheries products: marine ornamental fish, corals, and seaweed.

Shrimps & prawns
In 1992, 32% (65,000 t) of the shrimps and prawns produced in Indonesia came from shrimp trawling, and 68% (125,000 t) was produced in coastal brackishwater farms (FAO). At present, the average by-catch (of which up to 95% is called "trash" and immediately discarded) of shrimp and prawn trawling in the Arafura Sea is 80% and can be as high as 95% in some areas. On the other hand, intensive shrimp aquaculture operations cause important coastal damages, both environmental (soil and water pollution and/or appearance of resistant pathological germs in coastal waters (Lin 1989)) and socio-economic (financial speculation and competition for land use with coastal coconut plantations, salt and rice fields (Anon. 1994c)). Such practices should be progressively replaced by more sustainable exploitation of natural resources, and the EU could assist in the research and development of adequate selective fishing gear as well as criteria for a code of conduct in shrimp aquaculture that investors should comply with.
Since significant monetary problems appeared in Asia (e.g. Japan) in October 1997, there are symptoms that a shift is happening from trade of shrimp among Asian countries towards more exports to the EU (e.g. less Vietnamese shrimps exported to Japan, balanced by more shrimp exports from Vietnam to the EU; Nguyen 1998). If the increase in imports of Asian shrimps by the EU is sustained in the future, then the EU market will have an increasing impact on shrimp production in Indonesia, and could play a role in promoting products from sustainable and

environment friendly shrimp trawling (e.g. use of By-catch Excluder Devices) and aquaculture (e.g. aim for less intensive farming practices).

Marine aquarium fish

Although prohibited by law in most countries, the use of toxic chemicals (e.g. cyanide -KCN-) to catch live fish is widespread. These chemicals stun the fish. Like any anaesthetic, excessive doses of cyanide kill the targeted fish, as well as all small fish and coral polyps present in the area of active cyanide dispersion. Cyanide also causes irreversible damages to the fish, especially their respiratory system. Such damages often lead to delayed mortality occurring before, during, or after the live fish are shipped and exported. If the fish dies after delivery it is a net loss for the importer, the retailer or the consumers. The latter often believe that they caused the death of the fish. The hobbyist may decide to buy new fish, which raises the demand and subsequently the pressure on reef fish populations. Cyanide is also used to catch larger size groupers and Napoleon wrasse. They are sold alive to restaurants specialised in Chinese food. In 1994, Indonesian exports to the world doubled, from 1,531 t to 2,862 t. The booming demand comes from Asian consumers, and could suggest a great deal of cyanide sprayed on reefs. According to trade data, until now there is no significant market for this fishery in the EU.

In 1994, the total number of ornamental fish (both marine and freshwater) exported from Indonesia is estimated at about 7.3 million fish (FAO 1996; Davenport, *pers. comm.* November 1997) (2.4% of the worlds' international trade) with a total export value of US$ 8.5 million. From 1993 to 1996, marine aquarium fish imports by the EU from Indonesia increased by 35%, and for freshwater fish by 7%. In 1996, these imports amounted about 400,000 fish (1.5% of the world's international trade in marine ornamental fish)(see relevant chapter), at a total value of US$ 5.4 million. On the EU market, marine ornamental fish tend to be more appreciated and more expensive (US$ 12/fish) than freshwater ones (US$ 9/fish).

An alternative "reef friendly fishing method" exists to replace "non-selective, high mortality rate cyanide fishing". It involves the use of hand held- or barrier nets. Although the method may be more time consuming for fishermen, it does not cause similar damages, and provides healthier ornamental fish. This is an important aspect for traders, since it gives a better guarantee of the quality of the "product" to importers and retailers. Field projects promoting "friendly reef fishing method" have started in the Philippines, and in Indonesia. Several coastal communities participate in training sessions, and a joined programme spreads awareness to other villages. These projects do not yet receive sufficient efficient local and international marketing support. It is essential that suppliers who do not use destructive fishing techniques to catch marine ornamental fish are known by traders both in exporting and in importing countries. Further, hobbyists should also be aware of all initiatives with regard to coral reef conservation and sustainable fishing initiatives, to have the opportunity to choose the product they prefer based on various parameters (commercial and biological). In this context, traders in the EU, who have been importing increasing numbers of reef fish for the past 6 years, have an important marketing role to play.

At present, no marine ornamental fish species are included in CITES. In June 1997 however, a European Regulation incorporated all species of seahorses in Annex D for monitoring of their imports into the EU, and for the possible need for inclusion in other Annexes (i.e. CITES Appendices). Surveys to collect data on catch of and trade in marine aquarium fish species still lack. Particularly species with a limited distribution, and thus more vulnerable to over-exploitation. International trade in these species must be documented and analysed to determine if the level of the exports jeopardises the future of wild populations. Results of such research work will allow to identify reef fish species "at risk".

Corals

Coral harvest and the collection of other marine invertebrates (e.g. shells) are usually not well managed and cause population depletion of several species with significant commercial value. In a vast country like Indonesia, distribution and abundance of species differ a lot from one region to another. Thus, harvest should be managed per region or province. A proposed approach is the "concession system" similar to the one used for forests and timber exploitation. In this case coastal

villages could receive "coral reef concessions" with strict quotas per species, and guidelines for monitoring of coral recovery. Focus would be put on provinces where most hard coral harvest occur, North Sumatra, West, Central and East Java, Bali, and South Sulawesi (Nokome Bentley, *in litt.* 30 December 1997). Field projects could promote sustainable harvest based on growth and recruitment of species, balancing coral collection in space and time, and taking into account reproduction seasons and other major biological parameters of each reef. Where possible, they should be linked to existing projects developed in coastal villages for awareness and training in environment-friendly marine aquarium fish catch on reefs.
Once the supply of corals from well managed coral reefs "concessions" is ensured, these products could be promoted, and traders in importing countries can be informed of the availability of hard corals harvested in a way that maintains healthy reefs and abundant marine resources. In importing countries, and particularly in the EU where Indonesian live coral imports raised significantly, traders should promote proper management of reefs. They can do so by giving preference to, purchasing their corals from exporters that deal with suppliers that participate in coral reef conservation, for instance implementing selective collection of hard corals.

Seaweed
They are mostly the product of cultivation by Indonesian fishing communities, and have a promising future on the EU market, where they are used in a wide range of food and pharmaceutical products. It may be used as a substitute for animal products that have recently experienced sanitary problems, (i.e. sheep and cow bones processed into gelatine).
Seaweed is cultivated in a limited number of sites in Indonesia, but seaweed culture should increase because the demand for agar and carrageenan is growing on domestic and international markets. Three species are involved.
With proper care and planning, seaweed can be farmed in a sustainable way, and become an additional source of income for fishing communities that totally depend on marine resources. In certain regions, efficient marketing of farmed seaweed (e.g. Northern tip of Sulawesi, Bali, Lombok) converted fishermen, often involved in the use of destructive fishing method -blast and cyanide-, to seaweed production. European companies that import large amounts of seaweed from Indonesia (e.g. in Denmark and France) could participate in projects for improvement of post harvest (Annex III) practices and marketing. They could help to increase fishers' benefits from the seaweed they produce.

The EU market can play an important role in ensuring a sustained and conservation oriented production of valuable Indonesian marine resources. This requires voluntary participation of the European industry (e.g. marketing, investment), bi- and multilateral regulatory measures on international trade and fisheries practices (e.g. WTO Dispute Panels), consumer awareness (e.g. green labelling), and efforts in relevant European commercial sectors.

RECOMMENDATIONS

The main scope of the following recommendations is the need to build strong links between conservation efforts and the trade sector. It is necessary to start actions such as field projects for the management of marine resources, awareness campaigns for fishers in villages, and legal measures for industrial fisheries practices. But each of them should include the trade component in order to link conservation efforts to over-seas markets. By incorporating traders (exporters, importers, retailers) in the planning, information on sustainable fisheries initiatives will go strait from the nets to the consumers in supermarkets. Traders know how to track products. They are in the best position to create market incentives and promote nature conservation work all the way through the chain of custody.

1. Awareness of stakeholders and consumers

- Use information materials of the EU Campaign for the Wildlife Trade Regulation (EC) No 338/97, to increase awareness of traders (importers) and hobbyists (consumers), with regard to listed species of corals sold in the EU, or shells and turtles sold in Jakarta shops and airport.
- Better collaborate with other marine conservation programmes for awareness of fishing communities by adapting and distributing available awareness materials formulated and designed in their context. For instance existing manuals on fish capture, and on coral reef care in English, Tagalok (language used in the Philippines), and sometimes in Indonesian.
- Consider developing a certification scheme for some important commodities: marine aquarium fish that are not caught with cyanide and corals originating from selective collecting practices, or for instance for shrimp caught with sustainable methods (e.g. low habitat damage, minimal bycatch, use of BED) or farmed applying environmentally friendly practices (e.g. lower density of shrimps in ponds), using MSC (Marine Stewardship Council) criteria and guidelines for certification of fisheries and aquaculture, and WWF Endangered Sea Campaign to pass the message of 85-95% by-catch of shrimp trawling, landed wasted by shrimp farms (For example: "*For a portion of 6 gambas (about 180gr) shrimps trawlers wasted 1.5kg of marine wildlife, and/or shrimp ponds caused the destruction of ... ha of mangrove or fertile agriculture land, as well as river and coastal pollution from antibiotics and fertilisers*").

2. Trade analysis and regulation

- Consistent trade records on some species imported should be compiled by EU Custom services to determine their status in the long-term and identify species at risk. Trade records reported by Indonesia to FAO should distinguish marine from freshwater fish. Monitoring marine aquarium fish trade per species on an international scale, and "per archipelago" on a country scale. Collection of baseline information on trade of marine ornamental fish species with limited geographical distribution, that may be threaten by overfishing to supply the aquarium trade. Use the information to propose research projects, and management measures (e.g. quotas for vulnerable species), and only if absolutely necessary, consider listing in CITES Appendix II or III, or in Annex B, C or D of the EC No 338/97 Regulation of certain marine aquarium fish species.
- Study the relevance and feasibility of establishing annual export quotas for corals at species level instead of genera. Verify scientific evidence with National Institute of Oceanography (P3O-LIPI).
- Creation of a "label" for ornamental fish caught with nets (on-going Project of Audubon Society/WWF, Philippines 1995). Labelling criteria are being developed by the AZA Marine fish taxonomic advisory group, the Marine Aquarium Council, and the Trade Advisory Group. Sustainable methods for the ornamental fish industry should address selective harvesting gears, better practices for holding, packing and shipping, higher water quality, training of staff in aquarium stores, exclusion of species which are unlikely to survive well in aquaria at present levels of knowledge. Captive breeding of marine aquarium fish should not be proposed as a alternative reef fish for various reasons: first governments, international agencies and protagonists may use it as an excuse to encourage more sustainable levels and practices with regard to reef fish catch; secondly, if farms are developed abroad, local fisherman might loose their job and source of income; and finally, reef fish breeding in countries of origin would

probably be in the hands of investors which would compete with traditional fishers. However, ranching, using juveniles bred in hatcheries and released in the wild, maybe a better initiative as long as all parameters are taken into consideration. One of them being maintain genetic diversity of wild populations. Ranching is possible for fish, as well as for shells. <* If successful, this effort should be linked to all other fields: fishing communities (point 4), industry/traders (point 3), consumers (point 2).>

- "Label" for shells and shellcrafts that are collected on sites (e.g. in coastal areas) following management plans that are designed for sustainable harvest of marine invertebrates (Romero, Project proposal, Philippines 1996)(Sue Wells, *pers. com.* February 1997). <* ditto>
- Identify marine species involved in Traditional Oriental Medicine (TOM) products, and undertake surveys on collection sites as well as analysis of trade data. Results will allow to establish monitoring as well as implementation measures for sustainable exploitation of species incorporated in TOM products (e.g. sea horses).
- Use the new EU Regulation on Trade in Wildlife (EC) 338/97 to support the conservation of marine species included in the 4 Annexes (A, B, C and D) of a total of 27,500 species. For instance sea turtles included in Annex A, hard corals and shells listed in Annex B, and seahorses in Annex D.
- Check and improve enforcement of other international conventions and regulations (e.g. the Bern Convention, the Convention on Migratory Species).

For all labelling efforts proposed above, it is important to recognise that they are mostly counterproductive if consumers can not be guaranteed what is promised (i.e. sustainability). Control, inspection, and funding of the system is the heart of the matter here.

3. Industry support

- With voluntary participation of shrimp fishing companies and farmers: Investigate and expand the use of available techniques for more sustainable methods (i.e. selective fishing gears), for instance the use of fish gratings (grids) on shrimp trawls developed on the Atlantic coast of Canada by "Fisheries and Oceans Canada". Such gratings greatly reduce the by-catch of larger fishes; at the same time they reduce the hand labour in sorting-out unwanted species.
- In Indonesia: set-up a commercial network in order to guarantee better prices for cultivators of dry seaweed (on-going commercial activity set-up by a North American company in Bali and Lombok in the early 1990s), and for collectors of marine ornamental fish and shells (e.g. Kapis -or Capiz- Romero, Project proposal, Philippines 1996).
- In Europe: stimulate the interest of companies in Denmark and France importing great quantities of raw-dry or processed seaweed, in conservation and development projects related to well planned sustainable seaweed farming, and to their products;
- In Europe: Inform ornamental fish dealers and stimulate the support of the aquarium trade industry for a better monitoring of hard coral (CITES) and live fish imports (see point 2).

4. Fishing communities awareness

- Together with local and other international NGOs (e.g. Ocean Voice International, Conservation International), formulate and implement field project (island and coast of the Molluccas and Irian Jaya) including the following activities:
  a) PRA/RRA (Participatory/Rapid Rural Appraisal),
  b) scientific survey with world experts, universities (local and foreign) and villagers,
  c) promote sustainable fishing methods (e.g. project for the use of nets instead of cyanide for ornamental fish; sustainable seahorses catch (Vincent 1996) -Philippines-), and use available awareness materials prepared for fisher folks in SE Asia,
- support ownership and co-management of reefs with local and provincial authorities, for instance concerning the possibility "reef concessions" where a locally designed management plan would serve selective use of all resources on the coral reef, including the collection of corals for export based on quotas and size limit per species,
- link with local market network (see point 3 and 5),
- link with other international organisations for potential "development" activities. NGOs started field projects for training and promotion of "friendly reef fishing" (International Marinelife Alliance, Haribon Foundation, Ocean Voice International, WWF, Conservation International, etc.), some NGOs look at the numerous trade factors and natural parameters that can bring the

exploitation of natural resources on coral reef to a more sustainable level, both by adopting different practices as by determining proper quantities for various marine species in trade (e.g. Marine Fish Advisory Council), and others formulated a code of conduct for retailers and importers, in order, among others, to increase survival during transportation and in the aquarium (e.g. Ornamental Aquarium Trade Association (OATA, ex-OFI), network of traders well represented in the EU). On-going investigation is performed involving data collection, new techniques and tests. Results allow to revise the guidelines that are drafted to make suppliers, traders and consumers aware of the status of knowledge with regard to "reef friendly practices".

5. Management of fisheries in Indonesia

- Enforce Directorate General of Fisheries' MSY (Maximum Sustainable Yield) for shrimp fisheries (14,000 tonnes, see relevant chapter), the restriction of shrimp trawling to the Arafura Sea, the distance of trawling operations to the shore, and the use of BEDs, or even temporarly ban shrimp trawling in the Arafura Sea.
- Improve enforcement of Act N°5 of the Republic of Indonesia on Conservation of Living Resources and Ecosystems 1990 prohibiting collection and domestic trade as well as export of all sea turtles species, except for Green turtles, of all Giant clams, and of Black corals (Antipatharia);
- Study impacts of so-called sea turtle ranching projects initiated in the 1980s and train local villagers to manage sea turtle eggs collection on a great number of Indonesian turtle nesting beaches;
- Make inventories of Giant clams operational captive breeding facilities complying with CITES provisions concerning F2 generations;
- Promote Giant clams and other shells restocking/ranching in protected areas or in selected coastal areas in immediate collaboration with state/university hatcheries (on-going Project of WWF-Indonesia);
- More research must be undertaken to document the extent of destruction of coral reef organisms by cyanide and the long-term impact on this ecosystem. The results should provide a more accurate picture of the ecological and economical costs of cyanide fishing. These figures would further help with estimating the potential long-term benefit of projects for the sustainable exploitation of reefs with coastal communities that fully depend on their resources;
- Establish clear regulations on mass purchase and stocking of toxic chemicals, i.e. cyanide, to help enforcing the prohibition of use of toxics in fisheries; and
- Support commercial networks once they are set-up by the industry (see point 3). This is applicable to goods imported in significant quantities by EU Member States of for which recent EU import data show a rapid increase, naming seaweed culture, coral collection, aquarium fish catch, and shrimp trawling or farming.

Bêche-de-mer, seahorses, and sharks fins are consumed in extremely small quantities in the EU. Asia is by far the largest consumer of "teripang", "kuda laut", and "ekor ikan hiu" in the world. Therefore, the present recommendations do not include conservation activities that should be implemented in Hong Kong, Japan, Taiwan, Singapore, Republic of Korea, etc. The section on Fishing communities awareness mentioned above would otherwise include techniques for sustainable fishing practices of sharks, seahorses and sea cucumbers.

probably be in the hands of investors which would compete with traditional fishers. However, ranching, using juveniles bred in hatcheries and released in the wild, maybe a better initiative as long as all parameters are taken into consideration. One of them being maintain genetic diversity of wild populations. Ranching is possible for fish, as well as for shells. <* If successful, this effort should be linked to all other fields: fishing communities (point 4), industry/traders (point 3), consumers (point 2).>

- "Label" for shells and shellcrafts that are collected on sites (e.g. in coastal areas) following management plans that are designed for sustainable harvest of marine invertebrates (Romero, Project proposal, Philippines 1996)(Sue Wells, *pers. com.* February 1997). <* ditto>
- Identify marine species involved in Traditional Oriental Medicine (TOM) products, and undertake surveys on collection sites as well as analysis of trade data. Results will allow to establish monitoring as well as implementation measures for sustainable exploitation of species incorporated in TOM products (e.g. sea horses).
- Use the new EU Regulation on Trade in Wildlife (EC) 338/97 to support the conservation of marine species included in the 4 Annexes (A, B, C and D) of a total of 27,500 species. For instance sea turtles included in Annex A, hard corals and shells listed in Annex B, and seahorses in Annex D.
- Check and improve enforcement of other international conventions and regulations (e.g. the Bern Convention, the Convention on Migratory Species).

For all labelling efforts proposed above, it is important to recognise that they are mostly counterproductive if consumers can not be guaranteed what is promised (i.e. sustainability). Control, inspection, and funding of the system is the heart of the matter here.

3. Industry support

- With voluntary participation of shrimp fishing companies and farmers: Investigate and expand the use of available techniques for more sustainable methods (i.e. selective fishing gears), for instance the use of fish gratings (grids) on shrimp trawls developed on the Atlantic coast of Canada by "Fisheries and Oceans Canada". Such gratings greatly reduce the by-catch of larger fishes; at the same time they reduce the hand labour in sorting-out unwanted species.
- In Indonesia: set-up a commercial network in order to guarantee better prices for cultivators of dry seaweed (on-going commercial activity set-up by a North American company in Bali and Lombok in the early 1990s), and for collectors of marine ornamental fish and shells (e.g. Kapis -or Capiz- Romero, Project proposal, Philippines 1996).
- In Europe: stimulate the interest of companies in Denmark and France importing great quantities of raw-dry or processed seaweed, in conservation and development projects related to well planned sustainable seaweed farming, and to their products;
- In Europe: Inform ornamental fish dealers and stimulate the support of the aquarium trade industry for a better monitoring of hard coral (CITES) and live fish imports (see point 2).

4. Fishing communities awareness

- Together with local and other international NGOs (e.g. Ocean Voice International, Conservation International), formulate and implement field project (island and coast of the Molluccas and Irian Jaya) including the following activities:
  a) PRA/RRA (Participatory/Rapid Rural Appraisal),
  b) scientific survey with world experts, universities (local and foreign) and villagers,
  c) promote sustainable fishing methods (e.g. project for the use of nets instead of cyanide for ornamental fish; sustainable seahorses catch (Vincent 1996) -Philippines-), and use available awareness materials prepared for fisher folks in SE Asia,
- support ownership and co-management of reefs with local and provincial authorities, for instance concerning the possibility "reef concessions" where a locally designed management plan would serve selective use of all resources on the coral reef, including the collection of corals for export based on quotas and size limit per species,
- link with local market network (see point 3 and 5),
- link with other international organisations for potential "development" activities. NGOs started field projects for training and promotion of "friendly reef fishing" (International Marinelife Alliance, Haribon Foundation, Ocean Voice International, WWF, Conservation International, etc.), some NGOs look at the numerous trade factors and natural parameters that can bring the

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ANNEX I

1. Marine (or associated) species in CITES lists

(Ref. *Checklist of fish and invertebrates listed in the CITES appendices.* (1995) WCMC and Joint Nature Conservation Committee Report No. 238 (198 pp.),
Checklist of mammals listed in the CITES appendices. (1995) WCMC and Joint Nature Conservation Committee Report No. 235 (130 pp.)
Checklist of reptiles and amphibians listed in the CITES appendices. (1995)WCMC and Joint Nature Conservation Committee Report No. 237 (84 pp.)
Checklist of CITES species. (1995) WCMC, CITES Secretariat, European Commission, and Joint Nature Conservation Committee (400 pp.))

1.1 Shells

Appendix II
Tridacna gigas
Tridacna crocea
Tridacna derasa
Tridacna maxima
Tridacna squamosa
Hippopus hippopus
Hippopus porcellanus

1.2 Marine Mammals

Appendix I

Sirenia
Dugong dugon (dugon)
Delphinidae
Orcaellla brevirostris (irrawady dolphin)
Delphinus delphis (common dolphin)
Sousa chinensis (indo-pacific hump-backed dolphin) ?
Stenella coeruleoalba (striped dolphin)
Stenella longirostris (long-snouted spinner dolphin)
Stenella attenuata (pantropical spotted dolphin)
Steno bredanensis (rough-toothed dolphin)
Tursiops truncatus (bottlenose dolphin)
Grampus griseus (risso's dolphin)
Lagenodelphis hosei (fraser's dolphin)
Phocoenidae
Neophocaena phocaenoides (finless porpoise)
Balaenopteridae
Balaenoptera acutorostrata (minke whale)
Balaenoptera borealis (sei whale)
Balaenoptera edeni (bryde's whale)
Balaenoptera musculus (blue whale)
Balaenoptera physalis (fin whale)
Megaptera novaeangliae (humpback whale)
Physeridae
Kogia breviceps (pygmy sperm whale)
Kogia simus (dwarf sperm whale)
Physeter macrocephalus (sperm whale)
Ziphiidae
Mesoplodon ginkgodens (ginkgo-toothed beaked whale)
Ziphius cavirostris (cuvier's beaked whale)
Feresa attenuata (pygmy killer whale)
Globicephala macrorhynchus (short-finned pilot whale)
Orcinus orca (killer whale)
Peponocephala electra (melon-headed whale)
Pseudorca crassidens (false killer whale)

1.3 Marine Turtles

Appendix I

Chelonia mydas (green turtle)
Eretmochelys imbricata (hawksbill turtle)
Lepidochelys olivacea (olive ridley)
Caretta caretta (loggerhead)
Natator depressa (flatback) (no nesting beach recorded in Indonesia)
Dermochelys coriacea (leatherback turtle)

1.4 Terrapins

Appendix I

Batagur baska (four toed terrapin, tuntong) (freshwater)

1.5 Crocodiles

Appendix II

Crocodylus porosus (= Crocodylus raninus) (estuarine, salt-water)
Crocodylus novaeguineae novaeguineae (= mindorensis)

Appendix I

Tomistoma schlegelii (freshwater, Gavialidae ?)

1.6 Lizards

Appendix I

Varanus komodoensis (Komodo & adjacent isl.)
Varanus bengalensis (Java, Natuna isl.)

Appendix II

Varanus dumerilii
Varanus indicus
Varanus karlschmidti (= jobiensis)
Varanus prasinus (= beccari) (IrJ., Aru isl.)
Varanus panoptes (= bogerti) (Irian Jaya)
Varanus rudicollis
Varanus salvadorii
Varanus salvator (Java)
Varanus timorensis (= similis)

1.7 Amphibians

Appendix II

Rana tigerina (freshwater)

1.8 Fish

Appendix I

Scleropages formosus (freshwater)

1.9 Corals

Appendix II

CLASS ANTHOZOA

Order Helioporacea (or Coenothecalia)
Family Helioporidae — *Heliopora coerulea* (blue coral)

Order Stolonifera
Family Tubiporidae — *Tubipora musica* (organ pipe coral)

Order Antipatharia (black corals)

Family Antipathidae

Antipathes abies
Antipathes aculeata
Antipathes assimilis (?)
Antipathes catharinae (?)
Antipathes contorta (?)
Antipathes crispa (?)
Antipathes cupressus
Antipathes curvata (endemic to IrJ.?)
Antipathes cylindrica
Antipathes delicatula (endemic to Ternate ?)
Antipathes dichotoma
Antipathes elegans (?)
Antipathes ericoides
Antipathes erinaceus
Antipathes flabellum
Antipathes indistincta (endemic to Damar??)
Antipathes longibranciata
Antipathes myriophylla
Antipathes pauroclema (?)
Antipathes pectinata (?)
Antipahtes pennacea
Antipathes plana (Solor)
Antipathes pluma (?)
Antipathes reticulata (?)
Antipathes sarothrum (?)
Antipathes sealarki (?)
Antipathes sibogae
Antipathes simplex (endemic to Ternate ?)
Antipathes stechowi (?)
Antipathes tenuispina
Antipathes ternatensis (endem. to Ternate?)
Antipathes thamnoides (endem. to Ternate?)
Antipathes ulex
Antipathes virgata (?)
Antipathes zoothallus (?)
Aphanipathes cancellata (IJ and Kai isl.)
Aphanipathes reticulata (endemic to Roti ?)
Aphanipathes undulata (?)
Bathypathes lyra (Sumatra)
Bathypathes patula (Banda)
Bathypahtes quadribranchiata (Banda)
Cirrhipathes aggregata (Selayar, T. Bone R.)
Cirrhipathes anguina
Cirrhipahes contorta (Banda)
Cirrhipathes musculosa
Cirrhipathes nana
Cirrhipahtes rumphii
Cirrhipathes saccula (Kai isl.)
Cirrhipathes semiglabra (?)
Cirrhipathes solorensis (end. to Solor ?)
Cirrhipathes spiralis (Aru isl., etc.)
Cirrhipathes translucens (end. to Aru ?)
Cirrhipathes variabilis (?)
Parantipathes laricides (end. to Seram ?)
Parantipathes tristicha (end. to Seram ?)
Parantipathes wolffi (Strait of Malacca ?)

Schizopathes affinis (Banda & PNG)
Sibopathes gephura (end. to Timor ?)
Stichopathes ceylonensis (Kai isl.)
Stichopathes echinulata (Mollucas)
Stichopathes gracilis (Flores)
Stichopathes semiglabra (Sulawesi)
Stichopathes variabilis

Order Scleractinia (+ N° of valid species in the world)

Family Astrocoeniidae *Stylocoeniella* (thorn coral, 3 species)

Family Pocilloporidae *Madracis* (12 species)
Palaustrea (1 species)
Pocillopora (brown stem coral, cauliflower coral) (about 8 valid species)
Seriatopora (about 6 valid species)
Stylophora (hood coral, possibly 4 valid sp.)

Family Acroporidae *Acropora* (table coral, bush coral) (about 100 valid species)
Anacropora (possibly 6 valid species)
Astreopora (porous star coral) (about 10 sp.)
Montipora (pore coral) (211 nominal species, including numerous errors...)

Family Poritidae *Alveopora* (estimated 16 valid species)
Goniopora (sunflower coral, daisy coral) (39 nominal sp. Unknown N° of valid species)
Porites (hump coral) (122 nom. sp., valid ?)
Stylaraea (?) (1 species)

Family Siderastreidae *Coscinastrea* (wrinkle coral) (8-9 valid sp.)
Plesioseris (?) (about 3 species)
Psammocora (sandpaper coral) (27 nom. sp., valid ?)
Pseudosiderastrea (false pillow coral) (1 valid species)
Siderastrea (?) (African pillow coral) (1 sp.)

Family Agariciidae *Coeloseris (?)* (1 valid species)
Gardineroseris (?) (1 or 2 valid species)
Leptoseris (?) (slender lettuce coral) (11 species recognized)
Pachyseris (12 nominal species)
Pavona (around 15 valid species)

Family Micrabaciidae *Leptopenus* (probably 4 valid species)
Micrabacia (about 2 species, names ?)
Rhombopsammia (2 species)
Stephanophyllia (3 species)

Family Fungiacyathidae *Fungiacyathus* (18-19 valid species)

Family Fungiidae (mushroom corals) *Cantharellus (?)* (2 species recognized)
Ctenactis (3 species recognized)
Fungia (24 species recognized)
Halomitra (2 species recognized)
Heliofungia (1 species recognized)
Herpolitha (?) (slipper coral) (1 species recognized)
Lithophyllon (2 species recognized)
Podabacia (2 species described)
Polyphyllia (2 species recognized)
Sandalolitha (2 species recognized)
Zoopilus (1 species recognized)

Family Rhizangiidae *Astrangia* (30 nom. species, valid N° ?)
Cladangia (possibly 2 species)
Culicia (possibly 6 valid species)
Oulangia (unknown N° of species)
Acrhelia (very delicate) (1 species)

Cyathelia (probably 2 species)
Galaxea (starburst coral)
(probably 5 valid species)
Madrepora (?) (3 species recognized)
Neohelia (?) (1 species)
Sclerhelia (?) (5 nominal species)
Simplastrea (1 species, end. to Indonesia?)
Family Pectiniidae *Echinophyllia* (flat lettuce coral) (probably 7 valid species)
Mycedium (2 valid species)
Oxypora (porous lettuce coral) (probably 3 valid species)
Pectinia (14 nominal species)
Physophyllia (possibly 1 valid species)
Family Mussidae *Acanthastrea* (starry cup coral) (probably 9 valid species)
Australomussa (?) (rare) (1 species)
Blastomussa (branched cup coral) (3 species recognized)
Cynarina (probably only 1 valid species)
Indophyllia (end. to Indonesia ?)
Lobophyllia (5 valid species)
Scolymia (4 valid species)
Symphyllia (larger brain coral) (at least 6 valid species)
Family Merulinidae *Boninestrea* (1 species)
Hydnophora (spiny coral) (probably 6 valid species)
Merulina (at least 3 valid species)
Paraclavarina (1 species)
Scapophyllia (1-2 species)
Australogyra (?) (1 species)
Barabattoia (1-3 valid species)
Caulastraea (probably 4 valid species)
Cyphastrea (lesser knob coral) (possibly 8 or 9 valid species)
Diploastrea (1 species)
Echinopora (hedgehog coral) (8 valid species)
Favia (knob coral) (70 nom. species, unknown N° of valid)
Favites (larger star coral)
(23 nom. species, unknown N° of valid)
Goniastrea (34 nominal species, unknown N° of valid species)
Leptastrea (crust coral) (possibly 6 valid species)
Leptoria (brain coral) (2 species)
Montastrea (5 valid spec. in the Indo-Pac.)
Moseleya (?) (1-2 species)
Oulastrea (1 valid species)
Oulophyllia (at least 2 valid species)
Platygyra (brain coral) (26 nominal species, unknown N° of valid species)
Plesiastrea (small knob coral) (1-2 valid sp.)
Family Trachyphylliidae *Trachyphyllia* (possibly only 1 valid species)
Family Anthemiphylliidae *Anthemiphyllia* (4 species recognized)
Family Caryophylliidae *Alatotrochus* (1 species)
Anomocora (2 species recognized)
Asterosmilia (?) (2-3 species)
Aulocyathus (?) (1-2 species)
Bourneotrochus (?) (1 species)
Caryophyllia (53 species recognized)
Catalaphyllia (1-4 species)
Ceratotrochus (?) (about 3 species)
Coenocyathus (?) (6-8 species)
Conocyathus (2-3 species)
Conotrochus (2 species)

	Crispatotrochus (10 species)
	Cryptotrochus (?) (2 species)
	Dactylotrochus (1 species)
	Dasmosmilia (?) (deep waters) (4 species recognized)
	Deltocyathus (12 species recorded)
	Desmophyllum (?) (4 valid species listed)
	Edwardsotrochus (about 4 species)
	Endocyathopora (?) (1 species)
	Euphyllia (8 valid species)
	Goniocorella (1 species)
	Gyrosmilia (?) (1 species)
	Heterocyathus (striped shoe coral) (11 nominal species)
	Idiotrochus (?) (2 species)
	Labyrinthocyathus (?) (about 7 species)
	Lochmaeotrochus (endemic to Indonesia?)(1 species)
	Montigyra (?) (1 species)
	Notocyathus (2 species)
	Odontocyathus (about 4 species)
	Paracyathus (?) (14 valid species)
	Peponocyathus (?) (2 species)
	Physogyra (at least 2 valid species)
	Platycyathus (?) (unknown N° of species)
	Platytrochus (?) (5 species recorded)
	Plerogyra (pearl coral) (at least 4 species)
	Polycyathus (?) (about 17 species)
	Rhizosmilia (?) (3 species)
	Sphenotrochus (?) (10 species)
	Stephanocyathus (7 species)
	Tethocyathus (about 10 species)
	Thrypticotrochus (?) (2 species)
	Trochocyathus (possibly 20 valid species)
	Tropidocyathus (2 valid species)
Family Flabellidae	*Blastotrochus (?)* (1 species)
	Flabellum (100 nominal species)
	Gardineria (?) (8 species recognized)
	Javania (7 species described)
	Placotrochides (2 or 3 species recognized)
	Placotrochus (possibly 3 valid species)
	Rhizotrochus (4 species listed)
	Truncatoflabellum (23 species described)
	Guynia (?) (1 species)
Family Dendrophyllidae	*Balanophyllia* (28 species)
	Cladopsammia (?) (probably 4 species)
	Coenopsammia (?) (unknown N° of species)
	Dendrophyllia (possibly around 30 valid sp.)
	Endopachys (possibly 6 valid species)
	Endopsammia (?) (possibly 5 valid species)
	Eupsammia (about 3 species)
	Heteropsammia (smooth shoe coral) (probably 2 species)
	Leptopsammia (at least 5 species)
	Rhizopsammia (9 species described)
	Tubastrea (red cave coral, tree coral, ...) (6 species recognized)
	Turbinaria (vase coral) (80 nominal species)

CLASS HYDROZOA

Order Milleporina	
Family Milleporidae	*Millepora* (fire corals) (at least 48 nom. sp.)
Order Stylasterina	
Family Stylasteridae	*Astya (?)* (2 species described)
	Conopora (10 species)
	Distichopora (?) (22 species described)
	Lepidotheca (?) (14 species described)
	Pliobothrus (5 speces described)
	Pseudocrypthelia (end. to Indonesia ?,1 species)

ANNEX II

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Trade in corals and living stones

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Key words: Conservation; coral reefs; coral trade; CITES.

Abstract: Harbours and airports in the Netherlands are frequently used for the import of coral reef organisms. The majority of cargoes of these mostly protected animals is in transit to other countries in Europe. The organisms are traded for various purposes: aquaria, swimming pools, decoration, souvenirs, precious stones, etc.
In 1994 three large loads of living and dead corals were intercepted in Rotterdam and Amsterdam by the A.I.D. (General Inspection Service) of the Ministry of Agriculture, Nature Management and Fisheries. Officers of the CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) have the authority to confiscate material protected by CITES, that lacks a CITES document. About these three cases an ex officio expertise was asked from the National Museum of Natural History in Leiden in order to proceed according to the law.
Problems concerning the issue of what is to be regarded as living, dead or (unprotected) fossil coral are discussed, and general questions are raised in order to support the creation of an international approach and to formulate clear criteria.

Introduction

During the last five years an expanding trade in marine organisms is perceptible. This is not only the result of increasing interest in unknown marine life, but also of the speedy and frequent airline facilities. Fragile reef corals and reef fishes can be transported easily within a day. As long as the trade is restricted to cultivated organisms it is acceptable, but it also concerns wild plant and animal species that are, or may become rare, and as a result of this exploitation, may end up as "endangered species".

Exploitation of and international trade in wild animals and plants may not only reduce populations to the point of no return, but it may also destroy whole ecosystems.

In the first half of this century this concerned mainly the large land animals like elephant, tiger, crocodile, etc., for their skins or teeth. After the second world war, with growing economy and transport possibilities, many other wildlife "objects" became targets of man's interest.

Inevitably, this growing business in wild living plants or animals had to be regulated.

The problems were discussed internationally at an assembly of the IUCN (International Union for Conservation of Nature and Natural Resources) in 1960. The IUCN General Assembly decided to create "an international convention on regulations of export, transit and import on rare or threatened wildlife species or their skins and trophies". This CITES (Convention on International Trade in Endangered

Species of Wild Fauna and Flora) was signed by 21 countries in 1973. Now over 130 countries are parties to CITES.

CITES establishes an international legal framework for the prevention of trade in endangered species and for an effective regulation of trade in others (Wijnstekers, 1992). The problems about exploitation and conservation of wildlife remain to be discussed internationally, because the concerns in these trades of producer countries and consumer countries are very different. In this respect it is worth noting the definition of conservation given in the Worlds Conservation Strategy:

Conservation is the management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations.

This definition certainly is relevant in the trade of coral reef organisms. Most reef organisms are not directly endangered, but damaging of the coral reef framework by for instance harvesting coral blocks, deteriorates the whole rich ecosystem.

Trade in corals: living, dead and fossil

Regulation

The trade in hard corals (mainly Scleractinia) became regulated by CITES in 1985.

At first only some genera were included in the list of protected animals, but because it is hard for law enforcement officers to identify these animals, they had problems with the sorting of protected and non-protected animals in shipments. Fortunately the proposal of Israel to put all Scleractinia and other hard corals belonging to the Antipatharia, Milleporidae, Stylasteridae, Coenothecalia and Tubiporidae on the list of CITES appendix II, was accepted in 1989. It concerns live and dead colonies, not fossil material.

CITES Appendix II includes:

a. All species which although not necessarily now threatened with extinction may become so, unless trade in specimens of such species is subject to strict regulations in order to avoid utilization incompatible with their survival.

b. Other species which must be subject to regulation in order that trade in specimens of certain species referred to in subparagraph a of this paragraph may be brought under effective control.

There is a possibility for a quotum system for Appendix II species in the framework of CITES, which means that organisms mentioned in Appendix II can be exported from the producer country or imported into the consumer country with a CITES document. The regulation of these quota is controlled by the national legislative authorities in each country. This is administrated by the W.C.M.C. (World Conservation Monitoring Center) in Cambridge, in order to gather statistics of the amount of trade in relation to the status of each species. The quota, the administration and the regulation of the CITES certificates are of course very difficult to control. It is not the subject of the present paper to discuss this, but it is certainly a field of much concern.

In 1989 all Scleractinian corals (the most important objects for coral trade) were placed on the CITES list and regarded as protected animals. Ever since, shipments of

these corals can only pass international borders with the required CITES document. In spite of this many coral shipments without a CITES document however still passed Dutch customs.

Examples

Between 1985 and 1989 several shipments of corals were intercepted by the A.I.D. and had to be inspected by NNM specialists in order to identify the species. Those species not on the CITES list could pass the customs, and other species mentioned in the list had to be confiscated. It was an enormous task, because the trade in corals and other marine organisms like molluscs increased. The demand in consumer countries grew steadily and the supply (mainly from developing countries) became better organised, so that the trade became more and more profitable. Several trading firms such as Neptunus (Texel) and Marine Life (Spijk) flourished.

However, after 1989 the coral shipments without an export CITES document could be confiscated completely. Some examples are:

- In 1992 a shipment of 80 large cases of corals from the Philippines containing thousands of dead coral colonies without an export certificate was confiscated and deposited in the NNM after court judgement, to be used for non-commercial (e.g. educational) purposes. Expositions are, or will be set up for the public with the aim to explain the basics of the necessity to protect wildlife.

- In 1993 a large shipment of living and dead coral arrived from Indonesia. It concerned about 500 colonies and fragments of colonies. Part of the animals were dying; about 70% were Scleractinia or coral colonies with encrusting algae or other marine invertebrates. The shipment was directly confiscated and transported to the Aquarium of the Rotterdam Zoo (Blijdorp). After closer inspection part of the material was returned to the trader, because it concerned "stones" with unprotected marine organisms like Alcyonaria, Gorgonaria, Pennatularia, etc. The NNM specialist did not agree, because these "living stones" were dead coral colonies. Thus confusion remained for both the A.I.D. and the dealers. Matters became even more complicated with some cases in 1994.

- In July 1994 a container with 13296 kg coral blocks from Miami arrived by ship in Rotterdam. An accompanying letter from the trader said:

"What I shipped is not coral, but rock that is made up of calcium carbonate (limestone). It is the same rock that is used to build highways, fill for yards and cement. I have a yard full of it that is used to make my driveway. The particular rock sent to Mr. de Jong was taken from the water so that it would have more colour and the appearance would be natural for use in Aquariums. The purple on the rock is calcareous algae. I had personally gone over each rock and can assure you there is no Coral".

The judgement of the specialist was that we were dealing here with dead Scleractinian coral colonies mainly belonging to the genera *Diploria, Porites, Montastrea, Agaricia* and *Siderastrea*.

Encrusting organisms were calcareous algae, sponges, bryozoans, molluscs, etc. Extraction of such coral blocks means further destruction of the already badly affected coral reef ecosystems of the Florida Keys. The shipment was meant for a seawater

swimming pool in the Netherlands. After some hesitation the shipment was released following great pressure of the traders.

- In August 1994 a large shipment of living and dead coral from Singapore arrived at Schiphol airport. It was intercepted by the A.I.D. and transported to the Aquarium of "Artis", Amsterdam Zoo. A judgement was asked of the NNM and the following statement was given:

"The coral material inspected contains approximately 700 coral colonies, of which 20% are living Scleractinia belonging to the genera *Trachyphyllia, Goniopora, Plerogyra, Physogyra, Euphyllia, Tubastrea, Porites, Goniastrea*. The other 80% concerns dead coral colonies on which other marine organisms settled, mainly soft corals, but also sponges, algae and Actiniaria".

These encrusting organisms are not protected and the trader asked the return of these "living stones". This case reached many newspapers and magazines, so both parties decided to make it an official court case. In December 1994 the Court of Justice of Haarlem decided, after having heard the testimony of the coral expert about the meaning of the term "living stones", to confiscate all coral material and to give it to Artis Aquarium.

- In September 1994 a crate with large (20 to 60 cm) coral blocks from Mexico was intercepted by the A.I.D. After inspection by the specialist, it was concluded that most "coral" blocks were constructed by various marine organisms, such as calcareous algae, molluscs, worms and corals. All blocks were encrusted by still living organisms like *Halimeda*, soft corals, sponges, Bryozoa, boring molluscs and scleractinian corals belonging to the genera *Cladocora, Phyllangia, Isophyllia*. These living organisms proved that the coral blocks came from a living coral reef ecosystem and not from a fossil reef as contended.

Because there was no CITES certificate, the material was confiscated and given to the Zoo in Rotterdam.

In conclusion

The coral shipments mentioned, containing either living coral, dead coral or "living stones" (also called "life rock"), are only some examples of the immense worldwide trade in the main builders of our richest marine ecosystem, the coral reef ecosystem.

Because the control concerning coral shipments had been rather chaotic during 1994 the A.I.D. asked instructions about the interpretation of the biological, geological and trade terms of "coral" and "living stones". There were problems about protected and not protected coral material.

Definitions of 1. fossil coral, 2. limestone, and 3. living stone, were formulated by the A.I.D.

1. Fossil coral rock is constructed by coral colonies more than 10.000 years ago

2. Limestone is a calcium carbonate conglomeration constructed by marine organisms.

3. A living stone is a stone or lime stone on which living organisms have settled.

This coral material is not protected, unless live coral is found on any of these coral blocks.

Coral specialists do not agree with the last definition, because harvesting of dead

coral blocks with encrusting marine organisms means deteriorating the health and sustainabiliy of the coral reef ecosystem.

In the court case of December 1994, the judges accepted the declaration of the experts and overruled the definition as used by the A.I.D.

In order to support the enforcement officers, Dutch experts (in cooperation with the International Society for Reef Studies and the IUCN) formulated their criteria for the existing trade in corals.

The following declaration was formulated by M. Borel Best (NNM, Leiden) and G.J. Boekschoten (Institute of Earth Sciences, VU, Amsterdam) in order to be used by the A.I.D. officers and to be discussed on the 8th International Coral Reef Symposium in Panama (June, 1996).

Living and dead coral

About the trade and harvesting of living coral (Scleractinia and other groups) and dead coral (living stones, life rock) the following:

In tropical coastal waters, several types of coral reef may be formed such as fringing reefs, patch reefs, barrier reefs and atolls. These reefs are constructed by marine organisms, plants or animals, but mainly coral animals, that are able to absorb calcium ions from the sea water and deposit this as a skeleton of calcium carbonate. The mineralogical composition is aragonitic.

By way of budding coral colonies are formed. Through continuous growth, a reef is formed. All sorts of other marine organisms settle in, on and between coral colonies. Thus the reef is consolidated and a reef wall is formed. Reefs can be hundreds and thousands of years old. By simultaneous physical and chemical processes, parts of the reef wall break off and fall on the sandy bottom.

The currents and wave action erode these blocks further. Larvae of all sorts of marine organisms, also larvae of the corals themselves, can settle on dead coral blocks, So these dead coral blocks are then the "living stones" of the reef and of extreme importance for the survival of the reef organisms and whole ecosystem. By continuous erosion coral sand is formed, which is important for the further consolidation of the coral reef wall. Because one of the functions of the reef is protection of the coast line, harvesting of too much coral sand weakens the coast.

In short, we can state that reefs, as important protectors of coasts and supporters of the most biodiverse marine ecosystem on earth, are constructed by living corals and other marine organisms. The dead eroded parts of the reef function as substrate for the larvae of numerous reef organisms, and coral rubble and sand contribute to the stability of the reef wall. We are dealing with a cyclus of construction and destruction in which all stages of the coral (life, dead as block, rubble or sand) are important to keep this ecosystem healthy and to maintain its biodiversity. All these coral stages should therefore be protected.

During the millions of years of the earth history these calcium carbonate walls have been formed. Coral reefs are already known from the Ordovicium (450 million years ago). By the tectonic movements of the earth crust, continental drift and sea level changes these coral reefs may also be found on land. These are fossil reefs. The

fossilisation process can take thousand of years, during which the aragonitic calcium carbonate is transformed into calcite; the skeleton is crystallised. Calcite is easily recognised because it is shiny and glitters along the fractures. Fossil coral does not contain organic material, in contrast to dead and living coral.

Fossil corals do not take part in the functioning of the reef ecosystem and therefore do not have to be protected.

The contents of this statement will be discussed on International Coral Reef Symposia. Only with an international approach we may succeed to convince producing and consuming countries involved in coral trade to stop their activities by not issuing CITES documents.

The main producer countries of coral material are the Philippines, Indonesia and some Pacific nations (Wells & Barzdo, 1991). During the last two years shipments with a CITES document from the Philippines decreased, while those from Indonesia increased. Strict regulation of the coral export in the last-named country is certainly necessary in order to protect the Indonesian reefs from fast deterioration (Best et al., 1992; Best, 1994).

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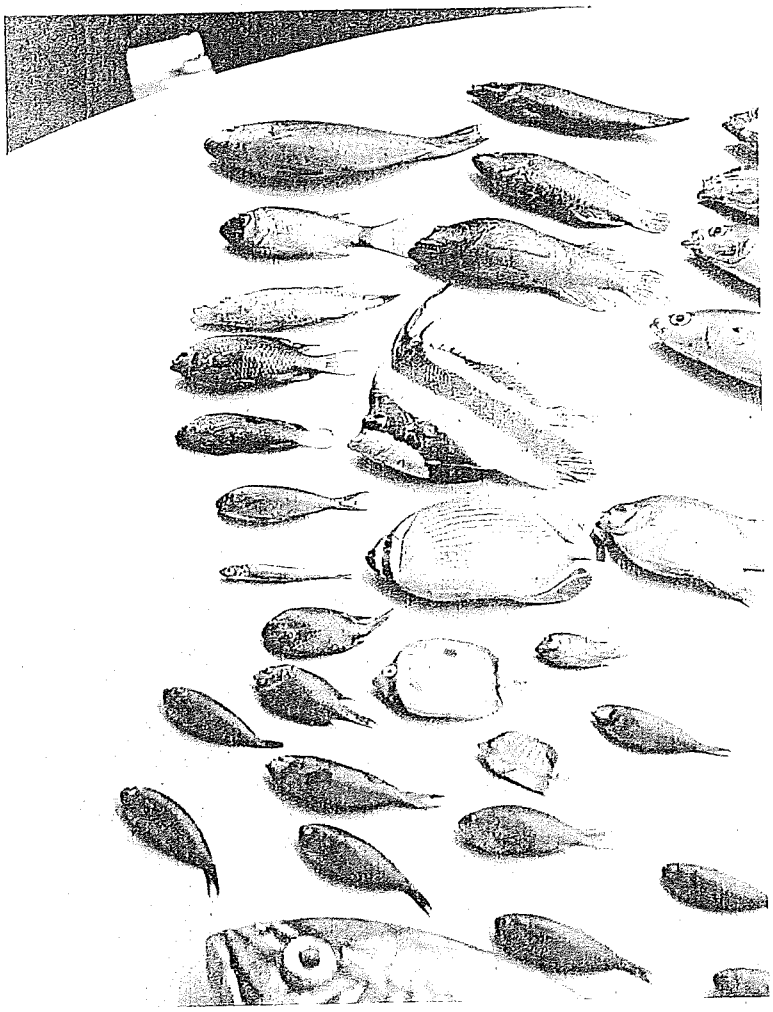
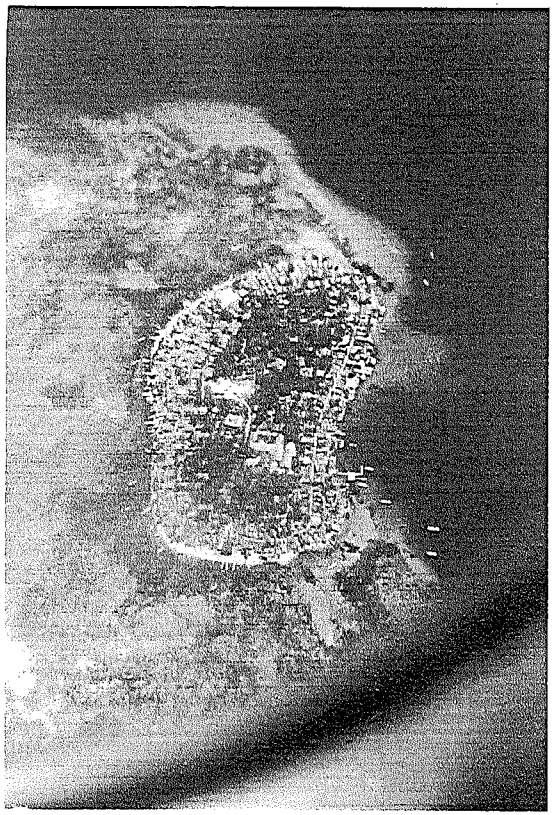
ANNEX III ILLUSTRATIONS *(Photo: Caroline Raymakers)*

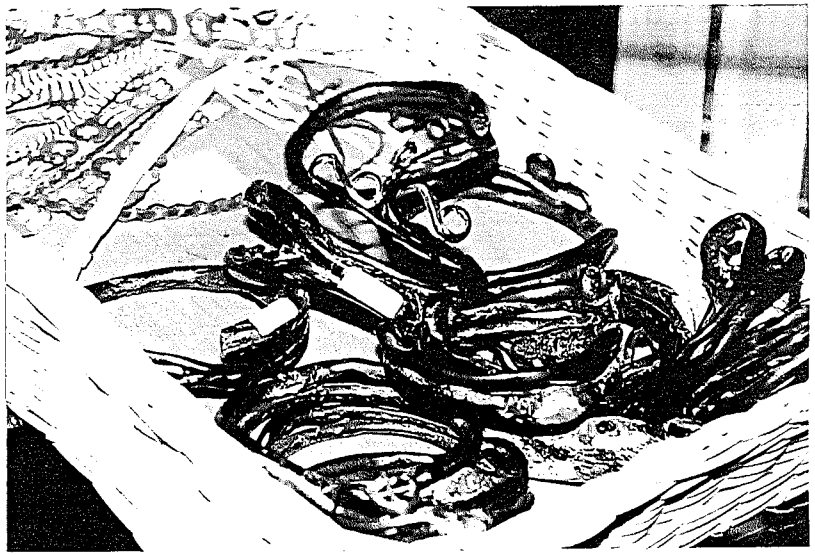
Victims of "dynamite fishing"; inedible, thus not collected by fishermen (Tukang Besi archipelago, Southeast Sulawesi, October 1995)



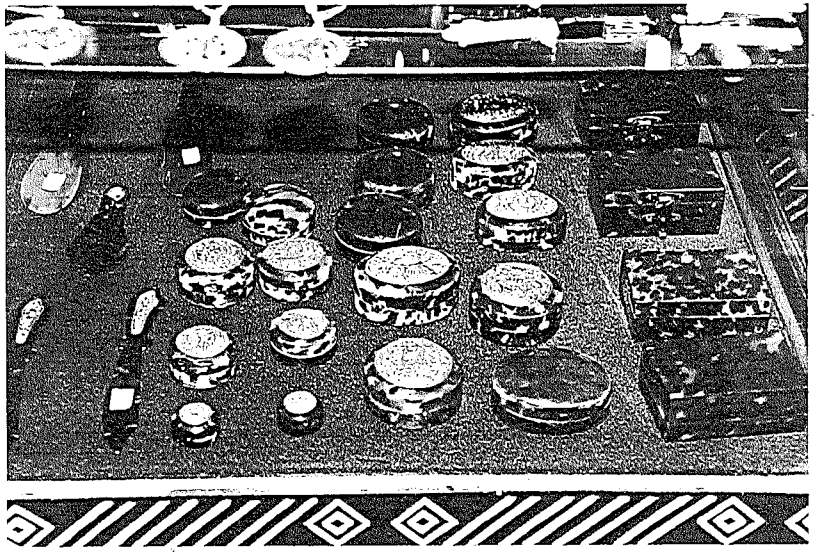
Densely populated island
in Spermonde archipelago
(South Sulawesi,
March 1998)



"Lola" (*Trochus niloticus*)
(Selayar, South Sulawesi,
November 1994)
(Photo: Reed Merrill)

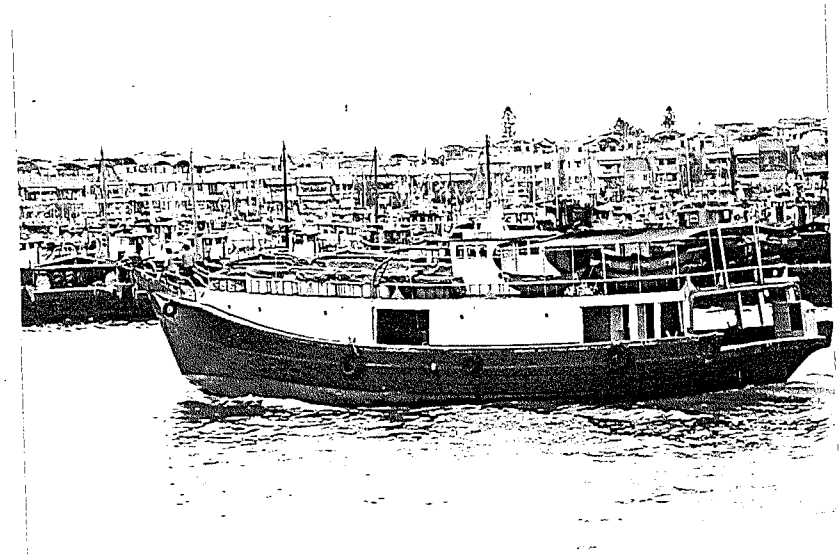


Black coral bracelets for sale, 4th flour in Pasaraya (Jakarta, April 1998)

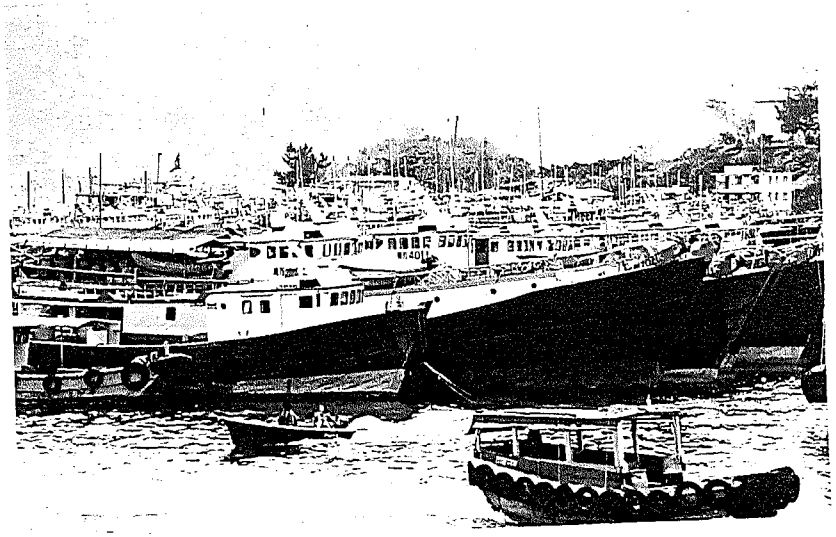


Turtle shell items for sale on the 4th flour in Pasaraya (Jakarta, April 1998)

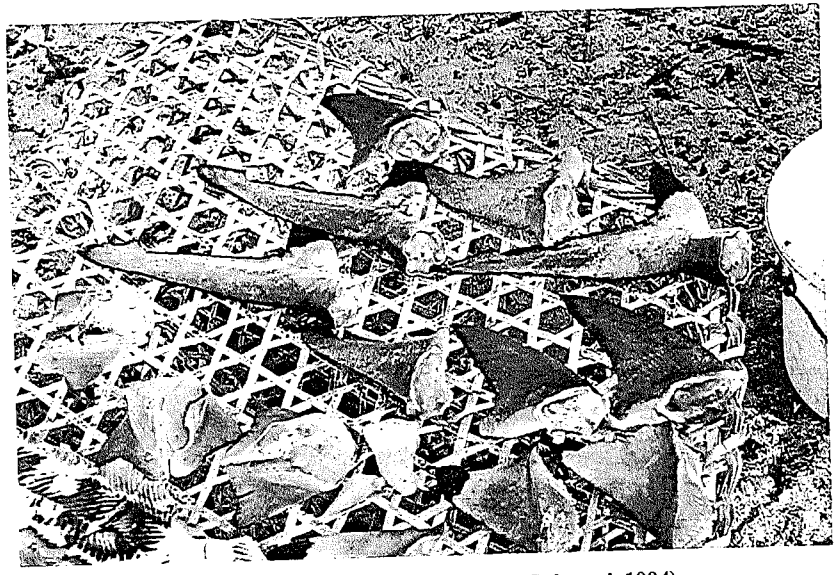
Hong Kong fishing vessel operating in Indonesian waters to catch live groupers and Napoleon wrasse for export to Chinese restaurants in Hong Kong (Ujung Pandang, South Sulawesi, June 1994)



Similar vessel in its home harbour
(Cheung Chan Island, Hong Kong, February 1996)



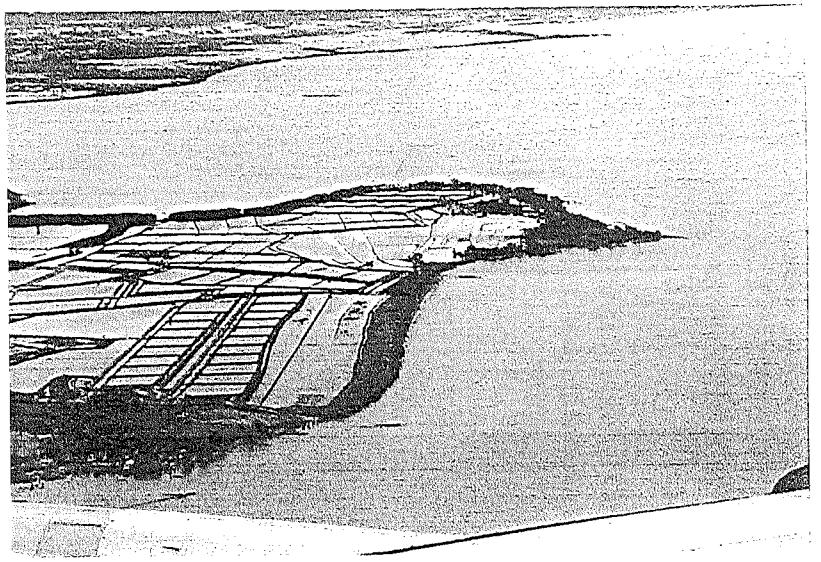
Fleet of vessels in their home harbour
(Cheung Chan Island, Hong Kong, February 1996)



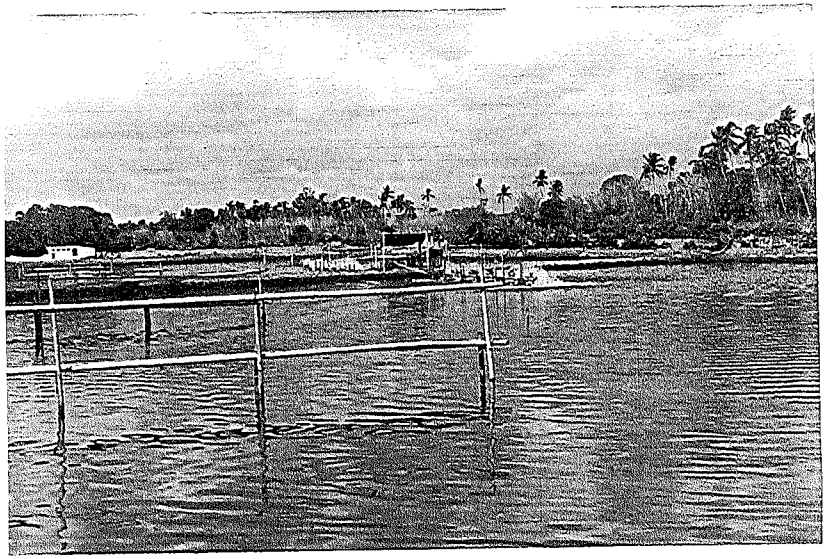
Shark fins and tails drying (Taka Bone Rate, South Sulawesi, 1994)

Shark meat drying (Taka Bone Rate, South Sulawesi, 1994)

Dry shark fins and sea cucumbers ("bêche de mer", "teripang") in a shop on Des Voeux Street (Hong Kong, February 1996)

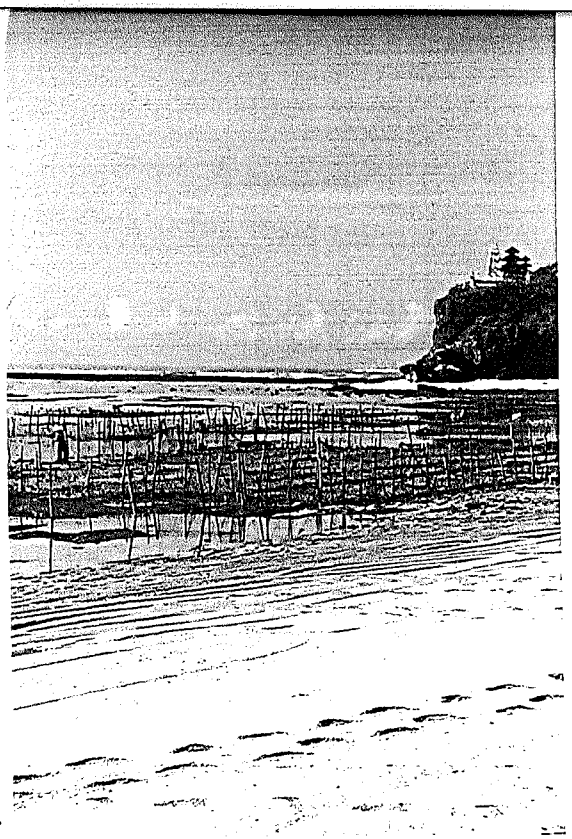


Brackishwater aquaculture ponds along the coast (North of Ujung Pandang, South Sulawesi, 1998)

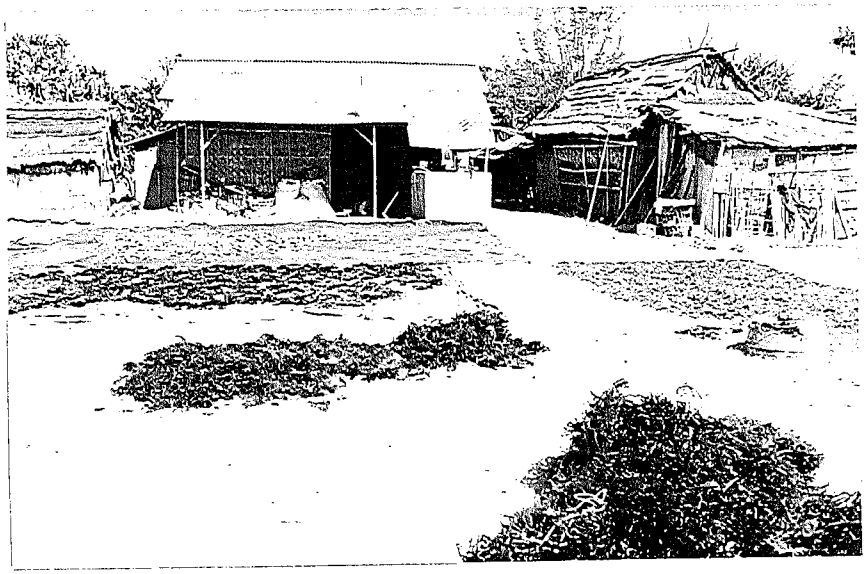


Intensive shrimp aquaculture pond (South Sulawesi, 1994)

Seaweed culture,
(Geger, Southwest Bali,
November 1994)

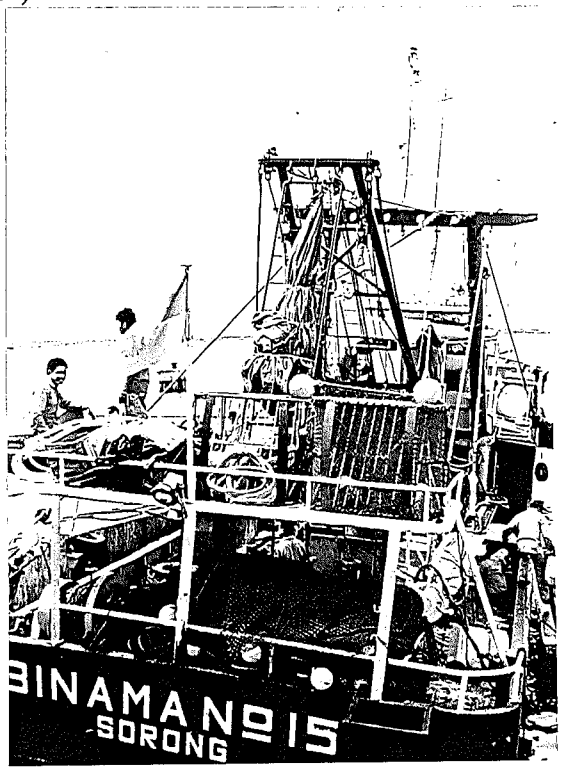


...two species of *Eucheuma* spp.



**Poor post-harvest practices: sand contamination during seaweed drying
(Geger, Southwest Bali, 1994)**

**Shrimp trawler
(Sorong, West Irian Jaya,
April 1995)**



ANNEX IV

Combined Nomenclature (CN): codes used by Eurostat

ANNEX IV

Combined Nomenclature (CN)
(closely linked to the Harmonised Commodity Description and Coding System)

Commodity Code	Description of goods
0301 10 10	Live Freshwater fish
0301 10 90	Live Marine fish
0302 29 90	Flatfish (N.E.S.1), fresh or chilled
0302 31	Albacore (*Thunnus alalunga*), fresh or chilled
0302 32	Yellowfin tunas (*Thunnus albacares*), fresh or chilled
0302 66 00	Eels (*Anguilla* spp.), fresh or chilled
0302 69 61	Sea bream (*Dentex dentex* & *Pagellus* spp.), fresh or chill.
0302 69 87	Swordfish (*Xiphias gladius*), fresh or chilled
0302 69 95	Gilt-head seabream (*Sparus aurata*), fresh or chilled
0302 69 96	Marine fish (N.E.S. 1), fresh or chilled (no longer used)
0302 69 97	Marine fish (N.E.S. 1), fresh or chilled (replaced ...: 96)
0302 69 98	Marine ..., fresh ... (excl. 0302 11 00 to ... 69 87)
0303	Total fish (N.E.S. 1), frozen
0303 41	Frozen Albacore (*Thunnus alalunga*), frozen
0303 42	Yellowfin tuna (*Thunnus albacares*), frozen
0303 49	Other species of tuna, frozen
0303 75 90	Other sharks (N.E.S. 1), frozen
030376 00	Eels (*Anguilla* spp.), frozen
0303 79 71	Sea bream (*Dentex dentex* & *Pagellus* spp.), frozen
0303 79 87	Swordfish (*Xiphias gladius*), frozen
0303 79 96	Other fish (N.E.S. 1), frozen
0303 79 97	Other fish (N.E.S. 1), frozen (no longer used)
0303 79 98	Other fish (N.E.S. 1), frozen (excl. 0303 10 00 to ... 79 87)
0303 79 99	Other fish (N.E.S. 1), frozen (replaced 0303 79 97)
0304	Total fish (N.E.S. 1), fillets and other meat
0304 10 38	Other fish (N.E.S. 1), fillets, fresh or chilled
0304 10 39	... fish (N.E.S. 1), fillets ... (excl. Cod & *Boreogadus saida*)
0304 20 33	Redfish (*Sebastes* spp.), fillets, frozen
0304 20 45	Other tuna (*Thunnus* & *Euthynnus*), fillets, frozen
0304 20 69	Other sharks (N.E.S. 1), fillets, frozen
0304 20 87	Swordfish (*Xiphias gladius*), fillets, frozen
0304 20 98	Other fish (N.E.S. 1), fillets, frozen (excl. 0304 20 21 to 85)
0304 90 65	Swordfish (*Xiphias gladius*), other products
0305 10 00	Flours, meals and pellets of fish fit for human consumption
0305 59 90	Other fish (N.E.S. 1), dried (not smoked, salted or not)
0305 69 90	... fish (N.E.S. 1), salted (not dried), smoked, and in brine
0306 11	Lobsters (*Panulirus*, *Palinurus*, & *Jasus* spp.), frozen
0306 12	Other lobsters (*Homarus* spp.), frozen
0306 13	Frozen shrimps
0306 14	Frozen crabs
0306 19	Other frozen products of crustaceans (N.E.S. 1), incl. meals and pellets fit for human consumption
0306 21 00	Not frozen lobsters, steamed or boiled in water
0306 23	Total, not frozen shrimps, steamed or boiled in water

0306 23 10	Pandalidae, steamed or boiled in water
0306 23 90	Others, steamed ... (excl. Pandalidae and *Crangon* spp.)
0306 24	Not frozen crabs, steamed or boiled in water
0306 29	Other, steamed... incl. meals and pellets fit for human con
0307 10	Oysters (all species)
0307 29	Scallops, other than live, fresh or chilled
0307 39	Mussels, other than live, fresh or chilled
0307 41	Cuttle fish & squids, live, fresh or chilled
0307 49	Cuttle fish & squids, frozen and not frozen (not canned)
0307 59	Octopus, other than live, fresh or chilled
0307 60 00*	Snails, other than sea snails
0307 91 00	Other aquatic invertebrates (2), live, fresh or chilled
0307 99	Other aquatic invertebrates, oth. than live, fresh or chill.(3)
0307 99 18	Oth. aq inv. (2), frozen (including jellyfish) (replaced by 19)
0307 99 19*	Oth. aq inv. (2), frozen (excl. jellyf., now 15) (replacing 18)
0307 99 90	Oth. aq inv.(2), dried, salted, or in brine (excl. chill. or froz.)
0507	... tortoise-shell, whalebone and whale hair, unworked ...
0508 00 00	Coral and similar materials (4), unworked ...
0509 00 00	Natural Sponges of animal origin
1212 20 00	Seaweeds and algae (excl. seaweed ash and Kelp)
1302 31 00	Agar-agar (extracted from seaweeds)
1605 10 00	Crabs, preserved (canned)
1605 20	Shrimp and prawns, preserved (canned)
1605 40 00	Other crustaceans, preserved (canned)
1605 90	Molluscs, preserved (canned)
1604 13	Sardines, sardinella & brisling or sprat, whole or in pieces
1604 14	Tunas, skipjack & Bonito (*Sarda* spp.), whole or in pieces
1604 15	Mackerels (*Scomber scombrus* & *S. japonicus*), wh. or pc
1604 19	Other fish (incl. *Euthynnus* other than skipjack), wh. or pc
1604 20 05	Surimi
1604 20 50	Minced sardines, and mackerels
1604 20 70	Minced tunas, skipjack, & others
9601	Worked corals, ivory, mother of pearl, shell, turtle sh., etc.
9601 90 10	Corals, natural or agglomerate & article of coral (N.E.S. 1)
9601 90 90	Bone, tortoise shell, horn, antlers, mother of pearl and other animal carvings, material & other articles of animals of these materials (N.E.S.1) (excluding ivory or coral)

(1) *N.E.S., Not Especially Specified.*
(2) *Aquatic invertebrates other than crustaceans, including sea urchins & sea cucumbers.*
(3) *Frozen flours, meals and pellets of aquatic invertebrates, other than crustaceans fit for human consumption.*
(4) *... unworked or simply prepared similar materials include: shells of molluscs, crustaceans or echinoderms and cuttle-bone, unworked or simply prepared, and waste or powder thereof.*

ANNEX V

The violations of Indonesian fisheries regulations in 1992 and 1993 (Gillet, 1996)

Type of Violation	Total No. Violations 1992	No. Indonesian Violations 1992	No. Foreign Violations 1992	Total No. Violations 1993	No. Indonesian Violations 1993	No. Foreign Violations 1993
Outside specified fishing area	11	3	0	38	3	35
Unspecified fishing gear	33	33	-	213	25	100
Using explosives	25	25	-	15	15	-
Using Cyanide, chemicals	12	12	-	57	17	40
Using trawl gear	65	3	62	142	45	97
Insufficient local crew	-	-	-	10	-	10
Destruction of coral reef	36	36	-	50	50	-
Fishing w/o license	142	10	132	500	30	470
Improper design/size of vessel	-	-	-	-	-	-
Other	177	36	141	103	41	62
Total	501	150	343	1136	234	902

Source: Unpub. data, Directorate of Resource Management, DGF

ANNEX VI

Indonesian species targeted by fisheries and reported to FAO (FAO Fishstat, 1996)

Fish
Ariidae (Sea catfishes)
Caesio spp (Fusiliers) target of blast fishers
Carangidae (Carangids)
Caranx spp (Jacks, Trevallies)
Chirocentrus spp (Wolf-herrings)
Decapterus spp (Scads)
Dussumieria acuta (Rainbow sardine -Clupeidae-)
Elagatis bipinnulata (Rainbow runner)
Elasmobranchs (Sharks, rays, skates, etc.)
Rajiformes (Skates and rays)
Epinephelus spp (Groupers)
Exocoetidae (Flyingfishes)
Formio niger (Black pomfret)
Haemulidae or Pomadasyidae (Grunts, sweetlips)
Harpadon nehereus (Bombay-duck)
Katsuwonus pelamis (Skipjack tuna)
Lates calcarifer (Giant Seaperch or Barramundi)
Leiognathidae (Ponyfishes or Slipmouths)
Lethrinidae (Emperors -scavengers-)
Lutjanus spp (Snappers)
Megalaspis cordyla (Torpedo scad)
Mugilidae (Mullets)
Nemipterus spp (Threadfin breams)
Pampus argenteus (Silver pomfret)
Pleuronectiformes (Flatfishes)
Polynemidae (Threadfins, tasselfishes)
Priacanthus spp (Bigeyes)
Psettodes erumei (Indian halibut)
Rastrelliger spp (Indian mackerels)
Sardinella gibbosa (Goldstripe sardinella)
Sardinella lemuru (Bali sardinella)
Sciaenidae (Croakers, drums)
Scombroidei (Tuna-like fishes)
Scomberoides spp -Chorinemus spp- (Queenfishes)
Scomberomorus commerson (Narrow-barred Spanish mackerel)
Scomberomrus guttatus (Indo-Pacific king mackerel)
Sphyraena spp (Barracudas)
Stolephorus spp (Stolephorus anchovies)
Synodontidae (Lizardfishes)
Tenualosa toli (Toli shad)
Trichiuridae (Hairtails, cutlassfishes)
Thunnus albacares (Yellowfin tuna)
Tylosurus spp (Needlefishes)

Molluscs
Anadara spp (Red cockles)
Crassostrea spp (Cupped oysters)
Meretrix spp (Hard clams)
Pectinidae (Scallops)
Sepiidae, Sepiolidae (Cuttlefishes, bobtail squids)
Loligo spp (Common squids)
Octopodidae (Octopuses)

Crustaceans
Metapenaeus spp (Metapenaeus shrimps)
Natantia (Natantian decapods)
Penaeus merguiensis (Banana prawn)
Penaeus monodon (Giant Tiger prawn)
Panulirus spp (Tropical spiny lobsters)
Portunus pelagicus (Blue swimming crab)
Scylla serrata (Indo-Pacific swamp crab)

Other Invertebrates
Holoturidea (Sea cucumbers)
Rhopilema spp (Jellyfish)
Scleractinia (Stony corals, madrepores)

Turtles
Testunidae (Green Turtle)

Seaweeds
Rhodophyceae (Red Seaweeds)

ANNEX VII

Lizards and Crocodiles, imports of Indonesian CITES listed species in the EU

Lizards

Although this study focuses on marine species, a few terrestrial species interacting with marine organisms (e.g. feeding on turtle eggs), and of socio-economical importance to inhabitants of beaches, estuaries, mangroves, as well as islands, are also included in the present work. For both socio-economical and conservation aspects it is interesting to have a look at the international trade data of certain valuable natural resources such as lizards and crocodiles.
Monitor lizards (*Varanus* spp) are common in relatively dry environments, sand and rock islands. Some of them are too heavy to climb trees, but they are all good swimmers and travel from one island to another. They are predators of turtle eggs. They dig-out numerous nests at night just after the turtle has left the beach.
An extensive bibliography on the biology, the use, the trade, and other related studies on lizards is available. The following paragraphs are limited to a brief overview of trade between Indonesia and the EU.

Legal trade

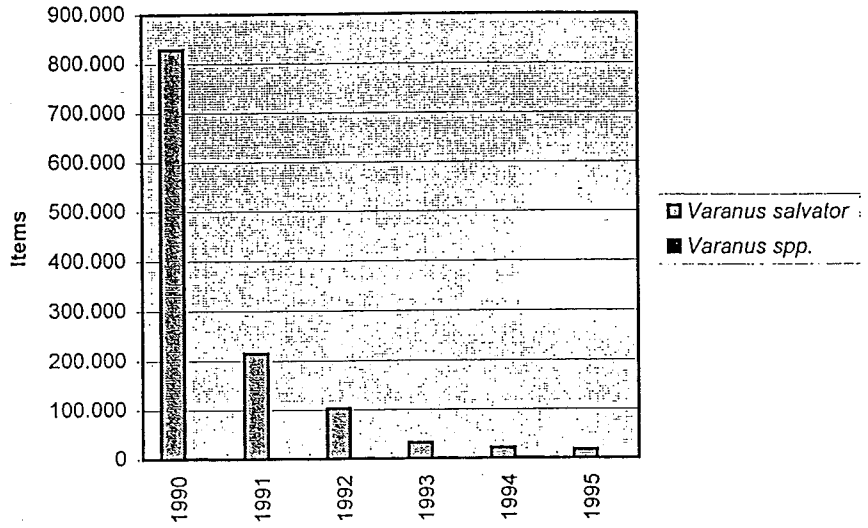
Of 11 species of Indonesian lizards (Dragon and Monitor, "byawak" in Indonesian language) protected under CITES, 2 are listed in Appendix I, Komodo dragon (*Varanus komodoensis*) (Komodo & adjacent island), and Indian- or Bengal Monitor (*V. bengalensis*) (Java, Natuna island), and 9 in Appendix II, Timor- or Spotted Tree Monitor (*Varanus timorensis (= similis)*), Sand Monitor (*V. gouldii*), (Irian Jaya), Pacific Monitors (*V. indicus*), Emerald Monitor (*V. prasinus (= beccari)*) (IrJ., Aru isl.), Rough-necked Monitor (*V. rudicollis)*, Papuan Monitor or "Tree crocodile" (*V. salvadorii*), Two-banded-, Water- or Malayan Monitor (*V. salvator*)(Java), Dumeril's Monitor (*V. dumerilii*), and Sepik Monitor (*V. karlschmidti (= jobiensis)*). The first 6 species and the sub-species *V. salvator togianus* are protected by law in Indonesia (Luxmoore and Groombridge 1990). For the ones that are not protected, capture quotas are set annually for each of the 25 Indonesian provinces, and permits are delivered by the Ministry of Forestry (Luxmoore and Groombridge 1990). From 1990 till 1995, the Indonesian MA issued export permits for all species to the EU, except for the Bengal Monitor. Permits were delivered for species that do not occur in Indonesia, like *V. niloticus* (Africa), and *V. flavescens* (India, Bangladesh, Nepal, Pakistan). The latter may be due to misidentification.

From 1990 to 1995, only three live Komodo Dragons were officially exported (exemptions), 1 in 1991 straight from Indonesia to Germany, and 2 in 1992 from Indonesia to the Netherlands via Singapore.
The trade unit is called "specimen", for Monitor lizards as for crocodiles, it may be a live or stuffed animal, a wallet, a belts, or other products made from lizard or crocodile skin.
In 6 years (1990-1995) almost all EU imports are *Varanus salvator*, the other 8 species imported represent less than 0.5% of the 1995 market. During this period, the exports of Indonesian Monitor lizards to the EU declined drastically, from 830,000 items recorded in 1990 to less than 18,000 in 1995. The volume of trade recorded in 1995 was 2% of what it was in 1990 (Table 11). However, the total exports of Indonesian Monitor lizards does not show the same drop, from 700,000 items of *V. salvator* in 1991, to 480,000 in 1996. The EU imports of *V. salvator* in 1995 represented less than 3% of the Indonesian exports (Anon. 1996c).

Table 11 Legal imports of Indonesian lizards into the EU (No. of specimens)

	1990	1991	1992	1993	1994	1995
Varanus salvator	828,810	214,530	102,907	32,429	21,659	17,654
Varanus spp.	1,535	825	459	400	1,146	84

Source: WCMC, January 1997.



As mentioned earlier, between September 1991 till March 1995 (or April 1996 for two species), the EU banned the import of Indonesian specimens of Monitor lizards (Council Regulation (EEC) 36 26/82), included in CITES Appendix II C2 list. However, according to WCMC data, permits were still issued. Does this reveal that the ban was apparently not really enforced ? and/or is it due to wrong monitoring of CITES permits by the CITES Management Authorities ? Without being able to assess the causes of this observation, it certainly shows a need for further analysis.

The EU Member States involved in Indonesian Monitor lizards trade are, United Kingdom (383,705 items over the entire period, 1990-1995), France (300,085 specimens (sp)), Austria (247,063 sp), Germany (91,051 sp), Spain (62,930 sp), Denmark (36,194 sp), Belgium (28,701 sp), Italy (22,757 sp), the Netherlands (21,037 sp), Sweden (18,076 sp), Portugal (9,697 sp), and Finland (688 sp).

Seizures

Compared to the very high legal imports of Monitor lizards, the records of seizures are quite low. As mentioned for shells and turtles, not all EU custom services and CITES MA could report their seizures at the time of the survey.

Table 12 Seizures of Indonesian lizards reported by EU Member States (No. of specimens)

	1990	1991	1992	1993	1994	1995	1996
Varanus spp.	20	253	133	158	3	6	46

Source: Custom Services and CITES Management Authorities (Ref. Table 1)

Crocodiles

Although this study focuses on marine species, terrestrial species of ecosystems that are closely linked to the sea, and of socio-economical importance to inhabitants of beaches, estuaries, mangroves, as well as islands, are also included in the present work. For both socio-economical and conservation aspects it is interesting to have a look at the international trade data of valuable natural resources such as lizards and crocodiles.
Depending on the status of populations, crocodile species ("buaya" in Indonesian language) maybe listed in Appendix I in some countries and in Appendix II in other countries. This is the case for the two species occurring in Indonesia, where the populations of Estuarine or Salt-water crocodile (*C. porosus (*or *Crocodylus raninus)*) and New Guinea crocodile (*Crocodylus novaeguineae novaeguineae (*or *C. mindorensis)*) are listed in Appendix II. The False- or Malayan Garhial (*Tomistoma schlegelii*) (freshwater, sometimes classified as Gavialidae) is an Appendix I listed species.
A comprehensive bibliography on biology, use, captive breeding, trade, and other related studies on crocodiles is available. The following paragraphs give a summarised to an overview of trade between Indonesia and the EU.

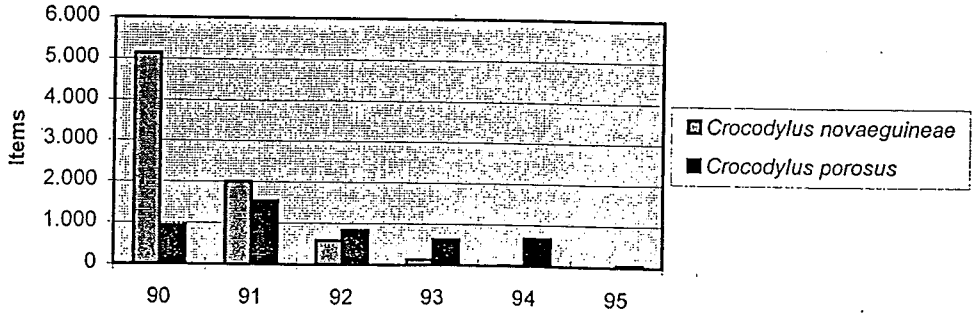
Legal trade

Although from 1991 till 1995 the EU declared a ban on imports of Indonesian CITES listed crocodiles, records show that the trade did not stop.
From 1990 till 1995, one False Gharhial (*T. schlegelii*) was officially exported by Indonesia to the EU: one live specimen has been imported by the United Kingdom via Switzerland, in 1992.
During the same years, as observed with Monitor lizards, the EU imports of Indonesian live or stuffed specimens as well as articles made of crocodile skin, show a drastic decline. In 1995, almost no export permit was issued by the Indonesian MA (47 permits represent less than 0.1% of the 6,000 export permits delivered in 1990).
This sharp drop of the trade, is probably the consequence of the EU ban. However, the fact that imports did not raise after the ban was lifted, could be caused by increasing supply of skins from crocodile farms in Southeast Asia, or because of the declining market in EU Member States. Indeed, since the late '80s, ranching started, and captive breeding of crocodiles is now common in the region. This would explain why no permits were issued for Indonesian wild animals while the crocodile skin articles (bags and wallets) are still available in many European luxury shops.

Table 13 Legal imports of Indonesian crocodiles into the EU (No of specimens)

	1990	1991	1992	1993	1994	1995
Crocodylus novaeguineae	5,137	2,005	590	137	17	0
Crocodylus porosus	931	1,531	843	625	668	47
Tomistoma schlegelii	0	0	1	0	0	0

Source: WCMC, January 1997.



Although, an EU ban of crocodile specimens imports was declared between 1991 and 1992 for *C. porosus*, or between 1991 and 1995 for *C. n. novaeguineae*, EU Member States still reported the import of crocodile specimens (WCMC 1997). Without being able to assess the causes of this lack of enforcement of the EU ban on imports of Indonesian C2 species, it certainly shows a need for further analysis. Is it linked to lack of training of enforcement agencies ? and/or wrong monitoring of CITES permits ?
The EU Member States involved in imports of crocodile products are France (11,740 items over the entire period, 1990-1995), Germany (153 items), United Kingdom (124 items), Italy (105 items), the Netherlands (100 items), Austria (20 items), Sweden (2 items), Denmark and Spain (1 item each).

Seizures

Compared to the relatively large numbers of specimens imported in the early '90s, and considering the EU ban on imports of Indonesian Appendix II C2 CITES listed species (including crocodile species) from 1991 to 1995, the number of recorded seizures was surprisingly low. Apparently the EU ban was obviously not well enforced, by both CITES MA and Custom services in Indonesia and at the borders of the EU. However, no real conclusion can be drawn from the limited data available.

Table 14 Seizures of Indonesian crocodile product by EU Members States (No of specimens)

	90	91	92	93	94	95
Crocodylus spp.	1	11	83	1	2	0

Source: Custom Services and CITES Management Authorities (Ref. Table 1)

For all species included in the C2 listing and submitted to the EU ban data are needed on years following the lift of the ban, after 1995, to see if there was a decline in European imports in Indonesian specimens of lizard and crocodile. Potential causes of a drop may be, subsequent possible drift of EU demand from Indonesia towards other supplying countries, change in fashion that caused a decrease in demand of natural reptile skin, the shift of supply from natural to fake skin and from wild populations to captive breeding (e.g. crocodiles), and/or wild populations depletion. Additional information on lizard and crocodile trade is needed to clarify the matter.

In order to better enforce CITES, Custom Services of the EU Member States usually channel their efforts in controlling two kinds of imports, small parcels that tourists bring back, often holiday souvenirs or presents, and large cargo shipments involving the commercial freight of EU industries (for instance, leather industry). A comparison using data of custom services, over four years (1993-1996), at the International Airport in Frankfurt (Germany) reveals that the average number of goods seized per infraction detected among tourists, was 3.65 specimens ("souvenirs"), while for commercial shipments it was 68.25 specimens. Thus, in terms of productivity, at the International Airport in Frankfurt, it was 19 times more efficient to focus on commercial shipments, smaller in number but larger in terms of content, than to concentrate on controlling tourists, numerous in parcels but small in number of specimens traded.
Customs officers' efforts to control "tourists souvenirs" raise public awareness. Both control approaches of individual luggage and cargo are therefore important.

Discrepancies between hard corals trade records reported by the exporter (Indonesia) compared to the ones reported by importers (EU Member States) (N° of pieces)

	19 90		19 91		19 92		19 93		19 94		19 95	
	Imp. (1)	Exp. (2)	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.
ES	13,500	38,400	16,700	14,342	34,227	13,985	15,900	19,655	69,745	49,508	57,723	*Not yet*
D	2,720	3,768	6,977	6,977	12,778	12,778	24,109	174,740	30,884	46,075	59,656	*reported*
FR	12,816	28,727	58,416	33,565	20,649	5,538	9,346	52,971	10,237	10,015	0	"
UK	0	5,990	0	7,948	9,468	5,660	7,705	26,505	21,118	15,336	25,156	"
NL	7,160	21,409	250	5,885	0	0	3,211	26,785	27,184	23,395	0	"
IT	1,712	31,214	7,812	8,900	4,754	21,096	544	56,510	1,632	9,245	7,086	"
AT	1,272	3,210	936	2,970	295	0	3,947	10,160	3,013	1,948	517	"
DK	198	1,432	0	0	0	1,320	190	2,150	506	1,522	2,384	"
BE/LX	0	6,000	0	0	0	0	0	1,000	421	4,190	401	"
SE	7	0	0	48	0	0	0	6,125	0	1,525	172	"
Total	**39,385**	**140,150**	**91,091**	**80,635**	**82,171**	**60,377**	**64,952**	**376,601**	**164,740**	**162,759**	**153,095**	

Source: CITES annual data report compiled by WCMC, 1997.

(ES, Spain; D, Germany; FR, France; UK, United Kingdom; NL, Netherlands; IT, Italy; AT, Austria; DK, Denmark; BE/LX, Belgium/Luxembourg; SE, Sweden)

(1) Imports of corals by Indonesia reported by EU Member States

(2) Exports of corals to EU Member States reported by Indonesia