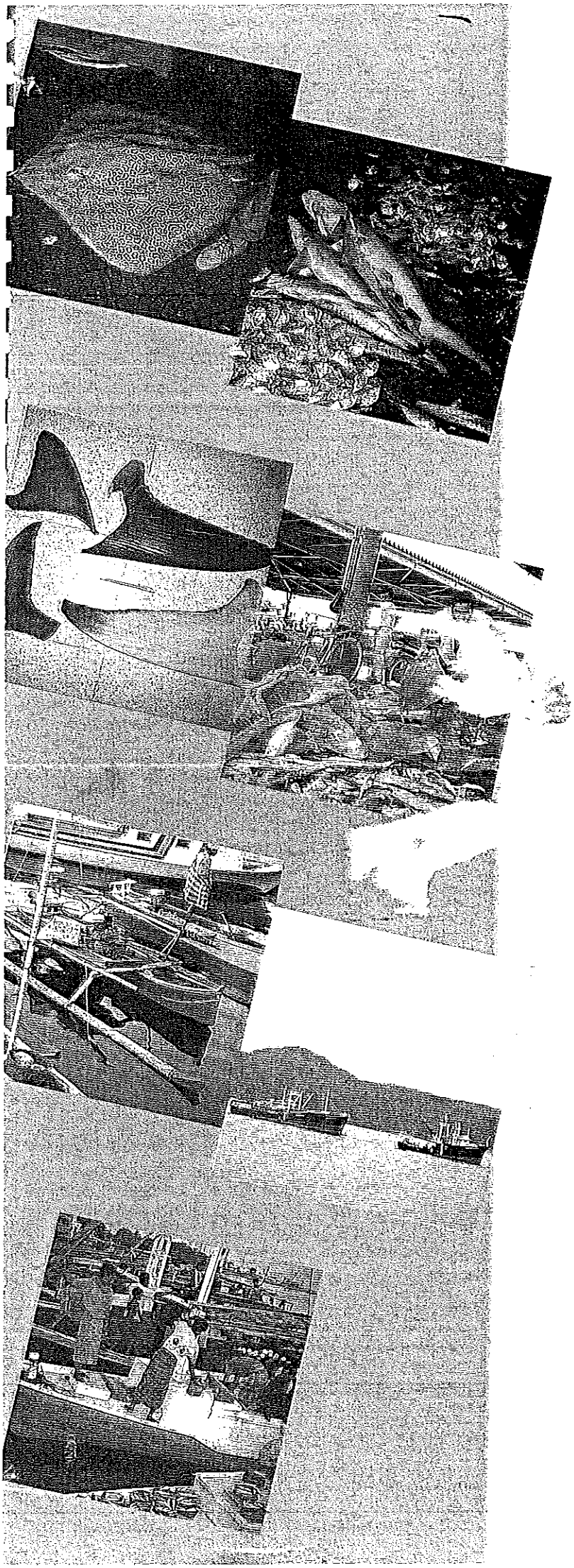

TRADE REVIEW

SHARK FISHERIES AND THE TRADE IN SHARKS AND SHARK PRODUCTS OF SOUTHEAST ASIA

Edited by
Chen Hin Keong

A TRAFFIC SOUTHEAST REPORT

TRAFFIC
----SOUTHEAST ASIA----

SHARK FISHERIES AND THE TRADE IN SHARKS AND SHARK PRODUCTS OF SOUTHEAST ASIA

Edited by
Chen Hin Keong
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Front cover photograph: (From top; Left to Right)
Reticulated whipray, Jakarta; Small carcharinids, Jakarta
Large fins , Ujung Pandang; Skinning of sharks and rays, Jakarta
Boats, Raja Wali Fish market, Ujung Pandang; Taiwanese trawlers, Ambon
Boats unloading, Poutere Fish market, Ujung Pandang

Photo credit: Nokome Bentley/TSEA

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The currency conversion used over the time the study being carried out, but the general exchange rate to the US$ used are RM2.56, 25 baht, 28.58PhP, S$1.39, and Rp2300. Most of the tables and figures are found in the Appendices.

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INTRODUCTION

Shark fisheries have historically represented only a minor and relatively low-value contribution to the overall fisheries production of most countries, and are often a small and/or seasonal component of multi-species fisheries that include high-profile species such as tuna and swordfish. However, there has been an apparent rise in the trade in shark fin in the last decade which has focused attention on what is in fact a substantial fishery, but one about which little is known. According to Bonfil (1994), the total global level of sharks, rays and chimaeras caught was estimated at 1 350 000t. In most cases, due to a general lack of management and research on elasmobranch fisheries, it is not known if the level of harvest is sustainable. Shark species are currently in demand for their fins, cartilage, skins, meat, oil and livers. Despite the global pressure on this resource, only a few nations include shark fishery in their management regimes. Consequently, very little is known about the biology and ecology of most shark species.

The TRAFFIC Network was concerned about the potential negative impact on the fishery and the resulting trade on shark populations and this prompted the initiation of a global study of shark fisheries and trade in early 1994. This was followed in November 1994 by the adoption by the CITES Conference of the Parties of Resolution Conf. 9.17, *Status of International Trade in Shark Species*, which directed the Animals Committee to research and report on the biological and trade status of shark species to the tenth meeting of the Conference of the Parties.

TRAFFIC Southeast Asia, as part of a Network-wide study, including TRAFFIC offices in East Asia, East/Southern Africa, Europe, India, Oceania, and the USA have undertaken research on the exploitation of sharks in their regions. TRAFFIC staff and consultants and partners sought to examine available information on shark fisheries, utilisation of shark products, domestic markets and trade, and management and conservation measures.

This report compiles available fisheries information on sharks through published reports, statistics, interviews, and field and questionnaire surveys. Although the bycatch data for shark fisheries can be found for some countries, the estimation of total landings is believed to be greater than that quoted in official statistics. Since the meat of most species is not of high economic value, carcasses are discarded in the sea to save space on deep sea fishing boats. However, for coastal shark fisheries, fishermen have been reported to keep and sell carcasses to supplement their income.

Table 1.0.1 shows the commercial elasmobranch fisheries of the four countries in Southeast Asia where data is available. Indonesia is the top harvester, taking an average of 42 700mt of elasmobranch species every year. Thailand is second in elasmobranch exploitation with 12 400mt/yr, followed by Malaysia (9 400mt/yr) and Philippines (8 400mt/yr). From 1974 to 1991 Indonesia showed a sharp increase in production, with a total of 18 500mt rising to 79 800mt. In Thailand, the annual elasmobranch catch averaged 12 200mt between 1986 to 1991. While in Malaysia and the Philippines during the same period, catches averaged 14 500mt/yr and 18 100mt/yr, respectively. Figure 1.0.1 shows the elasmobranch fisheries of the four countries.

METHODOLOGY

Studies were carried out in selected countries in the Southeast Asia region, namely Thailand, Philippines, Malaysia, Singapore and Indonesia. A map of the region is included in Appendix 3 (Map 1). These countries were chosen because there were known trade in sharks' fins and products and as a follow-up to the Bonfil study which targeted these five countries in the region.

The study was carried out through cooperation with various lead persons and in partnerships with agencies and organisations in those countries, and in Indonesia, through a consultant, Nakome Bentley.

Indonesia was considered a special case where a consultant was hired as it was felt that a more detailed study was required since it was identified as the largest shark fishery in the world. The focal persons in each country were Choomjet Kamjanakesorn in Thailand, Andrew Tay in Singapore, Noorainie Awang Anak in Malaysia, Romeo Trono in Philippines and Gayatry Lilley in Indonesia. The focal persons in turn either conducted part of the study themselves and/or engaged other investigators. WWF Indonesia Programme also provided the services of Ms Wanda Kambey to help Nakome Bentley in interviews and translations.

In all country studies, information was obtained from published material, interviews with fishers, traders and researchers and from personal observations. The methodology for information collection was left to the focal persons in each country as there has previously been no or limited research done on shark fisheries which could guide the present study. A set of questionnaire was sent to all focal persons in an attempt to list the main information required.

In Malaysia a set of questionnaire was sent out to researchers and fisheries officials for filling as well as direct interviews with selected persons. In Indonesia, interviews were conducted based upon questions set by the consultant (Appendix 1). Colour plates of selected species from Last and Stevens (1994) were used to aid interviewees in species identification and a number of ports were also visited. In Thailand, the interviews were conducted with fisheries researchers and fishers, traders and visits to fishing ports were also carried out. In Singapore, the investigators made a number of contacts with the trading companies and hotel and restaurant industry in an attempt to obtain trade information as Singapore is mainly a trading and consuming nation. In the Philippines, literature search, interviews and field studies were carried out by the staff of WWF Philippines.

Malaysia

Introduction

In Malaysia, the harvest of sharks and rays comprise only 2.46% of the worldwide catch. With minor development of the elasmobranch fishery in the country since 1961, the level gradually increased from 1976 to 1991 to 16 900t/yr, representing 2.2% of the total fishery catch in Malaysia in 1991. Rays are more prominent than sharks in total catches, averaging 60% of all elasmobranch (SEAFDEC data as cited in Bonfil 1994). Furthermore, from 1976 to 1991, catches showed sharks slightly declining while rays increased (Bonfil, 1994).

For the purposes of this section, large scale refers to purse seine, trawl, otter trawl, gill nets, hook and line; whereas, small scale refers to gill/drift net, hook and longline, and traps.

Fishing grounds

The FAO sub-divides its regional fishery data collection into major fishing areas around the world. Two of these areas encompass the fishing grounds of Malaysia: a) Area 57 - East Indian Ocean (west coast of Peninsular Malaysia) and b) Area 71 - West Central Pacific Ocean (South China Sea and the east coast of Peninsular Malaysia, Sabah and Sarawak). Skates, rays and sharks are caught throughout Malaysian waters, though the catch in the west coast of Peninsular Malaysia is greater than that from the South China Sea (Table 2.2.1). The data from 1987 onwards have been extrapolated by FAO.

The survey only managed to obtain the 1993 Malaysia Annual Fisheries Statistics. Broken down by region and months, the report presents shark and ray landings from the main coastlines of Malaysia for the year (Table 2.2.2). The west and east coasts of Peninsular Malaysia, at between 5 600t and 5 240t

respectively, was three times greater for rays than that landed in Sabah and Sarawak (Table 2.2.3). However, for sharks, the main landing areas were in the South China Sea: Sabah (2 112t) and Sarawak (1 679t); followed by the east coast (1 485t) and west coast (694t) of Peninsular Malaysia (Table 2.2.4). The data clearly showed that rays are the major portion of the catch with 14 600t, as compared to sharks at 6 300t. The main fishing periods for rays were from June until early October in the South China Sea region; while, in the more sheltered waters of the Straits of Malacca, no noticeable periods were established. For shark landings, fishing in the South China Sea showed two peak periods, one in April and another in September. The April season also coincides with shark landings in the Straits of Malacca. The Malaysian monsoon season is from September to December along the west coast of Peninsular Malaysia, and October to February in the east coast of Peninsular Malaysia, Sarawak and Sabah. At this time, landing data is insufficient to determine if any trends are related to the monsoon cycle.

The major fisheries landing areas of Malaysia, between 1976-1989, were the grounds off the coasts of Peninsular Malaysia and Sarawak (Bonfil, 1994). Sarawak accounted for 15% of the total elasmobranch catch, with the west and east coasts of Peninsular Malaysia at 11% and 9%, respectively, with Sabah at 6%. The west coast of Malaysia is the most important fishing ground for rays, followed by Sarawak and east coast of Peninsular Malaysia.

Dogshark and catshark species have been targeted for catch in Sabah, although the main harvest of sharks is as bycatch (Sabah Fisheries Department, *in litt.*, March 1996). Artisanal and modern shorebase catch were carried out throughout the state and there is no coastal area where sharks are not fished.

Fishing gear

Elasmobranch catches in Malaysia are predominantly the bycatch of trawl fisheries, with only a small portion taken from directed fisheries. Data available from 1990 to 1994 showed that most rays are landed using trawl nets, accounting for over 80% of total rays landed in 1990-1991 (Table 2.3.1). Trawl net landings for rays began to decrease in 1993-1994, accompanied by an increase in landings from drift/gill nets and hook and line methods. Shark landings by trawl netting have also decreased since 1990, from a high of 80% in 1991 to only 46% in 1994, despite a threefold increase in total landings for the same period. Figure 2.31a shows that the increase in shark landings is mostly attributable to increases in drift/gill net and hook and line gears. Subsequently, in regard to regional landings, there is an increase in the use of drift/gill nets and hook and line methods. For rays, off the Straits of Malacca, the hook and line gear represented 21% of the catch, in comparison to 12% in the South China Sea in 1993, possibly due to calmer waters in the Straits. In the same year in Sabah and Sarawak, shark landings from drift/gill net gear attributed 51%, as compared to 39% for trawl nets and 10% for hook and line.

Bonfil (1994) reported that the majority of elasmobranch caught in 1988 were taken by large scale fisheries. In both coasts of Peninsular Malaysia and Sabah, trawlers accounted for 60% to 70% of the local shark catches and 72% to 93% for rays. Purse seine catches contributed less than 1% of shark landings in Peninsular Malaysia. In the waters off Sarawak, large scale otter trawls landed 70% of the rays, but only 30% of the shark catches. Other large-scale gear accounted for less than 1% of catches of those kinds.

In terms of their contribution to total elasmobranch catches, small-scale fisheries for sharks and rays are not that significant in comparison to large-scale fisheries. In 1993, purse seines and trawler group gear, accounted for nearly 71% and 51% of ray and shark landings respectively in Malaysia (Table 2.32a and b). In the same table, it can be seen that trawler landings accounted for between 63% to

80% (excluding Labuan which was 98%) of all ray landings in the waters off Malaysia. For sharks, the landings have ranged from around 53% to 78%, for West and East coasts of Peninsular Malaysia and Sarawak but for Sabah, trawlers landed only 28% of the catch. The rest of the landings have been from small-scale fisheries.

Species

The most common shark species caught in Malaysia are listed in Table 2.4.1 (C. Phail, pers. comm. 1992 as reported in Bonfil, 1994).

Table 2.4.1

Shark and ray species landed in Malaysia

Scientific name	Common name
Rhyncobatis djiddensis	White-spotted guitarfish
Gymnura spp.	Butterfly ray
Scolidon sorrakowa	Milk shark
Chiloscyllium indicum	Bamboo shark
Sphyrna spp.	Hammerhead shark
Dasyatis spp.	Stingray

The import and export of sharks and shark products

The Malaysian statistics do not differentiate between the different species of sharks caught and processed. Therefore, data are only available under the general heading of 'dogfish and other sharks', while fins are the only product which statistics are gathered for.

Malaysia imports a small amount, from 16.1t to 26.6t, of frozen shark meat from a few countries (Table 2.5.1). In 1989, the importing countries were Australia and New Zealand, with the addition of Norway in 1990. Since then there has been no record of imports of frozen shark meat from those three countries. From 1991 to 1993, the bulk of the imports have been from Taiwan, with USA contributing 0.68t in 1992 only. Pricing was inconsistent, ranging from RM0.99/kg (US$0.36/kg) in 1991 to RM3.99/kg (US$1.55/kg) in 1993, to a high of RM15.77/kg (US$5.82/kg) in 1989. The reason for the variation in price is not known.

Export of frozen shark meat is not regular and possibly depends on demand by importers. United Kingdom was the main importer of shark meat in 1991 and 1992, receiving 33.5t and 44.5t, respectively. In 1993, Taiwan imported 8.1t and Singapore took in only 20kg valued at RM40 (US$15.60). Prior to 1991, there was no export data for shark meat.

Sharks' fins are compiled under separate categories depending on the preparation processes: raw; dried whether or not salted but not smoked; and salted but not dried or smoked and in brine. Some of the figures, especially for 1990, cannot be obtained but there are figures from 1989 to 1993. Table 2.5.2 records sharks' fins in the dried form, whether or not salted but not smoked. The imports vary from 78.96t in 1989 to a high of 209.49t in 1992. Indonesia and Singapore have been the main countries exporting the dried form of sharks' fins into Malaysia, with a combined total of 76.85t in 1989, 103.33t in 1991, 198.28t in 1992, and 331.68t in 1993. This shows a steady rise in the export of sharks' fins to Malaysia, which received insignificant amounts (much less than 1t usually) from other countries in the same period.

During the same period, the total exports of dried fins but salted and the raw forms have been small, ranging from 1.2t in 1989 to 42.3t in 1990 (Table 2.5.2). No significant trends can be seen in annual exports of shark products to individual countries, ranging from 0.01t to 40.05t.

Other information

In Sabah, the price of a whole shark, in general, was sold for about RM1 - RM2/kg (US$0.40 - US$0.80/kg)(Sabah Fisheries Department, *in litt.*, March 1996). The processing of sharks' fins is usually carried out as a cottage industry by fishermen or middlemen. Fresh fins weighing 600gm are only 300gm after processing and sold for RM70 (US$47/kg)(Sim, K.M., pers. comm., February 1996).

Observational recordings by Cook and Compagno in Malaysia in January 1996, showed that, in Sabah, fins were extracted from very small sharks, including those of less than 1m. Extractions of this size were also observed in Indonesia by TRAFFIC Southeast Asia consultant in March 1996. However, it is not known if this was a result of a decrease in the size of sharks caught, or due to the type of fishing gears used. Personal communications from a few sources also indicate that fins were usually removed by fishermen at sea, although a number of carcasses were also brought into port.

Legislation

Sharks and rays are not protected by legislation in Malaysia, both as a species or for fisheries management purposes. Fishing gears are licensed by the Fisheries Department and permits are required for importing and exporting activities. These two licensing requirements represent the only form of control.

Thailand

Introduction

Thailand has been harvesting sharks since the 1960's, with catches varying from 9t to 12t and an average of 11.8t since the late 1980s (Table 3.1.1). However, shark landings have not been restricted to its coastal waters as the fishery was also caught in waters of other nations, including Indonesia, Vietnam and Malaysia (Kamjanakesorn, pers. comm., April 1996). This extended harvest arose from the over-exploitation by trawlers in the Gulf of Thailand (Menasveta *et al.*, 1973, Pope, 1979, as reported in Bonfil, 1994). An apparent recovery of the stock was reported by Bonfil (1994), but additional information is needed to support this statement. In 1987, 4 600t of sharks were landed compared to 2 500t in 1993; however, the value of the catch doubled and reached 52.5 million baht (US$2.06 million) in 1993 (see Table 3.1.1 and Figure 3.1.1)

Fishing ground

Bonfil (1994) reported that the important fishing grounds for the shark and rays fisheries is the Gulf of Thailand. From 1976-1989 catches from the Gulf averaged at 2 955t/yr for sharks and 4 885t/yr of rays, while harvests from the Andaman Sea contributed only 1 042t/yr of sharks and 1 079t/yr of rays. Emphasising the amount of elasmobranch fisheries caught out of Thai waters, the aforementioned production figures represent only 38% and 62%, respectively, of total landings for sharks and rays. Table 3.21 and Figure 3.21 show the quantity of catches of sharks and rays from the Gulf of Thailand and the Andaman Sea for the period 1983 to 1992. Some of the more important fishing ports are located around Songkhla Lake and its coastal area: Chumporn Province, Aung Thong National Park (Sorat Dane Province), Brachuap-kimikorn. Sirimontaporn (National Institute of Coastal Aquaculture, *in litt.*, December 1995) estimated that 1 000 vessels were involved in shark
fisheries around Songkhla Lake and its coastal environs. In comparison there are an estimated 5 000 vessels (above 21m in total length) fishing in the Gulf of Thailand (Preyanat, *in litt.*, December 1995).

Most of the fishermen within Thai waters do not target sharks directly. A large number of shark landings result from bycatch, though the total amount is relatively small. Sharks and rays caught in Indonesian waters, around northern Sumatra, South China Sea and Arafura Sea off Irian Jaya, are usually bought by traders. It was reported that approximately 100 Thai trawlers fish in northern Sumatra; 200 trawlers, 100 purse seine and 50 longliner boats fish in the South China Sea and about 150 Thai trawlers, with Indonesian flags, fish in the Arafura Sea. These fishing boats usually land at the ports located in Samut-sakorn Province, Samut-prakarn Province and Songkla Province. In Samut-sakon Province, most fishing boats have a larger quantity of rays than sharks, which range in size from 30-150 cm. At the Samut-prakarn Province, boats also haul in more rays than sharks and the size of the catch is also relatively small. In addition, Thai fishing boats also patrol the waters off Myanmar and Bangladesh, and to some extent Indonesia, and land their catch in Ranong Province, Phuket Province, Pang-gna Province and Satun Province. Conversely, not many foreign vessels were reported to be operating in Thai waters (Karnjanakesorn, *in litt.*, April 1996).

Fishing gear

Thai elasmobranch fisheries are mainly from large-scale activity. In 1988, most of the catch on both coasts were taken by trawlers. Out of a total of 11 438t of elasmobranch, otter trawls caught 63% and 82%, respectively, of shark and ray catches from the Gulf of Thailand, and 92% and 64%, respectively, from the Andaman Sea coast (Table 3.3.1). Additionally, pair trawlers in the Gulf of Thailand took another 10% of both fish catches. In 1989, otter trawl was responsible for 75% of the total sharks landed in the Gulf of Thailand (Table 3.3.2). In 1991, the percentage of total sharks caught by otter trawl in the Andaman was 88%.

In the Gulf of Thailand, large gill nets contributed to 22% of shark catches but only 1% of the rays. Purse seiners took only a small portion of both fishes. In the Andaman Sea, local gill nets accounted for 29% of the rays harvested. Minor amounts (less than 1% to 7% of local catches) of both fishes are taken by small-scale hook and line and longline fisheries in both coasts.

Table 3.3.1

Catches of sharks and rays according to fishing gear and zones in Thailand in 1988 in metric tonnes

Type of fishing gear	Gulf of Thailand		Indian Ocean	
	Sharks	Rays	Sharks	Rays
Large scale				
Purse seine	1	0	-	-
Trawl	12	10	-	0
Otter Trawl	63	82	92	64
Gill net	22	1	4	-
Small scale				
Gill/drift net	1	3	-	29
Hook/long line	0	4	4	7
Total Catch (mt)	**3436**	**5963**	**408**	**1631**

Source: SEAFDEC, 1988.

Table 3.3.2

Shark catches in Gulf of Thailand by gear type (1989)

Fishing methods	Shark (metric tonnes)
Otter board trawl	1188
Pair trawl	158
Purse seine	7
Anchovy purse seine	1
King mackerel gill net	209
Other gill net	2
Long line	13
Total	**1578**

Table 3.3.3

Shark catches in Andaman Sea by gear type (1991)

Fishing methods	Shark (metric tonnes)
Otter board trawl	555
Pair trawl	16
Other gill net	7
Hook	54
Total	**632**

Source: Thailand marine fisheries statistics, 1992.

Species

Rays comprise a larger proportion of chondrychthian catches than sharks in Thailand. For the period of 1976-1991, rays accounted for 64% of the elasmobranch production, whereas sharks were only 36%. The Thai Department of Fisheries estimates that 95% of the shark catch was composed of individuals smaller than 1.5m TL, mainly *Carcharhinus* spp., while the main batoid species were *Dasyatis* spp. and various eagle rays (Bonfil, 1994). Table 3.4.1 records the shark and ray species commonly traded in Thai markets (Kamjanakesorn, *in litt.*, 1996).

Table 3.4.1

Sharks and rays traded in Thailand markets

Scientific name	Common name
Chiloscyllium griseum	Bamboo shark
Chiloscyllium indicum	Bamboo shark
Chiloscyllium punctatum	Bamboo shark
Stegostoma fasciatum	Zebra shark
Nebrius ferrugineus	Nurse shark
Carcharhinus amblyrhynchoides	Requiem shark
Carcharhinus amblyrhynchos	Requiem shark
Carcharhinus amboinensis	Requiem shark
Carcharhinus brevipinna	Requiem shark
Carcharhinus dussumieri	Requiem shark
Carcharhinus leucas	Requiem shark
Carcharhinus limbatus	Requiem shark
Carcharhinus melanopterus	Requiem shark
Carcharhinus sorrah	Requiem shark
Rhizoprinodon acutus	
Rhizoprinodon oligolinx	
Scoliodon laticaudus	
Sphyrna lewini	
Sphyrna mokarran	
Dasyatis spp.	

Source: Kamjanakesorn, 1996.

Sirimontaporn (*in litt.*, December 1995) considers *C. griseum* and *C. punctatum* to be common, whereas *Cacharhinus amblyrhynchos* is rarely caught by fishermen.

The import and export of sharks and shark products

The statistical data collected is from 1983 until 1992. During this period, the import of shark products has been in general decline, from 147t in 1983 to a low of only 20t in 1991, despite a brief rally from 1986 to 1988 which peaked at 124mt. The value of imported products varied, though in the 1990s the average price was US$12.13/kg. The export of shark products from Thailand has been more stable with 51t in 1988 and 18t in 1992; and an export price ranging between US$18.50-US$49.16/kg. The latter was paid in 1990, while the former was priced in 1984. In general, the price of exports has been well above US$25/kg (Table 3.5.1 and Figure 3.5.1).

In Thailand, official statistics for sharks are categorised into 'dogfish and other sharks, excluding liver, in roes and/or frozen' and 'sharks' fins, salted and whether or not salted'. Data was collected from the Annual Fisheries Statistics of Thailand for 1990 to 1994.

The import and export of dogfish and other sharks from 1990-1994 are shown in Tables 3.5.2a and 3.5.2b and Figure 3.5.2. The total export of shark products ranged from 50kg to 102 000kg. It is not known why this large increase occurred over the period statistical data was gathered. Canada has consistently been the biggest exporter of the product into the country during this period, and in 1994 contributed 58.1% of the total import of dogfish and other sharks, followed by Denmark (17.8%) and Germany (15.8%). Between 1990-1992, the Netherlands, Norway and United Kingdom also exported shark products to Thailand, though exports from these countries stopped in 1993 and 1994. The export of dogfish and other sharks from Thailand to other nations is not consistent, with only six receiving

countries from 1990-1994. In 1994, the two countries that imported dogfish and other sharks from Thailand were PR China (82.4%) and Singapore (17.6%), totalling 1 334t (Table 3.5.2b).

Tables 3.5.3a and 3.5.3b and Figure 3.5.3 highlights the import-export trade of shark fins in Thailand from 1990-1994, comparing the quantity and value of each. The export of 'shark fins, dried, whether or not salted' during 1990-1994 was mainly to three countries, Hong Kong, Japan, and Singapore. All other countries listed only imported a significantly lesser amount and not consistently.

The only Customs data that was obtained for 1994 recorded that Thailand imported sharks' fins of the Rat shark and other frozen sharks totalling 614 221kg at a value of 19 206 010baht (US$768 240), and dry sharks' fins totalling 127 442kg valued at 40 338 131baht (US$1 613 525).

Utilisation of sharks

There are no shark processing plants in Thailand. As shark fisheries usually result from bycatch, most fisheries processing plants in Thailand do not engage in shark processing due to the irregular supply. Therefore, all shark processing is carried out as a cottage industry, mostly by the families of the fishermen located in the provinces where the fishing fleets reside.

The shark's meat is preserved as salted meat and as sweetened meat. Part of the meat is prepared in the form of fillets (fresh or frozen). Shark's fin of large sharks are sold in dried or salted form to make the delicacy shark's fin soup. The skins of rays are sold to tanneries and ray fins are preserved as salted meat. A small number of shark's jaws and teeth are sold as souvenirs to the tourist trade. Jaw bones sell for 50baht (US$2) each and are sold mainly to local tourists. Cartilage, and other discarded parts, together with small sharks and rays are sold to fish mill factories for only 0.80baht/kg.

Shark livers are sometimes mixed with other food and used by shrimp farmers in aquaculture schemes. Vidthayanon (*in litt.*, December 1995) noted Stuffed Shark for sale on the western coast of Thailand. A local species with a very strong smell, the Welbeehm's sharpnosed shark *Scoliodon walbeehmi,* is cooked in strong spices and eaten in restaurants, though only the young ones.

Other information

Thai fishermen in the Gulf of Thailand normally go out to sea for 10 days at a time. Both fishermen and Thai Fisheries officials felt that the general size of individual catches has been decreasing over a number of years. Preyanat (*in litt.*, December 1995) estimates the size to have decreased by 30-40cm, although the time period for this reduction was not stated.

In a survey of shark fisheries conducted by TRAFFIC Southeast Asia in Thailand, only one trader was found to engage in buying sharks from the fishermen in Samut-sakorn Province. According to the trader, the size of sharks were small, between 30cm and 150cm, and the quantity of rays landed outweighed that for sharks. The daily landings of sharks and rays in the province was estimated at 400-500kg. In Samut-prakarn Province there were only a few traders dealing with sharks, of whom recounted the smaller sizes and quantities of sharks caught and a greater proportion of rays landed.

In Pattani Province where most of the fishing fleet plying in Indonesian waters resided, TRAFFIC Southeast Asia's collaborator interviewed one of the four small scale shark processing households found in the province. The trader obtained the following species from fishermen: Black fin sharks, White shark, Tiger shark, Squat-headed Hammer Head shark *Sphyrna tudes* and White-spotted Shovelnose Ray *Rhynchobatus djiddensis*. Sharks with fins were bought at 20baht/kg (US$0.80/kg), while those without fins were only 6-7baht/kg (US$0.24-US$0.28/kg). It was reported that sharks were caught using hook and line, trawl net and mackerel gill nets. Although infrequent, skins were sold to the tannery at 4baht/kg (US$0.16/kg), but the total volume is very low and little information can be

found. Meat was sold to a fish mill for 0.80baht/kg (US3 cents/kg), but the overall supply from fishermen was limited because of the practise of throwing carcasses back into the water. Meat, which has been salted for 2 days and dried for 2 more days, was sold at the market for 20-40baht/kg (US$0.80-US$1.60/kg).

Fin prices depended on the size, with large fins priced at 220baht/kg (US$8.80/kg) and small fins at 110baht/kg (US$4.40/kg). Fishermen were able to obtain four fins from most sharks, except for the Shovelnose ray, providing only three. The most expensive fins were those from the Shovelnose ray, whose meat was priced at 50baht/kg (US$2/kg), but whose fins fetched between 1 000-2 000baht/kg (US$40-US$80/kg). However, the meat was usually sold to the fish mill factory. For example, a 120kg shark can produce about 30kg of salted dry meat and dried fins weighing around 1-2kg after processing.

The Pattani Province trader estimated that he buys approximately 700-800kg of sharks each month from fishermen landing catch in Indonesian waters. In comparison, it was reported that only two to three sharks are landed in Thai waters each month.

Another trader in Pattani whom also obtains the species listed above, excluding the White shark and including the Frog shark, bought his supply from fishermen trawling in Malaysia, Vietnam and Indonesia, however, the catches from Malaysia and Vietnam were occasional. The prices for the different sharks were: Frog shark - 7baht/kg (US$0.28/kg), Hammer Head shark - 12-15baht/kg (US$0.48-US$0.60/kg), Tiger shark - 5baht/kg (US$0.20/kg) and Shovelnose ray - 30baht/kg (US$1.20/kg) with fins, and 8baht/kg (US$0.32/kg) without fins.

Jaws of the Black fin shark, if of sufficient size, sold for about 100baht (US$4) each. Salted shark meat sold for 40baht/kg (US$1.60/kg). Sweetened shark meat was also sold for 80-90baht/kg (US$3.20-S$3.60/kg), but due to a long processing time and sugar requirements this is prepared infrequently. The second trader did not process sharks' fins and only sold fresh fins for 25baht/kg (US$1/kg), and estimated that he bought 3 000kg of shark per month.

Legislation

There is no legislation for the protection of sharks in Thailand. However, fishing vessels have to be registered with the Fisheries Department and trade tariffs are imposed on shark imports and exports. There is no restriction on sizes caught.

Philippines

Introduction

Shark fisheries exist throughout the entire country, the dogfish being the most well known. The commercial exploitation of the spiny dogfish was started in 1967 because of the demand for squalene oil, therefore, this particular shark industry has been the most studied by academicians (Encina, 1975). Before the late 1970s, however, the elasmobranch catches were of minor importance, usually below 10 000t, with greater quantities landed from the mid-1980s until 1991, when landings were consistently above 16 000t/yr (Table 4.1.1). In 1994, the shark catches were only contributing 0.037% or 329t of commercial fisheries and 0.489% or 3 849t of municipal fisheries of the country (BFAR, 1995). The Philippines catch accounted for 2.63% of the world elasmobranch harvest. Taiwan is also known to have engaged in shark fisheries in the Philippines (Eleserio, pers. comm. as reported in Samariego, *in litt.*, December 1995).

Figure 4.1.1 shows the shark fisheries catch from 1968 to 1992 and seems to indicate three distinct periods of shark catch. From 1968-1972, the catch averaged 460mt/yr, which increased dramatically

to an average of 9 800mt/yr during 1973-1985, and then nearly doubled to an average of 18 100mt/yr from 1986-1991. The 1992 catch showed a steep decline back to levels harvested during the second period.

SEAFDEC data, as reported in Bonfil (1994), stated that ray catches were more abundant than catches for sharks, representing an average yield of 53% of elasmobranch during 1977-1991. The data collected from the Bureau of Agriculture Statistics (BAS) between 1976 to 1994, showed that rays were caught in greater quantities than sharks (Table 4.1.2).

In the Philippines, the fisheries are divided into municipal, or in-shore artisanal fishery, and commercial or deep-sea fishery. Substantially more sharks and rays were landed from the municipal shark fishery than from the commercial sector. Over the entire 19 year period, the total number of sharks from municipal landings was 105 650t, compared to just 7 910t from commercial landings. For the harvest of skates and rays during the same time frame, the amount was 121 439t for municipal and 7 886t for commercial.

A map of the Philippines with the main fishing areas is included in Appendix 3 (Map 2).

Fishing gear

Table 4.2.1 shows the bycatch landings resulting from different types of fishing gear in 1988 (SEAFDEC as reported in Bonfil, 1994). At that time, small scale fisheries provided the majority of elasmobranch catches in the Philippines. In Luzon, large scale trawlers accounted for 30% of the shark catch and only 6% of the rays. In Visayas, large scale purse seiners accounted for 11% of sharks caught and 8% of the rays. The harvest of sharks and rays from small-scale fisheries in Luzon, Visayas and Mindanao were mainly by hook and long lines (7%-76%) and gill nets (8%-81%). The hook and long line method was more effective in catching sharks from Visayas and Mindanao. On the other hand, the catch from gill nets were normally smaller than that for hook and long lines, except for rays caught in Visayas. Small scale gear, classified as 'other', was attributable for the second largest catch in both groups (28% rays and 10% sharks) in Mindanao (Bonfil, 1994).

Table 4.2.2 and Figure 4.2.2 lists the types of fishing gear used and production of commercial fishery in the Philippines for 1990 and 1994. In comparison to Bonfil (1994), where small scale fisheries provided the majority of elasmobranch catches, large scale fisheries, in these two years, indicated a greater catch of sharks and rays. Harvested mainly from purse seine and trawl vessels, together they accounted for 67% and 91%, respectively, of the elasmobranch caught in 1994 and 1990.

Observation by Trono (*in litt.*) in April 1996 found that fishermen in the Zamboanga region used long lines, bottom set lines and drift nets to catch sharks.

Fishing ground

SEAFDEC figures as reported in Bonfil (1994) for 1976-1990, showed that Mindanao was the area of largest harvest for both sharks and rays, averaging 3 185t/yr and 2 724t/yr, and 24% and 21% of the total elasmobranch catches, respectively. Luzon followed with 1 993t/yr (15%) of sharks and 2 312t/yr of batoids (18%). Catch production of sharks and rays in Visayas was the lowest with an average of 1 108t/yr (8%) and 1 856t/yr (14%) respectively. Bonfil stated that there was a general decline in shark catches from these areas and an increase in batoid yields. Bureau of Agricultural Statistics from 1994, shown in Table 4.3.1 and Figure 4.3.1, distinguish changes in landing production and locations. For sharks, the Luzon area accounted for only three tonnes from the Sibuyan Sea and Manila Bay; whereas, in the Visayan region 53t were harvested from the Guimaras Straits, Samar Sea and Visayan Sea, however, Mindanao had the largest catch with 272t. For batoids, landings in 1994 showed that the Visayan region had become the dominant catch site with 514t.

Whale sharks are highly exploited in the southern islands of Pamilacan, Bohol and Camiguin at the Bohol Sea (WWF Philippines Programme, 1996). Hunting season is from November to May and March and April are considered as peak months. The season also coincide with the appearance of manta rays and whales. Hunting is carried out using traditional methods of metal spears or hooks. The catch is then towed to the village to the shallowest points and left aground. The fins are the most expensive parts of the shark, and the meat and skin are also taken, although the taking of parts other than fins is reported to be a recent action. The innards, that is the stomach, intestines and heart are cooked as viand, a local favourite dish. According to sources from Talisayan, whale shark liver oil can also be effectively used as pesticides in rice fields and coffee plantations. The head has some value for its meat and skin but the rest of the animal is disposed in the sea.

The whale shark fins are sold fresh or dried. A fisher can obtain a set of 8 fins, that is the caudal, dorsal, pectoral and anal, from a single animal. At Misamis Oriental, a set of fresh fins is sold for US$116.36 to US$174.55 at the landing site. In Bohol, the price is US$296.74 for a fifteen-footer (5m), which is considered the smallest, and the fins of a fourty-footer (14m) can fetch US$523.66. Fresh meat prices varies from US$0.08/kg during peak season to US$0.20/kg during the lean months. Dried meat fetches higher prices at between US$1.55/kg to US$2.71/kg. A single shark is reported to yield up to 300kg of dried meat which translates to US$465 to US$813 per animal. Local buyers bid for the sharks at the landing sites, and the parts are processed by drying before being shipped to other city markets in the Philippines.

The report also noted that the number of fishers involved in whale shark fishery is increasing whereas it is reported by the fishers that the catch has been steadily decreasing. A group in Talisayan fishers reported a decline from 100 sharks in 1994, to 80 in 1995 and down to 30 in 1996.

According to Samaniego and the WWF Philippines report, manta rays were also landed in Pamilacan Island and Bohol, and devil rays were landed in Camiguin. In Pamilacan, the number of manta rays landed is thought to be high. Estimates from interviewing fishers, suggest a figure of around 1 000 rays landed from December 1995 to May 1996 alone from at least 60 fishing boats at Pamilacan Island. The main gear used is the drift gill net and are set along the migratory route of the manta. The size of the rays caught ranges from 1.5m to 6m wing spans. Other species are also landed at the same time including sailfish, sharks and sometimes even whales. Samaniego reports that the meat of the rays are sold at 300PhP/kg (US$10.50), the skins at 30PhP/kg (US$1.05) and a whole carcass, depending on the size, may reach 8 000PhP (US$280). The WWF report mentions that the prices of a 4m wing span ray sells for around US$155 and the largest with a wing span of 6m is about US$310 at the landing site. The meat is dried and sold for between US$7 - US$10 per kilogramme. The liver, which is sold salted at one part salt to six part liver, fetches US$7.75 per 5 gallon container. The gill rakers are sold dried for US$7.75/kg.

The ports involved in shark fisheries in Philippines included Pamilacan, Bohol, Turtle Islands, Lubang, Mindoro, Calauit Island, Palawan, San Fernando and Pampanga (PCP, 1995). TRAFFIC Southeast Asia survey of the shark fisheries around Zamboanga found that the main fishing grounds were in Batorampon Point, near Baranguay Labuan (west coast), and the Sta. Cruz Island, near Basilan at Sambay Island (roughly 3 hours by boat from Zamboanga), Pilas Island, Jolo, Tawi-Tawi, Cotabato and Siasi.

The Philippines Development Authority at Navotas Port provided details of shark unloadings for 'wholesale' and 'retail and overland' amounts (Tables 4.3.2 and 4.3.3). Landings fluctuated throughout the year due to weather conditions, with the peak season from March to September during the Southeast monsoon, and the lean period from October to February during the Northeast monsoon. Only a few years, 1991, 1992 and 1995, follow the monsoon trend in total unloadings for the wholesale market, and the reason for this inconsistency is not known Regarding the retail market figures, there

was no discernible pattern, although 1992 production fluctuated between 90t in May and only 7t in March.

Species

Table 4.4.1 shows a partial listing of sharks landed in the Philippines. Warfel and Clague (1950) reported that tiger sharks were the major catch from longlines from exploratory fishing.

Table 4.4.1

Shark and ray species landed in the Philippines

Scientific name	Common name
Aetoplatea zonura	
Alopias vulpinus	Thresher Shark
Atelomycterus marmoratus	Coral catshark
Carcharhinus amblyrhynchos	Gray Reef Shark
Carcharhinus melanopterus	Blackfin Reef Shark
Carcharhinus limbatus	Blacktip shark
Centrophorus spp	
Centroscyllium cf. *kamoharai*	Jelly sharks
Dasyatis kuhlii	Bluespotted maskray
Galeocerdo cuvier	Tiger Shark
Hemitriakis leucoperiptera	
Hexanchus griseus	
Hexatrygon sp.	
Himantura uarnak	Honeycomb
Himantura undulata	Leopard whipray
Isurus oxyrinchus	Mako Shark
Mustelus cf. griseus	
Nebrius ferrugineus	Nurse shark
Pristis cuspidatus	
Rhincodon typus	Whaleshark
Rhinobatidae	Guitarfish
Scyliorhinus tprazame	
Sphyrna sp.	Hammerhead shark
Sphyrna mokarran	Great Hammerhead
Sphyrna zygaena	
Squalus acanthias	Spiny dogfish shark
Squalus cf. rancureli	
Taeniura lymma	
Triaenodon obesus	Reef Whitetip Shark

Sources:

1. *Compagno, L.J.V. (unpub. 1995) The Chondrichthyes of Philippines*
2. *Pawikan Conservation Project (1995) Unpublished Report*
3. Trono, *in litt.* April 1996

Spiny dogfish (Based on Encina, V.B., 1982): Since 1967, the Spiny dogfish has been exploited in the Philippines due to the overseas demand for squalene oil, primaryly by the Shisedo cosmetics company in Japan up to until 1982. Extracted from the liver, aqualene oil is roughly 80-85% of its weight and the liver accounts for 20-25% of the total body weight of the fish. The meat is white, odourless and

edible and is used in fish meal and fertilisers. Skins are also tanned and used to manufacture leatherwear.

Spiny dogfish is strictly a bottom dwelling species found in trenches at a depth of between 200 to 1 000m. Dogfish are caught using set bottom longline gear, which are 500m long and have 300-350 hooks. The gear are placed in fishing grounds at night and hauled up the following morning.

The import and export of sharks and shark products

The data collected for 'dried sharks' fins, whether or not salted' is from 1990 to 1994 (Table 4.5.1). The largest and most consistent importer of sharks' fins from the Philippines is Hong Kong, with Singapore a distant second. Due to a lack of import data for commodities of the Philippines, the overall trend in the trade remains unclear.

The National Statistics Office provided data for 'shark liver oil and franctions not chemically modified' from 1990 to 1994 (Table 4.5.2) and the Fisheries Statistics provided export figures for squalene oil between 1973 to 1981 (Table 4.5.3). The primary importer for the former was Japan, although imports decreased sharply from 133 933kg in 1991 to 26 875kg in 1994. Whether or not the decrease was due to the availability of supply is not known. Korea also imported 60 077kg from 1990-1994. From 1979-1981, the average amount of squalene oil exported was 262 670kg/yr.

Other information

Very little research has been carried out on sharks in the Philippines. The Zamboanga State College of Marine Science and Technology began monitoring the abundance of sharks in local waters, including size and weight and biology. However, the study was just initiated and will take time to yield useful data. An example of their initial data for some species is given in Table 4.61.

TRAFFIC Southeast Asia obtained some pricing information for shark products (Table 4.6.2). Predictably, the largest fins garnered the highest prices. For example, a white fin from the guitar fish sold for 3100PhP/kg (US110/kg). Although five sharks' fins traders were located, only one interview was conducted. One company, established in 1989, purchased 200-300kg of assorted sharks' fins per month, of which most sizes were less than 12 inches. The same company bought only pure shark liver oil, which is based on quality, the density of which is 60kg/m^3.

Three food processing plants were also approached for information. One company bought shark carcasses, without the head, fins and entrails, at a price of 45PhP/kg (US$1.60/kg). The meat was used to prepare fishballs and tempura, then transported to Manila and presumably sold there. During the peak shark landing season from March to September, this corporation bought up to 10t of sharks per day, but in the off season from November to February, the supply was less than 200kg/day. On average they estimated their monthly intake at between 55-60t.

Another company exported fishballs to the USA for US$3/kg. They purchased sharks, without the head, fins and entrails, for between 16-45PhP/kg (US$0.56-US$1.60/kg). Their demand amounted to only 20t per month. However, starting from 1996, they stopped using sharks because of unstable prices and stiff competition for limited supplies in the market at Zamboanga. No information was obtained from the third processing company.

Table 4.6.3 lists those shark species observed during a brief survey of the market in Zamboanga over a four day period from 31 March to 3 April 1996. Most sharks landed were less than 1.5m in total length, and harvested in very small numbers. The exception being the nurse shark, which was landed everyday of the survey with a total of 28 . Only the Thresher and Great Hammerhead sharks were of

greater size, 4.5m, with 1 and 2 catches respectively. The shark season begins in March and regular visits to the ports are required to analyse trends, fishing gear used and fishing vessel information.

According to a shark liver oil producer from Cagayan de Oro City, Mindanao, various diseases such as cancer, leukaemia, tuberculosis, diabetes, asthma, bronchitis, pneumonia, influenza, gastric ulcer, neuritis, tumours can be prevented by ingesting squalene, though the dosage and regularity was not mentioned. This supplier, in business for 2 years, bought crude liver oil from fishermen from the waters of Misamis Oriental, Mindanao and Letye Island. The sharks, mainly the spiny dogfish, were caught using hook and line gear and averaged 14-16in in length, although they can grow to 2.5 feet. Even with fins less than 1.5in, buyers were reported to be interested and offering 500PhP/kg (US$17.50/kg) dry weight. Using a simple method to extract the crude oil, the liver is chopped up and boiled with a little water. As the oil rises to the surface, it is skimmed off and allowed to cool off to remove the residue.

Each boat trip yielded roughly 15 litres of crude oil from a total of 60-80 sharks. The crude oil was bought from the fishermen at 400-500PhP/l (US$14-US$17.50/l) and shipped monthly to Manila buyers in two drums (each drum holds 200 litres) and sold at 160 000PhP (US$5 600) per drum. It was estimated that 800-1 000 sharks are required to produce one drum. Refined oil was packed in 25 litres containers. A drum of refined squalene oil (about 8 containers) sold for 220 000PhP (US$7 700) because of its quality and hygienic packaging. In the Cagayan area, the producer reported that there are were only two suppliers of squalene oil, but with such a high margin of profit competition may increase.

Singapore

Introduction

Singapore is the most important trading nation in Southeast Asia. With only 190 open boats (Table 5.1.1), Singapore's fishing fleet is not large, nevertheless, it imports, processes and exports a wide range of fish products including sharks' fins. The data presented do not include marine products landed by Singapore and Peninsular Malaysian registered vessels direct from the sea or imports to and exports from Indonesia. The survey was not able to obtain information on Indonesia, which was considered as classified and not released to the general public by the Government of Singapore. The main fish landing port is at Jurong Fish Market.

Table 5.11

Composition of Singapore Fishing Fleet (1992)

Type of vessel	Number	GRT
Trawlers	85	3107
Gill netters	9	77
Trap setters	2	75
Long liners	6	1058
Other liner	1	32
Fishing carriers	7	46
Other non fishing vessels	4	27
Total decked boats	**114**	**4422**
Open boats (179 powered, 11 not powered)	190	

Source: Bulletin of fishery fleet statistics, FAO 1992.

Shark landings

Nominal catch statistics were obtained from FAO for Singapore from 1983-1992 (Table 5.2.1, Figure 5.2.1). A small quantity of sharks and rays were landed each year, ranging from a high of 1436t in 1984 to a low of 650t in 1992. The amount for rays fluctuated yearly with an average catch of 608mt/yr.

The import and export of sharks and shark products

Singapore has a number of traders dealing with the import, export and wholesale markets in sharks' fins, although not all are specialised in one commodity. The Yellow Pages showed 31 companies dealing wholly in, or in combination with other food commodities, sharks' fins. TRAFFIC Southeast Asia's collaborator conducted a survey of the companies in March 1996 and found that most have a retail outlet supplying pre-packed shark products and a wholesale arm supplying hotels and restaurants. At a rough estimate, the retail arm of the business only accounted for about 5% of the turnover. No information was obtained on the wholesale trade in fresh meat. The Sunday Times (19 May 1996) article quoted a major importer of shark's fin into the country, that the estimated quantity of fins consumed by Singaporeans annually is about 500 000kg, up from 400 000kg five years ago.

According to the head of purchasing for food and beverage at a major luxury hotel in Singapore, sharks' fins were purchased in the dry form from wholesalers. For example, this particular hotel bought an average of 50kg of dried fins per month, rising to 100kg when the hotel booked more wedding banquets. Anecdotal evidence suggested that the highest demand comes from Chinese restaurants and Chinese banquets in hotels. Customarily, the shark is considered a powerful animal and its consumption will engender strength and vitality. Sharks' fins are believed to be primarily consumed in restaurants because of the lengthy preparation time deterring individuals and families. Therefore, there is little evidence in the wet markets and supermarkets of the sale of sharks' fins and shark products.

Canned sharks' fins was found to be sold in the markets. Labels reported that the product is made in Singapore at a retail price for a 15.9oz can of S$11.50 (US$8.28). Health food shops also stocked some shark products, the most frequent being a squalene product. Shark cartilage, manufactured in the USA, sold in small packets for S$22.40 (US$16.13). For both squalene and cartilage, imports came from Japan, New Zealand and the USA. In an attempt to satisfy the modern consumer, instant sharks' fins soup, for microwave convenience, was found on offer from one local Chinese medicinal hall.

Data from 1988-1994 was obtained for the import and export of 'sharks' fins, whether dried or salted' and 'prepared' (Table 5.3.1 and Figure 5.3.1). In general, twice the amount of 'prepared' fins were exported in comparison to imports, with quantities averaging 70.6mt/yr. The annual average for 'dried or salted' shark fins imported into the country was 1 214mt, whereas exports averaged 989mt. In 1994, Singapore imported 1 230mt valued at S$50 million (US$32million), which makes it the third largest importer of sharks fins. The majority of imports were re-exported to Hong Kong (ITC, 1995).

Tables 5.3.2 to 5.3.5 provide a list of countries importing and exporting 'sharks' fins, either as dried or salted' or 'prepared' to and from Singapore from 1990-1995. Dried or salted fins were mainly imported from a few major countries with a larger number of secondary source countries. The primary exporters into Singapore during this period were Hong Kong, India, and Yemen, consistently averaging 100t each year. Secondary sources contributing at least 50t annually were Japan, Pakistan, Spain (slightly less than 50t), Sri Lanka, and Taiwan (recently from 1993-1995).

The import of 'prepared' sharks' fins to Singapore from 1990 to 1995 is recorded in Table 5.3.3. Spain, in 1994 and 1995, was the largest exporter of this commodity to Singapore, followed by Hong

Kong and Thailand, although the quantity from the latter decreased dramatically in recent years from a peak of 14 000t in 1991 to 178t in 1994. Other countries supplied up to 5 200t in 1995.

Export of 'dried' or 'salted' sharks' fins from Singapore is shown in Table 5.3.4. Hong Kong was the largest recipient of imports from Singapore with more than 500t annually, Malaysia was a distant second with 100t and, surprisingly, Myanmar was third, although the figures fluctuated between 40t in 1995 and a peak of 122t in 1991. Taiwan and Thailand were consistent importers with small quantities varying between 4t in 1993 to 66t in 1994 for the former and 11t in 1991 and 38t in 1994 for the latter.

Table 5.3.5 gives the export figures for 'prepared' sharks' fins from Singapore from 1990 to 1995. The main importers were USA, Taiwan, and Hong Kong, with the latter being the largest at more than 21 000t from 1991-1995. Exports to Japan decreased progressively from 19 000t in 1990 to 1500t in 1995. France and Germany also imported consistently in small quantities, with the former receiving 3 240t in 1994 and 1995.

Table 5.3.6 below gives an indication of prices of selected products in Singapore.

Table 5.3.6

Market prices for selected shark products in 1995

Product	Indicative prices*		Market	Origin
	S$	US$		
Black sharkfins				
Dorsal/pectoral				
40cm above	75.00	51.37		
30-40cm above	65.00	44.52		
20-30cm above	52.00	35.61	CIF Singapore	India
10-20cm above	40.00	27.40		
below 10cm/pc	15.00	10.27		
Blue shark, Pectoral, lower dorsal set	50.00	34.25	C&F Singapore	South America
Yellow fins, Dorsal/pectoral & tail	70.00	47.10	CIF Singapore	India
30cm above				
Yellow fins (Illuppa)	60.00	41.10	CIF	India
Dorsal/pectoral & tail			Singapore	
30cm above				
Black tails				
40cm above	225.00	154.11		
30-40cm above	190.00	130.14		
20-30cm above	150.00	102.74	CIF Singapore	India
10-20cm above	125.00	85.62		
below 10cm/pc	55.00	37.67		

* US$1 = S$1.46

Source: Infofish, FAO, as reported in ITC, 1995.

Legislation

There are no laws that afford protection to marine life in Singapore, including sharks or rays (Tay, Nature Society Singapore, pers. comm., March 1996). However, all importers and exporters are required to obtain a Trade Development Board approval for trade and must attach a declaration of the description of goods to every submission. The goods are identified using the International Standard Industrial Classification (SITC) codes. There are no import tariffs or restrictions on the import of shark fins into Singapore.

Indonesia

Introduction

Chondrychthians have undoubtedly been caught in Indonesia for thousands of years. However they have probably never represented a major part of the catch. Between 1987 and 1991, sharks and rays accounted for only 2.41% of fisheries production (Bonfil, 1994). Despite the high value of some shark products they contribute an even lower proportion to the country's fisheries products export earnings (1.3% in 1993). Nonetheless, Indonesia (Figure 6.1.1) has the largest chondrychthian fishery in the world (87 138t in 1993) with the highest sustained rate of growth (Bonfil, 1994). Catches of both sharks and rays increased significantly during the early 1980s and have continued to rise (Figure 6.1.2). Between 1992 and 1993, shark and ray landings rose by 6 999t (8.73 %), the second highest increase since 1980. No evidence of chimaerid (Sub class Holocephali) catches was found and the lack of deepwater trawl fisheries means they are unlikely. Therefore, further discussion is limited to elasmobranchs (sharks and rays).

Chondrychthian fauna

Indonesia has the richest chondrychthian fauna in the world. In most parts of the world there are less than 200 shark, ray and chaemerid species. Australia's waters are comparatively rich in having around 300 species. Only relatively small amounts of chondrychthian research have been done in Indonesian and there is little published information on it's fauna. However, Indonesia's shallow water elasmobranch fauna is at least as rich as Australia's, and although little is known about its deeper waters, the same appears true for this habitat. It is estimated that Indonesia has at least 350 chondrychthian species (P. Last, pers. comm., 1996).

The geographic and depth distributions of some Indonesian elasmobranch species are presented in Table 6.21. This list is drawn from species distributions in Last and Stevens (1995) and Compagno (1984) and is not complete. In particular there are likely to be more ray species than are listed. For instance, trawl surveys off the Indian Ocean coasts of Sumatra and Java have found members of the families Rajidae (*Irolita* spp., *Raja* spp.), Torpedinidae (*Torpedo* spp.), Narcinidae (*Narcine* spp.), Urolophidae and Gymnuridae (*Gymnura* spp., *Aetoplatea* spp.) (Gloerfelt-Tarp and Kailola, 1984). The paucity of deepwater research also means that there are likely to be more squalids (members of the family Squalidae) than are presented here. However, since most fisheries are confined to shallow waters, Table 6.2.1 includes most species that dominate the catch.

Fisheries landings data

Though Indonesia has a well designed system for the collection and publication of fisheries statistics, the reliability of data must be checked. Annual publications provide summaries of data such as catches of each species or group, gears used, sizes of boats and number of fishermen for each region or province (Figure 6.3.1). More detailed fisheries statistics such as catches in each district, the types of processing, and the gear used to catch each species or group are available in separate publications for

each province. The unification and detail in the system are far in excess of those in many industrialised nations. This reflects the importance of such data in developing countries, since it is often the only management tool available.

Unfortunately deficiencies do exist in the system: (i) The data is limited in its taxonomic detail. While separate catches are estimated for many species, data for chondrychthians is only provided at the level of 'sharks' and 'rays'. Variations in the life history traits of species mean that they can act differently to fishing pressure. Such differences are masked when collective categories such as these are used. (ii) Dudley and Harris (1987) concluded that there may be significant inaccuracies in the data. They found that incorrect sampling procedures were often used, some of which may have resulted from the lack of data for unreported catches in landing ports. They estimated that landings recorded in each district can be inaccurate by a factor of as much as 0.8 or 3.8. They added however, that when the estimates for each district are summed to provide a total for the province such inaccuracies may be cancelled out. Furthermore, as long as such errors do not vary consistently with time the data is still suitable for an analysis of trends in various fisheries. As with most fisheries statistics systems these data are *estimates* of catches and as such caution should be used in interpreting their absolute values.

The current system of fisheries statistics collection was initiated in 1976 (Dudley and Harries, 1987) and the data available to date is tabulated in Appendix 2. Explanatory notes in *Fisheries Statistics of Indonesia* define fishery production as 'the live weight equivalent of the landing, i.e. "the round, fresh", "round, whole" or "ex-water" weight equivalent of the quantities recorded at the time of landing'. This suggests that data for each province represents the amount landed there and not necessarily what was caught in adjacent waters. Statistics on the numbers of 'set gillnets' and 'set longlines' were also obtained.

Sharks

While there has been an increase in the overall shark catch, there has also been a significant shift in its geographical distribution. During the late 1970s landings of sharks were concentrated around the central and western provinces, in the Java Sea, Strait of Malacca and Indian Ocean (Figure 6.3.2). During the next five years, landings increased relatively uniformly although proportionally large increases occurred in South Sulawesi and the north and south coasts of West Java (Figures 6.3.2 and 6.3.3).

By 1990 most of the regions with historically larger landings, had experienced significant decreases at some time. These included the west coast of North Sumatra; Riau; the north and south coasts of West Java and East Java; the north coast of Central Java and South Kalimantan (Figures 6.3.2 and 6.3.3). Landings in some of these regions, particularly those which experienced declines around the mid 1980s, have had increases since. For example, the south coast of West Java, the north coast of Central Java and South Kalimantan. Landings in other regions, such as the north coast of East Java and South Kalimantan, continued on decreasing trends (Figure 6.3.3).

Landings in the other western provinces, such as West Sumatra, the west coast of Lampung, Bengkulu and the Strait of Malacca coasts of Aceh and North Sumatra, have continued to increase although as of 1993 none have reached 2000t (Figure 6.3.3). The provinces of South Sumatra, the east coast of Lampung and Central Kalimantan are all in the Java Sea. Unlike neighbouring regions along the north coast of Java landings were initially low but have a continually increasing trend (Figure 6.3.3).

Most of the western and central provinces saw the greatest expansion in catch during the early 1980s. Since then catches have generally decreased or remained relatively level. However in the eastern provinces, particularly Maluku, North Sulawesi, West Nusa Tenggara and Irian Jaya, there were large increases in the late 1980s (Figure 6.3.3). Apart from Irian Jaya, there were no consistent decrease in

landings in any of these provinces from 1985 to 1992. However, in 1993 West and East Nusa Tenggara, Maluku and North Sulawesi all had decreases in landings of between 18 and 42%.

Rays

The geographical distribution of ray catches has differed from that of sharks with only relatively few regions dominating production. In the late 1970s the Straits of Malacca supported the largest catches (Figure 6.3.4). However in the early 1980s the area's relative importance decreased due to a decline in its own production and increased catches from South Sumatra, the north coast of Java, Central Kalimantan and South Sulawesi (Figures 6.3.4 and 6.3.5). The late 1980s saw the continued expansion of fisheries in most central provinces as well as increases on the west and Strait of Malacca coasts of North Sumatra (Figures 6.3.4 and 6.3.5). However, by this time there were significant decreases in South Sulawesi and the north coast of West Java (Figure 6.3.5). The early 1990s also saw the development of fisheries in the more distant eastern provinces such as East and West Nusa Tenggara, East Kalimantan, Maluku and Irian Jaya. In particular there was a dramatic increase in landings in East Nusa Tenggara in 1993 (Figure 6.3.5).

Interpreting changes in catches

The changes in landings observed in each of the provinces could be a result of changes in fishing effort or fish population abundance. Data on sharks were not reported to the Fisheries Department at the District level all the time, and shark products were exported directly to other countries without passing through landing ports. Since recruitment in elasmobranch populations is largely unaffected by environmental fluctuations any changes in catches is most likely to be a reflection of a populations response to fishing, or changes in the fishing activity itself. For example, increases in catch may be a result of increased fishing effort, increased efficiency or the exploitation of previously unfished populations. Although not always the case, when demand for the product remains stable, a decrease in production is more likely to result from decreased population abundance than decreased effort or efficiency.

Variations in catches due to changes in effort can be removed by the use of appropriate effort indices. These are used to calculate a catch rate, or catch per unit effort. This then provides a more accurate reflection of population abundance providing an appropriate index of effort is used. Generalised measures of effort such as the number of vessels fishing can be prone to increases in efficiency which increase the effective effort of each unit. Effects such as serial depletion of stocks can also result in increasing or stable catch rates despite localised overfishing. For these reasons changes in catch rates must be interpreted with caution.

There is a close correlation between the total catches of sharks and rays and the total number of gillnets and longlines (Table 6.3.1 and Figure 6.3.6). Such a correlation does not necessarily imply that these are the only methods which catch elasmobranchs. However, it is in concordance with anecdotal evidence which suggests that these are the primary methods used to catch sharks and rays.

Although these correlations are high, there have been fluctuations in catch rates. During the latter half of the 1970s there was a decrease in the catch rates of both sharks and rays, by both methods. There was a rapid increase in 1980, but afterwards the decline resumed. In the late 1980s further increases occurred but since this time, catch rates have been decreasing for sharks and relatively stable for rays (Figure 6.3.6).

The close correspondence between the sudden increases in the catch rates of both groups by both gears during the 1980s, suggests that they are due to factors other than increases in population densities. These could include increased catches of both groups by other types of gear, and the fishing of

previously unexploited populations. This reinforces the need to study catch rates at a smaller spatial scale and with a wider range of effort indices.

Changes in the number of each of these gears does not explain all the fluctuations in catches that have occurred. At the provincial level the correlations between catches and the number of gear units are weaker (Table 6.3.1). In general there is a closer relationship between catch and the number of gillnets than the number of longlines. In a number of provinces there are no records of set longlines being used. In general there have been increases in both the catch of sharks and the number of gear units. In some provinces the ratio between units and catch has remained relatively constant (e.g. South Sumatra, Figure 6.3.7). However, elsewhere there have been disproportionately high or low increases in catch relative to the number of units of gear (e.g. North Sulawesi and Maluku, Figure 6.3.7). Decreases in catch that have been observed in some provinces can be partially explained by decreases in the number of gear units but discrepancies do also exist (e.g. South Kalimantan, Figure 6.3.7).

Similar cases are observed for ray catches. Some provinces have similar rates of increase in catch and effort (e.g. South Sumatra, Figure 6.3.8) while in others they appear unrelated (e.g. North Sumatra and North Coast, West Java, Figure 6.3.8). The rapid increase in ray catches in East Nusa Tenggara occurred while the number of gillnets was decreasing. However in 1993 there was a slight increase in the number of longlines used in the province (Figure 6.3.8).

Catch rates of sharks and rays by set longlines and set gillnets can be highly variable. In some provinces they have varied by more than an order of magnitude (e.g. Rays/Longlines, Lampung, Figure 6.3.9). Such variation is unlikely to be a result of fluctuations in population abundance alone. It is most likely to be a result of changes in catches of sharks and rays by other methods.

In general catch rates have shown more stable trends since 1989. Since that time various provinces have had increases (e.g. Sharks/Gillnets, West Kalimantan and Rays/Longlines, Lampung, Figure 6.3.9) and decreases (e.g. Sharks/Gillnets, west coast North Sumatra, NC East Java, South Sulawesi) in catch rates. While catch rates do show some evidence of reduced population abundance, the indices of effort that are currently available do not permit a simple interpretation of the observed changes in catches.

Domestic fisheries

Much of Indonesia's fisheries are artisanal, that is they are based on relatively small and technologically simple fleets. Throughout Indonesia, but particularly in the eastern provinces, the people of southern Sulawesi dominate fishing activities. These people, the Bugis, Makassarese, and Butonese, have wide ranging fleets and well organised trading structures, but are also the main users of destructive fishing methods. One Makassarese fishermen from the Spermonde Archipelago described the boundaries of his activities as Kalimantan, the Philippines, Irian Jaya and Australia. They have also moved to other areas since their local region has been overfished. For example, Osi Island off the north coast of Seram (Figure 6.1.1) is inhabited by fishermen from south Sulawesi who fish towards the east in places like Irian Jaya. Similar settlements have been established along the coast of Irian Jaya and on the islands of Nusa Tenggara.

Much of these people's fishing activity occurs during voyages of two to three months. Often a group of fishermen will share the expenses and profits from a trip. Most commonly about 6 people contribute half a million rupiahs (US$220) each. This money is used for food, fuel and other supplies. On a good trip they will return with a total of about 30 million rupiahs (US$worth of catch. They all have an equal share in the takings, although often a captain will be designated. Australian fisheries officers report that handicapped persons are sometimes taken on illegal fishing trips to Australian waters. If the boat is apprehended these people are used as scapegoats by the rest of the crew who claim them to be the captain.

There also appears to be an increase in the number of 'fishing bosses'. These people are known as *punggawas* and act as creditors to the fishermen. They will lend them fishing equipment or money for fuel, supplies and boat maintenance. In return they are able to buy the fishermen's catch at a low price. One example given was that the *punggawa* may lend a fisherman Rp500 000 (US$220). The fisherman is then obliged to sell all his fish, regardless of the value of the) pecies, to the *punggawa* at the low price of Rp1 500/kg (US$0.65). One *punggawa* in Ujung Pandang had 43 boats and a total of 200 families in his fleet. He took 66% of catch and the fishermen took the remainder. At the time, twenty of his boats were on two month trips fishing for shark fins in Maluku. He recently had two of his boats burnt after they were apprehended fishing in Australian waters.

The *punggawas* appear to have extensive control over fishing activities in eastern Indonesia. At Bulukumba in South Sulawesi the Fisheries Department's official landing place had been closed for a couple of years because all the catch was being directly collected by *pongawas*. It is not known whether these activities are illegal.

Bycatch

Fisheries statistics indicate that sharks and rays are caught throughout Indonesia. Much of this catch is a result of artisanal fishing activities, as well as commercial shrimp trawlers, in which elasmobranchs are caught on an opportunistic basis or as a bycatch while targeting other species. When using set gillnets, set longlines and handlines, sharks and rays are caught along with other species. Although they are not the target species, elasmobranchs can represent a significant proportion of the catch.

Most of these activities occur in shallow water coral reef and coastal environments. The species composition of the elasmobranch catch seen in local markets often corresponds with these habitats. The blacktip reef shark, blue-spotted maskray and blue-spotted fantail ray are common coral reef species which are widespread in Indonesia (Last and Stevens, 1994). These species dominate the elasmobranch catch in many fish markets (TRAFFIC consultant's obs., 1996)

Longlines are often used to target demersal teleosts such as snappers (Family Lethrinidae) and groupers (Family Serranidae). The baits used are also attractive to sharks. One fisherman in South Sulawesi reported using longlines 100m long with twelve size 1 or 2 hooks. He set these in waters about 30m deep and got catch rates of about 3 sharks per day. Bottom set gillnets are used in similar depths around coral reefs. They are about 100m long and 3m high with 15cm stretched mesh size. Fishermen reported up to ten small sharks per day using such gear. Rays were also reported to be a common bycatch of this method.

In addition to widespread opportunistic catch of elasmobranchs, there are several target fisheries. These can be differentiated not because they are managed as separate fisheries but because they target different species or are in distinct areas.

Rhynchobatids for fins

There are a number of locations where demersal elasmobranchs are being targeted specifically for their fins. In particular the white-spotted guitarfish (Family Rhynchobatidae) is sought after. Their fins are worth around 1.5 times more than those from other species. This species occurs in sandy shallow waters throughout Indonesia and have probably been caught in the Java Sea for some time. However in recent years they have been heavily targeted in the eastern provinces of Maluku and Irian Jaya. This could be the primary reason for the rapid increase in shark landings from these provinces during the late 1980s. (Although it is technically a ray, the white-spotted shovelnose ray is shark like in appearance and is probably included under this category).

The Aru Islands in southeast Maluku (Figure 6.1.1) are a major focus for the exploitation of Rhynchobatids for fins. Locals in the area catch small sharks in gillnets that they deploy close to shore from canoes or sailing vessels (Hitipeuw *et al.* 1994, Ruhunlela, pers. comm., 1996, B. Wenno, pers. comm., 1996). Shark fins are reported to have been an export from the islands for centuries (B. Wenno, pers comm., 1996). However since the mid 1970s there has been an increasing number of boats fishing the waters around the islands. They are generally small motorised boats of between 10 and 50t from Sulawesi, Kalimantan and Flores (B. Wenno, pers. comm., 1996, Amir, 1988). Thousands of fishermen are reported to stay in the area for 2 to 4 months during the peak season from October to January. Many come from South Sulawesi in a long and expensive journey. From Spermonde Archipelago it takes a boat of 10-12 horsepower, four days and nights and about 220 gallons of fuel to reach the Aru Islands. However the rewards are great with a two month trip resulting in 100-200kg of fins per boat worth at least Rp15 million (US$6 500).

The boats use bottom set gillnets made from monofilament nylon with a stretched mesh size of about 50cm. The nets are 9 meshes deep and are made up of 10 to 12 pieces which are each 60 to 70m long. Each boat uses 3 to 4 nets. The nets are set overnight in 25 to 45m of water (Amir, 1988). Sandy or muddy substrates in relatively turbid waters have the best catch rates. Such fishing grounds are found in the large area of shallow water to the south and east of the islands (Amir, 1988, B. Wenno, pers. comm., 1996). Boats fish in these areas for one to two weeks and then return to the islands for freshwater and supplies (Amir, 1988, B. Wenno, pers. comm., 1996).

There is evidence that these boats sometimes fish in Australian waters. It takes the average vessel only 7 to 8 hours from Dobo to the edge of the Australian Exclusive Economic Zone. Fishermen reported fishing illegally in Australian waters and vessels based in Dobo have been apprehended there by fisheries enforcement officers (M. Flanagan, pers. comm., 1996).

Amir (1988) studied the catch on such a vessel during a 21 day trip in November and December 1987. He recorded 121 'rays' (52%), 71 white-spotted guitarfish (31%), 11 teleost fish (5%), 10 giant shovelnose rays (4%), 8 whale shark (3%), 7 green turtles (*Chelonia mydas*, 3%) and 3 tuna (1%). These catches seem quite low and translate to only 3.4 white-spotted guitarfish per day. However in a survey of 15 shark fishing boats around the Aru Islands, Amir (1988) reported an average price of Rp72 268 (US$31) per individual of this species (Table 6.4.1). Such prices mean that even low catch rates of this species may be economically viable.

From 1976 to 1986, shark landings in South East Maluku represented a large proportion of the province's total. In this period there was only a gradual increase in landings and gillnet effort in South East Maluku (Figure 6.4.1). The average catch rate increased slightly after 1978 and may reflect an increased efficiency of the vessels and/or gillnets or increasingly more distant fishing grounds (Figure 6.4.1).

For Amir's (1988) fifteen survey boats the average catch weight of fins in 1993 was 1249.8kg. Assuming an average of 4 gillnets per vessel (Amir, 1988) these figures are similar to catch rates calculated from government statistics of about 0.3t/gillnet. This suggests that at least prior to 1987 catch statistics were not for live weights but actual landings of fins. After 1986 there was rapid increase in catches in Maluku (Figure 6.3.3) and this may reflect a conversion to recording live weights. Whatever caused the increased in recorded landings in the late 1980s, prior to this time annual live weight catches of sharks in Southeast Maluku probably averaged at least 4 000t[1].

[1]Estimated using the average annual landings between 1976 and 1986 (257.5t) and a conservative fin to live weight conversion factor of 16.67 (based on the two dorsal fins and upper lobe of the caudal fin (see Section 6.6) representing 6% of total weight). The total wet fin weight represents between 4 and 6% of total weight for most shark species (Kreuzer and Ahmed, 1978). The conversion factor used assumes that fins have not been dried. In reality they have probably been at least partially dried during fishing trips and as such the catch

The fishery for white-spotted guitarfish around the Aru Islands appears to have already reached its peak. After its inception in the 1970s, the fishery rapidly expanded. Reports suggest a 'boomtime' in Dobo, as the number of boats reached a peak in 1987 when there were about 500. However there has been a decline in catch rates since and now there are only about one hundred (F. Amir, pers. comm., 1996). There are reports that the boats are having to fish further from the island and a number of vessels from Dobo have been apprehended in Australian waters (Wallner and McLoughlin, 1995, M. Flanagan, pers. comm., 1996). One fin exporter said that although the fins of the white-spotted guitarfish were the most valuable there were now fewer of them.

Similar methods are used by vessels based in Merauke, Irian Jaya (TRAFFIC consultant's obs., 1996). There appear to be a number of separate companies in this port, each with several shark fishing boats. These boats are about 10 to 20m long and also use bottom set gillnets with large monofilament nylon meshes. Many of the boats are equipped with electronic navigation equipment, radio communications and hydraulic net haulers (Wallner and McLoughlin, 1995).

Large numbers of dried shark skins and spinal cartilage are present around the docks and outside several warehouses and/or factories. Many of the skins appear to be from Rhynchobatids and other demersal species. Information from crews of these vessels suggest that they fish offshore and close to and sometimes within Australian waters. The smaller vessels were reported to fish closer inshore. It is likely that shark fishing operations out of Merauke are similar to those around the Aru Islands and have a similar catch composition. However they are probably fishing in the area to the south of Yos Sudarso Island. At least some fishing activity also occurs in Australian waters. Shark fishing vessels from Merauke which are apprehended are generally in the Arafura Sea north of the Gulf of Carpentaria (C. Melon, pers. comm., 1996).

Similar shark fishing methods have also been reported in a number of other areas. Bugis people are reported to gillnet for sharks near Sorong and the western coast of Irian Jaya (Figure 6.1.1). Both areas are adjacent to large areas of shallow water which are probably suitable for this type of fishing. Muller (1990) reported that there is a Bugis population in the town of Agats with 15 gillnetting boats which specialise in catching sharks for their fins: "The dried fins are exported to Singapore, Hong Kong and Taiwan to end up in shark's-fin soup. These boats, which stay out at sea for up to a month at a time, motor out of Agats most of the year. During the local season of high waves, November/December through March/April, the vessels shift their operation to the seas around Merauke." Similar shark fishing operations exist elsewhere along this coast including around Konkonau (Muller, pers. comm., 1996).

Vessels operating out of Muara Angke in Jakarta fish with large mesh bottom set gillnets in the Sunda Strait and surrounding waters (Figure 6.1.1). Nets have a stretched mesh size of about 50cm and are 9 meshes deep. Thirty to fourty pieces each 65 to 96m long make up a single gillnet. Boats are about 13m long with a 33 horsepower inboard motor and undertake 23 to 27 day trips (Mappeati, 1991). These vessels fish in 40 to 80m of water and catch a wide variety of elasmobranchs. These include hammerhead sharks, carcharhinid sharks, sawfish, white-spotted guitarfish, eagle rays and stingrays. During one twenty day long trip Mappeati (1991) recorded a catch composition of 116 rays (57.4%), 23 sharks (11.4%) and 63 guitarfish (*Rhynchobatus* spp.).

One *punggawa* in Ujung Pandang targeted white-spotted guitarfish for fins around Tarakan, Kalimantan and near the Malaysian border (Figure 6.1.1) for one year during the late 1980s. Crews of six used 5 to 7t boats to fish shallow waters with gillnets. They used a total of about 5km of gillnets which were set overnight on the bottom. The nets were made in Taiwan although they were modified so that the 10 cm mesh size was increased to 30cm.

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weight could be at least twice as high.

Carcharhinids for fins

The targeting of carcharhinid sharks such as the white and black tip reef shark appears to have a long history in Indonesia. Specialist shark fishermen from southeast Sulawesi have targeted sharks for centuries. During long annual voyages they fished for sharks using handlines. They used shark rattles made from coconut shells and a bamboo pole to attract sharks (Wallner and McLoughlin, 1995). However the increase in the price of shark fins has resulted in greater fishing effort being directed towards these species.

There has been a increase in the fishing power of vessels with a shift towards using longlines. A single vessel usually has a number of these, with up to one hundred hooks each. Baits used include skipjack, dolphin, dugong, cow and cat. In the more remote areas shark flesh is often used. Some fishermen reported occasionally using dynamite fishing while targeting sharks. This serves the dual purpose of providing bait and attracting sharks.

It is apparent that overfishing has resulted in localised depletion such that these activities are now only worthwhile in more remote areas. For example, fishermen report having caught large number of carcharhinids in the Spermonde Archipelago during the 1940s and 50s. Now only a few generally small individuals are caught in the area and they must go further afield to catch fins large enough to sell.

Target fishing for these species is now focussed on areas such as Nusa Tenggara, and the Timor Sea. There are reports that the island off North Sulawesi, northern Maluku and northern Irian Jaya have also recently attracted such activities. One source reported two warehouses full of shark fins on the island of Sangihe, between North Sulawesi and the Philippines.

These areas have not traditionally had as high fishing pressure and presumably have greater shark populations. For example, the indigenous people of Sumba in East Nusa Tenggara (Figure 6.1.1) do not traditionally have a close affinity with the sea. As a result the seas around the island have not been as heavily exploited as those around southern Sulawesi. Sumba is now one of the latest areas in which Bugis and Makassarese fishermen are focussing their efforts, particularly for high value products such as shark fins. Such situations probably exist elsewhere. Similar fishing methods are used by boats based in Pelabuhanratu, Java (Figure 6.1.1). They use longlines to target sharks including hammerheads, spot-tail sharks, tiger sharks in waters as far off as Christmas Island and Sumatra.

The shallow shoals in the northern Timor Sea between Roti and Western Australia have attracted Bajau specialist shark fishers for hundreds of years. Whether this was due to a depletion of stocks in their home grounds or because of naturally greater abundance in these areas is unclear. In 1968 Australia declared sovereignty over a number of offshore reefs and islands in the Timor Sea. These had been traditional fishing grounds for Indonesians targeting demersal reef fish and trepang. However, in 1974 a *Memorandum of Understanding* (MOU) was signed by the Australian and Indonesian governments. This allowed subsistence fishing by non motorised vessels on these reefs. The area accessible to such activities was extended to include the waters between these reefs thus forming the 'MOU box'. However this demarkation failed to recognise the importance of areas such as the Sahul and Holothuria Banks as traditional fishing grounds for shark fishermen. A number of vessels have been caught illegally fishing in these areas.

There have been significant changes in shark fishing activities within Australian waters. Fishers from southern Sulawesi have settled on Roti and Timor (Figure 6.1.1) in order to have easier access to the 'MOU box'. Their influence, and the increased price for shark fins has lead to increased effort by generalist fishers on these islands. Prior to 1988 less than 10% of vessels boarded by Australian fisheries officers caught shark. Since then 80% of traditional boats have had shark on board. There

has also been an increase in the technological sophistication of the gears used. Many vessels are now using longlines with up to 100 hooks (Waller and McLoughlin, 1995).

As well as these 'traditional' sailing vessels there has also been a number of motorised vessels apprehended in Australian waters fishing exclusively for shark fin. These vessels are based in a variety of places but are almost always manned by Butonese fishermen (Wallner and McLoughlin, 1995). Many of these boats use Kupang, Timor as a stop off for refuelling and restocking before continuing on south (M. Flannagan, pers. comm., 1996)

Based on Australian surveillance and boarding data, Wallner and McLoughlin (1995) estimated that in 1994 there were 160-240 and 80-120 shark fishing trips by Indonesian sailing and motorised vessels respectively. These caught an estimated 570 to 961t. Although some Australian waters are traditional shark fishing grounds there has been an increase in these activities. Fishermen claim that there is increasing pressure to fish these areas because of overfishing in Indonesian waters (M. Flannagan, pers. comm., 1996). This is despite the fact that fishers run the risk of fines and their boat being destroyed. Some *punggawas* reported that they intentionally send older more decrepit boats to fish illegally in Australian waters. A brief stay in an Australian prison, enjoying relative luxuries such as chicken and apples, and a free aeroplane trip home are often not enough to deter the crew.

Dasyatids for flesh and skins

There appears to be a large target fishery for rays in the Java Sea. Vessels involved in this fishery are based in Muara Angke and Muara Baru, Jakarta. These boats use mostly trawls and fish for 8 to 14 days (P. Last, pers. comm., 1996) off the north coast of Java, South Sumatra, Lampung (including the Sunda Strait) and Riau. However these areas are only fished during the dry season from May to October and for the rest of the year the vessels are based in eastern provinces such as Maluku.

Adjacent to Muara Angke there is a large fish drying area of about 10 to 15 hectares. Approximately 30 to 40% of the product drying there is ray flesh (P. Last, pers. comm., 1996). This supports the assertion that large amounts of ray are landed in Jakarta despite the relatively low landings recorded for this province. In 1993, only 182t of rays were recorded as landed in Jakarta compared to at least 2 000t for the adjacent areas of South Sumatra, the east coast of Lampung, and the north coasts of West, Central and East Java (Figure 6.3.4).

On a typical voyage of 8 to 14 days during the dry season a single boat catches approximately 8 t of rays (P. Last, pers. comm., 1996) These are mainly the white spot ray (*Himantura gerrardi*) and Bleeker's whipray (*H. bleekeri*) but the patchwork whipray (*H. favus*), the reticulate whipray (*H. uarnak*), the leopard whipray (*H. undulata*), the pink whipray (*H. fai*) and the eagle ray (*Aetomylaeus maculata*) are also caught (TRAFFIC cionsultant's obs., 1996, P. Last, pers. comm., 1996). Most individuals landed are 0.8 to 1m in disk diameter (TRAFFIC consultant's obs., 1996) but can be larger. Other elasmobranchs are landed at Muara Angke and Muara Baru, including the zebra shark (1 to 2.5m total length), shark ray (0.7m TL), white-spotted guitarfish (1.5m TL), carcharhinids (probably blacktip reef shark or spot tail) (0.4 to 1.5m TL) and scalloped hammerheads (1.5 to 2m TL). At least some of these are probably caught while targeting rays.

Similar ray catches have been recorded around South Sulawesi using *jantrang* a 'trawl modification'. Catches of about 50 rays per shot were reported. These are mostly eagle rays which are sold to central Java.

Squalids and Hexanchids for squalene and oil

There is evidence of a growing exploitation of some deep sea shark species for liver oil and squalene. Interviewees identified several ports as being bases for such activities, including Pelabuhanratu, Java;

Bontang, Kalimantan; Mamuju, South Sulawesi; Fak-Fak, Irian Jaya and the north coast of Seram, Maluku. A company in Cilengsi, Bogor processes the livers of deep sea dogfish to extract squalene. Their pamphlet claims that fishermen use demersal longlines in 300-1 000m to catch members of the family Squalidae. It is reported that the company pays fishermen at Ujung Genteng, near Pelabuhanratu to catch these species. Mamuju in South Sulawesi is well known by local fishermen for its catch of dogfish. A sea product exporting company in Ujung Pandang is reported to sell about 1 000 drums of liver oil per year (1 drum weighs about 48kg). It is likely that most of this product comes from the operations at Mamuju.

Suitable species of sharks for the production of oil and squalene exist in waters between about 300 and 1 000m (Wibowo and Susanto, 1995). All of the above ports are adjacent to such areas (Figure 6.42). The origin of liver oil exports also corresponds with some of these locations (Figure 6.6.2). There are reports of similar fishing in waters about 300m deep off Merauke. However such depths of water do not exist in the Indonesian EEZ within at least 800km of this port.

There is no definitive information on the species which are caught for liver oil extraction. Many interviewees identified members of the Family Hexanchidae as being caught for this purpose[2]. One company claims to use the leafscale gulper shark (*Centrophorus squamosus*) and the greeneye spurdog (*Squalus mitsukurii*). The latter species has large amounts of vitamin A but very little squalene (J. Stevens, pers. com., 1996). Wibowo and Susanto (1995) listed *Centrophorus squamosus*, *Hexanchus* spp., *Dalatias licha* and *Centrophorus uyato* as species that occurred in Indonesia which may be suitable for the production of squalene. With the exception of *Hexanchus griseus* none of these species have been recorded in Indonesia (Last and Stevens, 1994). This confusion is partly a result of the lack of deepwater chondrychthian research that has been done in Indonesia. Indeed previously undescribed species may be being exploited.

Foreign

Taiwanese longlining

Evidence from Indonesian fishers suggest that there are large numbers of foreign vessels targeting shark in eastern Indonesia. The majority claimed these to be of Taiwanese origin although others mentioned that there were also Korean boats. While not all fishers were clear as to where these boats operated they said that they generally fished in deeper offshore waters. The Banda Sea, between East Timor and the island of Seram (Figure 6.1.1) was mentioned in particular. All generally agreed that these boats were based in Bitung, North Sulawesi. In May 1995 eighteen Taiwanese longliners were docked here (TRAFFIC consultant's obs., 1995). These were all very similar, around 20m in length and had longlines and radiotransmitter floats. It appeared that most of the crew of these boats were Indonesian but that the captains may have been Taiwanese. One vessel was loading frozen shark carcasses onto a larger Taiwanese mothership. According to its crew it was loading on the catch of all of the smaller boats and then returning to Taiwan. The head and fins of the sharks had been removed but they appeared to be all of the same species of carcharhinid and about 2 to 3m long. Fins were being unloaded separately. Judging by the shape, size and colour of fins and carcases they were probably blue sharks (*Prionace glauca*). The surface longline gear being used further supports this assertion. The crew and local people said that only sharks were caught and that they were not bycatch from tuna fishing operations.

Export statistics show that almost all the frozen and fresh shark that was exported from Indonesia in 1993 originated from Bitung (Figure 6.6.2). Furthermore almost all of these products were exported to Taiwan that year (Table 6.6.3). This is almost certainly the catch that is being loaded onto these

[2]Note that the identification guide that was compiled was not comprehensive for deepwater Indonesian elasmobranchs.

Taiwanese motherships. *Fisheries Statistics of Indonesia 1993* list the total shark landings in North Sulawesi as 1 860t. However, according to Indonesian *International Trade (Exports) of Fisheries Commodities 1993*, a total of 9 231t of shark products (8 292t frozen, 938.5t fresh or chilled, 0.178t brined fins) were exported from Bitung in 1993. Based on carcass weight alone, these landings are the largest in Indonesia. This fishery probably caught at least 12 900t[3] live weight of blue shark in 1993. This represents more than 20% of the country's shark catch in that year. One source suggests that there were about 40 of these vessels fishing in Indonesian waters in 1995 but that there are none at present (G. C-T. Chen, pers. comm., 1996).

Taiwanese gillnetting

In the early 1970s Taiwanese vessels began fishing in the Arafura Sea for sharks. They used drifting gillnets up to 8km long to catch species such as the Australian blacktip shark (*Carcharhinus tilstoni*), the spot-tail shark and tunas . During this time average annual catches were about 17 000t processed weight (about 25 000 live weight of which about 78% was sharks, Stevens and Davenport, 1991). When the Australian Fishing Zone[4] (AFZ) was declared in 1979 a quota was placed on catches within Australian waters. Continued restrictions forced the vessels to end fishing in the AFZ in 1986. There are reports that at this time most of the fleet switched operations to Indonesian waters in the Arafura Sea. McLoughlin *et al.* (1994) reported that 55 Taiwanese gillnetting vessels were licensed to fish in Indonesian waters. While the activities of this fleet were undoubtedly an important component of Indonesia's shark fishery, no evidence of its existence was found during this study.

Bycatch

Foreign vessels also catch elasmobranchs as bycatch during trawling operations. Trawling is only allowed in waters east of 130°E. However, in this area there are large numbers of domestic and foreign trawlers (Amir, pers. comm., 1996, Wenno, pers comm., 1996). In particular, many trawlers have been reported in the shallow waters around the Aru Islands. Discarded fish, including sharks and rays, are often washed up on the beaches of the southeastern islands (Ruhunlela, pers. comm., 1996, Adhyakso, 1995). Allegedly, foreign vessels sometimes illegally fish within territorial waters (within 12nm from the coast) during the night and leave prior to dawn.

The larger, mostly foreign vessels, target demersal teleosts. Foreign trawlers use the ports of Bitung, Ambon and Merauke (TRAFFIC consultant's obs., 1995, 1996). In April 1996, twelve large Taiwanese trawlers were at anchor in Ambon Harbour. Three similar sized Thai trawlers were present in Merauke in June 1995. Both of these ports had very large exports of frozen fish (62 757t and 28 179t respectively) to Thailand, Korea and Taiwan. This suggests that foreign trawlers are catching large quantities of fish which are then directly transported back to their home country. Similar export statistics were recorded for other ports suggesting similar activities elsewhere. The proportion of elasmobranch bycatch from these activities is unknown. However the high landings, mean that even a low proportion could represent a significant part of the regions shark and ray catch.

Prawn trawling, appears to be done mainly by smaller domestic vessels. Domestic and foreign vessels could also catch large amounts of sharks and rays. Elasmobranch bycatch has been shown to be significant in similar prawn fisheries operating in nearby northern Australia (Pender *et al.*, 1992).

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[3]Based on exports of 9 231t of fresh and frozen carcasses and a conversion factor of 1.4. This is a conservative value based on a percentage carcass weight of 70% and does not account for loss of weight during freezing. Carcass weight has been shown to represent between 41.8 and 67.3% of total weight for a number of carcharinids (Kreuser and Ahmed, 1978).

[4]Now the Australian Exclusive Economic Zone

Trade

Trade routes

Indonesia has different trading systems for various elasmobranch products. This reflects their different values and end markets. Shark fins which are the most valuable product are destined for overseas markets. Some fins are consumed domestically, particularly in Chinese restaurants, but this is likely to be insignificant relative to the large amounts exported. Fins are sold and eventually exported, through networks that span the country. Trade data show that three cities, Jakarta, Surabaya and Ujung Pandang, dominate fin exports. Virtually all of the fins caught in the country are funnelled to these cities. Anecdotal evidence suggests that there is a hierarchy of buyers ranging from local villagers up to ethnic Chinese, who dominate the export business. According to one exporter the fin may be bought and sold up to ten times before it is actually exported.

Particularly in the eastern provinces the Bugis, Makassarese and Butonese people dominate fishing activities and probably have their own collection system. Many of these fishers are based in South Sulawesi and return their catch directly to a *punggawa* or exporter in Ujung Pandang. In the main street at Poatere Harbour, Ujung Pandang there are about twenty establishments that deal in shark fins. It is not clear whether these businesses export fins however it seems that a few larger firms fill this role. Estimates from researchers, exporters and *punggawas* suggest that there are 10-15 shark fin exporters in Ujung Pandang.

One exporter claimed to sell at least 1t of fins each month. Previously he sold more than 2t per month but catches had since declined. He bought fins from about 20 boats mainly in Sinjai and the Buton islands. He said that most of these fins had come from Australian waters. One pongawa reported that in 1987 there was a firm with its own boat that it used to ship fins directly to Hong Kong and China but that it has since gone bankrupt.

Exporters in Ujung Pandang have received increasing competition from companies based in Surabaya, Java (Figure 6.1.1). While Ujung Pandang receives fins from mainly local fishers, Surabaya gets them from all over the country. For instance, in the Aru Islands there are collectors who buy fins from local fishermen and transport them to Surabaya and nearby Gresik. Kupang is reportedly also used as a collection point for fins from the Timor Sea and Australian waters. These are then sent to Surabaya. Some fishers from Ujung Pandang also reported selling their fins directly to Surabaya because of the higher prices received there.

One person said he used to work for a Korean company buying shark fins from fishermen in towns on the north coast of Java such as Tuban, Jepara and taking them to Rembang where ethnic Chinese vendors were involved. He also reported that rays from the same areas are taken to the Belimby district of Surabaya.

In many cases the shark carcasses are dumped after their fins have been removed. This appears to be particularly true in more remote areas where there is less demand for the often large amounts of flesh caught. Transport costs to major population centres are often prohibitive and facilities for keeping carcasses fresh usually absent. Shark carcases do appear in markets, although they generally sell for low prices. Higher prices are received for rays which have better quality flesh. In particular whiprays, the blue-spotted maskray, eagle rays and the blue-spotted fantail ray are often seen in local markets.

Another use of rays has been the manufacture of leather goods. One company produces wallets and purses under the brand name *Parri*. These products are made in Yogyakarta although the tanning factory is in Jakarta. Their information lists '*Trygon sephen* and *T. kuhlii*' as species used[5]. However,

[5] These are probably the cowtail ray (*Pateobatis sephen*) and the blue-spotted maskray (*Dasyatis kuhlii*).

the pattern of denticles on the leather goods that TRAFFIC's consultant inspected was fairly consistent and most resembled that on the cowtail ray. There are large salting and drying facilities that deal primarily with rays close to Muara Angke and most of the ray landed here is processed in this area (P. Last, pers. comm., 1996). These are probably the source of skins for these leather goods.

Prices

Fins

The price of fins can vary greatly depending upon the degree of processing, species and size. For instance small blacktip reef shark fins are sold fresh in the Muara Angke market, Jakarta for Rp4000/kg (US$1.80/kg). In contrast, fully processed fins are sold dried and packaged in supermarkets for up to Rp750 000/kg (US$330/kg)(Wibowo and Susanto, 1995).

Although fin prices are significantly affected by the degree of processing most fins are traded with minimal value adding. During fishing operations the fins are generally cut from the carcass with a straight base which leaves relatively large amounts of flesh at their base. This is not valuable but makes the fins heavier. Fins which have this flesh cut away such that the fin base is lunate have a higher price per kilogram. This appears to be the maximum amount of processing that most fins receive in Indonesia. The relatively low average price of dried fin exports (about Rp68 000 (US$32/kg) in 1993), suggests that only a small proportion of exports are further processed. The following discussion is limited to the prices received by fishermen for dried fins with the base cut out.

Size is another major determinant of shark fin price. Prices as low as Rp15 000/kg (US$6/kg) were quoted for the smallest blacktip fins. In contrast some very large fins, suspected to be from a hammerhead shark, were priced at Rp300 000/kg (US$132/kg). Generally a set of fins from an individual is graded upon the length of the pectoral fins (Table 6.6.1). The boundaries for the various grades does differ between traders but the overall trend remains the same. Fins below about 20 cm pectoral fin length are worth far less.

Although less significant than processing and size, the species also affects fin price. According to fishers and traders the first and second dorsal fins and the upper lobe of the caudal fin from the white-spotted guitarfish are the most valuable. At around Rp200 000 to 300 000/kg (US$88 to 132/kg) for grade I and 'super' fins, they fetch prices about 1.5 times higher than other species. There are reports of as set of fins from a single shark of this species fetching up to Rp900 000 (US$396/kg).

Although they are less valuable, fins from blacktip reef sharks appear to be a significant part of fin trade. As with most carcharhinid species four fins are taken from this species: 2 pectoral fins, 2 dorsal fins and the lower lobe of the caudal fin. Grade I and 'super' fins from this species are worth about Rp125 to 175 000/kg (US$55 to 77/kg).

Wibowo and Susanto (1995) reported that fins from blue, mako, and tiger sharks are also valuable. However, one shark fin dealer quoted a lower price per kilogram for blue shark fins (Rp100 000/kg, US$44/kg) than for smaller blacktip fins (Rp150 000/kg, US$66/kg). Sawfish (Family Pristidae) fins are also said to be very expensive. Lower prices were reported for hammerhead shark fins Rp70 000 to 90 000/kg (US$31 to 40/kg). Fishermen said that although there is a market for fins from the grey carpet shark, zebra shark, thresher sharks and shark ray, they are worth very little. Fins from species such as the nurse shark (*Nebrius ferrugineus*) are worthless (Wibowo and Susanto, 1995).

The price of shark fins has varied considerably over the time. During the 1950s, shark fins were brought from fishermen for about Rp130 /kg. Although there has been massive inflation since this time, this was a low price compared to the standard commodity, rice. Prices continued to increase, however it was only in the early 1980s that it became worthwhile to target sharks for fins. There was a

rapid increase in shark fin prices during the late 1980s but export prices and reports from fishermen suggest that they have dropped recently. The head of a fishing company based in Ujung Pandang, South Sulawesi claimed that since 1957 his company had been selling shark fins. Since the late 1980s this had been his fleets primary target product. However in 1993 there was a decrease in shark fin prices and it was now more profitable to target live fish for export. Live coral reef fish are worth about Rp25 000/kg (US$11/kg) and are exported to elsewhere in Asia, mostly Hong Kong, for the restaurant market. There are other valuable competing products such as sea cucumbers, trochus and black coral. It has also been suggested that there has been a reduction in the profitability of targeting shark fins because their average size has decreased.

Shark flesh

Shark meat is not considered to be good eating and is probably not a traditional food item in Indonesia. Prices reported ranged from Rp500/kg (US$0.20/kg) for salted shark flesh to Rp3000/kg (US$1.30/kg) for whole small blacktip reef shark. A fish meal plant in the Aru islands was reported to buy white-spotted guitarfish for Rp150/kg (US$0.10/kg) in the late 1980s. However, this activity has since stopped for reasons unknown.

Ray flesh

Ray flesh is considered to be of better eating quality than shark. It is sold in markets for Rp3 000 to 7 500/kg (US$1.3 to 3.3/kg). Large whiprays (*Himantura* spp.) sell for around Rp10 000 to 20 000 (US$4.4 to 8.8) per individual. The pink and Jenkins whiprays appear to be most valuable.

Oil

Fishermen reported receiving Rp23 000 to 29 000/kg (US$10.1 to 12.8/kg) for shark liver oil in 1996. This is higher than average export prices in 1993 and may reflect an increase in its value.

Fins

Dried shark fins have been exported from Indonesia in large quantities for at least the last two decades. By the 1980s exports were over 200 t and rising steadily (Figure 6.61, Table 6.6.2). Despite increased landings of sharks (Figure 6.1.2) there was a drop in export volume in 1984. Exports recovered the following year and continued to rise to a peak of 547t in 1987. This is equivalent to catches of about 40 000 to 60 000t[6] live weight. Recorded landings of shark in that year where 36 884t.

Although prices continued to rise rapidly, the volume of dried fin exports decreased during the late 1980s and early 1990s. This was not directly related to an overall reduction in shark landings (Figure 6.1.2). The reduction in dried fin exports may be partly related to an increase in that of brined fins (Table 6.6.2). In 1993 brined fin exports were more than half of the weight of dried fins exports. However, the higher density of brined fins means that their weight correponds to lower live weight landings than those for dried fins.

Despite the widespread distribution of shark fisheries there are only a few major export points for fins: Jakarta, Surabaya and Ujung Pandang (Figure 6.6.2). Although these places appear to command an unusually high proportion of the trade they are Indonesia's largest cities and are important in the trade

[6]Rough estimates based on published values for the percentage of total body weight of dry shark fins. These range from 0.9% to 1.4% (Anderson and Ahmed, 1993, Compagno, 1990) resulting in conversion factors of between 71 to 111. Note that this will vary depending upon a number of factors including species and the extent of drying.

of most commodities. This pattern of dominance is not peculiar to shark fins and is very similar in dried fish goods in general (Figure 6.6.3).

In 1993 most dried fins were exported to Hong Kong and Singapore although a far greater price was obtained for those sent to Japan (Table 6.6.3). One fin dealer reported that most fins were currently being sold to Malaysia and Singapore because they were offering higher prices than Hong Kong.

Fresh and frozen flesh

There has also been an increase in the exports of fresh and frozen carcasses (Table 6.6.2). In particular there were large amounts of frozen shark carcasses exported in the early 1990s. In 1993 a total of 8 293t of "Frozen fish, Dogfish" was exported, all from Bitung, North Sulawesi (Figure 6.6.2). In the same year most "Fish, fresh or chilled, Dogfish" was exported from the same port (Figure 6.6.2).

Shark liver oil

A separate classification for shark liver oil is not given in export statistics. However there are categories for "Cod liver oils" and "Other fish liver oils". In 1993 a total of 177 301kg of "Other fish liver oils" with an average price of US$9.31/kg was exported from Indonesia. Most came from Ujung Pandang (Figure 6.3.4) and was sent to South Korea (56.5%), Japan (20.9%) and the Netherlands (22.6%). There is potential for shark liver oil to have been misclassified as cod liver oil. In 1993 a total of 150 110kg of cod liver oil with an average price of US$9.3/kg was exported mainly from Surabaya. It was sent to Japan and South Korea.

Other

There were eight Indonesian ports with more than 25 000t of fisheries exports in 1993. Of these, ports such as Tanjung Priok, Jakarta (total of 39 178t of fisheries exports); Tanjung Perak, Surabaya (81 377t) and Belawan, North Sumatra (30 831t) all have mixed exports of numerous different products.

However, in the other five ports obscure, or poorly defined products dominate exports. Bitung, North Sulawesi (44 144t) had exports dominated by "Frozen fish, Other flatfishes" (35.9% of all fisheries exports). This represented 89.5% of Indonesia's exports of this product most of which was sent to Taiwan (59.6%) and Japan (37.1%). Tanjung Balai Asahan, North Sumatra (31 655t) exported 23 754t (75.0%) of "Fish, fresh or chilled, Other salmon". This represented 85.0% of Indonesia's exports of this product most of which was sent to Malaysia (89.9%). Terempa a small town in Riau (62 972t) exported 62 485t (99.2%) of "Fish, fresh or chilled, Other". This accounted for 85.6% of all exports of this product, most of which was exported to Thailand (85.2%)

Merauke, Irian Jaya (28 179t) exported 28 151t (99.9%) of "Frozen fish, Others". The largest volume of any single product from one port in 1993 was a massive 62 757t of "Frozen fish, Others" from Ambon, Maluku (76 740t). Merauke and Ambon accounted for 96.3% of the exports of "Frozen fish, Others" in 1993. Most of this product was exported to Thailand (45.6%), Korea (28.5%) and Taiwan (20.8%) and represent 17.8% of Indonesia's total fisheries exports in that year.

These latter five ports are not major trading centres and there is no evidence that they support such large domestic fisheries. This and the dominance of their exports by a single commodity suggests that foreign fishing vessels are catching fish in the area, using these ports as a base and then returning to their home country to unload catch. This supported by TRAFFIC consultant's observations and information from fishers.

Imports

Only very small amounts of shark products are imported into Indonesia. In 1993 only 1 307kg of dried fins and 1 830kg of fins in brine were imported. These were worth an average of US$21.57/kg and US$21.28/kg respectively. No fresh or frozen shark was imported.

The average price of both dried and brined fin imports varied greatly with the country of origin (Table 6.6.4). However many are of higher value than exports of similar products (Table 6.6.3). This probably reflects a more highly processed product. Most of the dried fins were imported to Tanjung Perak, the port of Surabaya. However the greatest value of dried fins arrived at the Soekeorno-Hatta Airport, Jakarta where only 194kg had a value of US$21 297. The same differences are seen with brined fins. Although 1 500kg of brined fins arrived at Belawan Harbour, North Sumatra from Sri Lanka it was valued at only US$4.02/kg. In contrast 130 kg imported to Soekeorno-Hatta Airport from Batam had an average price of US$191.12/kg. (Batam is an Indonesian island which is very close to Singapore and which was declared a free-trade zone in 1989). A complete time series of import data is not currently available but total imports of dried fins were only 3kg and 650kg in 1988 and 1990 respectively.

Management

Indonesia is made up of 27 provinces, each with its own government. The national government based in Jakarta provides the overall directives and guidelines for laws and regulations. Implementation of these is then 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. Due to time constraints it was not possible to determine the fisheries management policies of each provinces. However, Lang (1992) reviewed national regulations pertaining to the marine environment and most of the following is drawn from that work. It should be noted that relevant provincial regulations may exist but are not covered here due to the limited scope.

Article 33 of the 1945 Constitution stipulates that the earth and water and the natural wealth conceived thereunder should be governed by the State and should be used for the people's utmost welfare. To this end *Indonesian Law No.9, 1985 re Fisheries* was enacted to optimise the development and management of fisheries. To implement this law the Minister of Agriculture has the authority to stipulate, among others, which fish catching devices are allowed, a total allowable catch, and size limits. The Department of Agriculture's Directorate General of Fisheries is responsible for the management of all Indonesian fisheries

At the next legislative level, *Government Regulation No.15, 1984 re Management of Living Natural Resources within the Indonesian Exclusive Economic Zone* gives the Minister of Agriculture the authority to stipulate the Total Allowable Catch (TAC) in the EEZ. This is based upon the research done by a number of sub-departments within the Directorate General of Fisheries. It appears that TACs are calculated for broad fisheries definitions, for example Pelagic, Tuna, Skipjack and Demersal fishes, rather than individual species. TACs are mainly used for determining whether foreign interests should be allowed to fish a resource and are not directly enforced by means such as a quota system.

Domestic fishing activities

Domestic fishing activities are managed through input controls which are enacted through *Government Regulation No. 15, 1990 re Fishery Business* . This requires all commercial fishing entities to have a fishing business licence (IUP) which specifies, the area fished, the kinds of target fish (e.g. tuna, shrimp, sharks), the number and size of fishing vessels and the type of equipment used. Each vessel must posses a fish catching permit (SIP). The Minister of Agriculture authorises the granting of IUP and SIPs to larger firms. Provincial governors or appointed officials have the authority to grant IUPs

and SIPs to companies without foreign capital investment or personnel, and who have vessels of less than 90 horsepower. Holders of IUPs are required to submit business activity reports every six months. Each year the grantor of the permit reviews the stipulations of the IUP. This allows for regular adjustments of regulations dependent upon reviews of the status of the fishery. IUPs can be revoked if biannual reports are not submitted or if its stipulations have not been adhered to.

Foreign fishing activities

The TAC estimate made by the Director General of Fisheries is used in the granting of foreign fishing access. In accordance with the United Nations Convention on the Law of the Sea (UNCLOS) if the TAC is not being fully utilised by Indonesian fishing companies then foreign vessels, in cooperation with an Indonesian company holding an IUP, are permitted to fish within the EEZ. The local companies require an Approval for the Utilisation of Foreign vessels (PPKA) and an international fish catching licence (SIPI) for each foreign vessel used. The fishing area, size of vessel and allowable equipment are specified in these permits. The PPKA is valid for three years. Renewals of SIPI are reviewed each year depending upon the ability of Indonesian vessels to utilise the TAC. Only the Minister of Agriculture is authorised to grant PPKAs and SIPIs. Under *Decree of the Minister of Agriculture No. 417/Kpts/IK250/6/1988 re Control of the Utilisation of the Fishery Resources in the Indonesian Exclusive Economic Zone* no new licences will be issued to foreign vessels which use gill nets, purse seines and dragnets.

All fishing activities

Presidential Decree No. 39, re Abolishing Trawl Nets was enacted to encourage the further development of traditional small scale fisheries and reduce conflict with trawl vessels. Regulations were introduced to ban trawling from Java, Bali and Sumatra by January, 1981 and from the whole of Indonesian territory by January, 1983. However, *Presidential Decree No.85, 1982 re Utilisation of Shrimp Dragnets*, allows the use of "shrimp dragnets" in waters greater than 10 meters deep around the Kei, Tanimbar and Aru Islands, Irian Jaya and the Arafura Sea east of Longitude 130°E. This has been seen by some as a *de facto* approval for trawl fishing in these sparsely populated areas. Since there is virtually no control, the obliged bycatch excluding devices are never used, which makes the "shrimp net" an euphemistic name for an ordinary bottom trawl' (Hitipeuw *et al.* 1994). *Decree of the Minister of Agriculture No. 769/Kpts/HK 210/0/1988 re Use of Bottom Lampara Nets* allows for bottom lampara nets to be used east of 130°E. This legislation further supports the use of trawl analogues in the area.

The 'Sentani shark' (*Pristis spp*) is protected under *Decree of the Mister of Agriculture No. 716/Kpts/Um/10/1980 re Determination of several Types of Wild Animals to be Protected.* This sawfish is said to only occur in Lake Sentani, Irian Jaya and is the only elasmobranch species currently protected in Indonesia, although it may already be extinct. Dugongs (*Dugong dugong*) and dolphins are protected under similar decrees.

Problems

The guidelines issued by the national government are mostly well aligned towards the aim of the continued sustainability of fisheries. However, there are severe short comings in the system. While the flexibility of the current approach allows for the application of more appropriate regulations in each province, it may have resulted in a lack of coordination and vague implementation. Although fishing licences provide a uniform basis for restricting effort through input controls, there is no evidence that they serve this purpose since there does not appear to be any system for setting limits to the number of IUPs or SIPs issued. This means that the number of fishing vessels can continue to increase. The vague specification of limits on the IUPs also allows for increases in the fishing power of each vessel.

There also appears to be major deficiencies in the enforcement of management regulations. Although fisheries, police and naval officers have the authority to enforce laws and regulations within the EEZ they are limited in their resources. The large numbers of fishers makes it hard to prevent even the most blatant crimes. Although banned, dynamite fishing and cyanide continue to be widespread and protected species such as the Napoleon wrasse (*Cheilinus undulatus*) appear in markets. The great demand for sharks' fin soup leads to the rapid depletion of shark fisheries. In comparison regulations such as the type of gear and number of boats used are far harder to enforce. For example, a number of sources claimed that companies were operating greater numbers of foreign fishing vessels than allowed, by simply forging SIPIs. Although these boats are not allowed to fish within territorial waters (within 12 nm of the coast), there are claims that they often break this rule. There are also claims of official corruption and protection in association with fishing activities. However, the present inadequacy of the regulatory and enforcement framework with respect to chondrychthian fisheries, probably makes corruption unnecessary for the continued expansion of effort.

CONCLUSIONS AND RECOMMENDATIONS

Indonesia's elasmobranch catch is the largest in the world. In 1993, recorded landings totalled 87 138t. However there are indications that landings data underestimate the live weight catches of shark and rays. For instance, independent research has shown that the large fishery targeting white-spotted guitarfish off the Aru Islands catches large amounts of rays, most of which are probably dead when discarded. It also appears that, for at least some of the time it has been operating, landings for the same fishery have been recorded as fin weight only. Since most shark is caught only for its fins such under recording may be widespread. Export data for dried shark fins and carcasses also suggests that more sharks are caught than are recorded in landings. Given this apparent underreporting the actual catch could be well over 100 000t.

Despite being very high, the total elasmobranch catch has continued to increase. However, this overall pattern masks significant changes that are occurring at a smaller scales within the country. Trends in landings in each province suggest, that while Indonesia's total shark catch continues to increase, most regions are fully or overexploited. In many of the provinces where shark landings had historically been high, there was a levelling or decline in catches. The rapid development of shark fisheries in the central and western provinces during the early 1980s was followed by stable or decreased catches. Anecdotal evidence also suggests overfishing has occurred in some areas. Fishers report a decline in both catch rates and the average size of sharks. At least some traditional fishing grounds have been overexploited and fishers are having to go further afield to maintain viable catch rates.

Changes in the distribution of catch support the inference that overexploitation has occurred in some areas. Only in those areas where landings have been historically low have there been significant increases in catch since the late 1980s. The eastern provinces such as Maluku, North Sulawesi and Irian Jaya, sustained much of the increase in overall shark catch during the late 1980s and early 1990s. These increases were not in proportional to human population increases in the area. Fishers generally undertake long and expensive trips to fish in such areas and would not do so if there was potential for greater catches in their home grounds. Increased shark fishing effort in Australian waters also suggests that Indonesian waters are at least fully exploited.

Export data also suggest an inability of Indonesian fisheries to meet an increased demand for shark fins. Although, export prices have risen rapidly there has been a decrease in the quantity exported.

Most of the shark catch results from the targeting of fins. Carcasses are usually dumped, particularly in the more remote fishing grounds. No use is made of the large amounts of flesh landed. The dumping of such large quantities of a food cannot be considered 'optimal utilisation of a natural resource for the benefit of the people' as stipulated under Article 33 of the Indonesian Constitution. Such activities could be deemed unconstitutional regardless of their sustainability.

Despite apparent problems with shark fishing activities in Indonesia, current management appears ineffective at restricting catches. Due to a lack of resources and the large amount of fishing activities, enforcement agencies appear to have limited regulatory effect. Further input controls are unlikely to have a significant effect on restricting the shark catch.

The shark fishery in Indonesia is primarily driven by the export market for fins. Restricting exports of fins could act as *de facto* output control. If quotas on the amount of exports were set properly, they could reduce the targeting of sharks specifically for fins, but still allow fishermen to sell the fins of sharks they catch incidentally.

Recommendation 1. That the Indonesian government introduce a quota on the quantity of shark fins that can be exported each year.

Such a control may be circumvented through smuggling, an activity which is reported to be quite common in Indonesia. For example, boats from Singapore are reported to enter Indonesian waters and barter alcohol and electronic goods for fish. Corruption may also allow for the circumvention of such a quota. Therefore, these factors necessitate better monitoring on the trade in shark fins.

Patterns in the catches of rays are less pronounced than those for sharks. However, as with shark catches, provinces which have had historically high landings of rays have experienced decreases at some time. Nonetheless, in most provinces, landings rose during the 1980s. There has not been such a dramatic shift in the distribution of ray catches and there is less evidence of overexploitation. However, landings in most provinces stabilised during the early 1990s. The continuation of high catches in the Java Sea are of particular concern. Such intense fishing pressure on species with low reproductive and growth rates could result in localised stock depletions.

Recommendation 2. That via specifications on fishing business licences (IUPs), the number of vessels using trawls (or analogues thereof) to catch rays in the Java Sea be restricted to current levels, until the sustainable catch is determined and appropriate management measures implemented.

There is also cause for concern over the recent increase in the exploitation of deep sea sharks for liver oil and squalene. As with shark fins, these commodities have the potential to provide valuable export earnings. Utilisation of deep sea resources could also reduce fishing pressure on shallow water habitats. However, the generally slow growth of these deepwater elasmobranch species means that careful attention needs to be paid to such fisheries. Indonesia has a large fishing fleet and with the potential decline of other fisheries there could be a dramatic shift in effort towards this valuable resource. Indonesia does not currently appear to have the necessary research and enforcement capabilities to ensure proper management of this resource should such a shift occur.

Recommendation 3. That the Indonesian government restrict the trade in shark liver oil and squalene to current levels, until the sustainable catch is determined and appropriate management measures implemented.

It is apparent that foreign vessels are taking large amounts of sharks in target longline operations. These are probably blue sharks, a species which, although more productive than many other elasmobranchs, is experiencing high fishing pressure around the world. Although sustainable levels of catch are not known, landings in Indonesian waters should be monitored carefully.

Foreign trawling operations are also catching significant amounts of demersal fish. Export data suggest than more than 190 000t was caught by such vessels in 1993. This is a massive catch, equivalent to at least of 6% of Indonesia's total recorded marine fisheries landings in that year. The

elasmobranch bycatch of such operations whether kept or discarded is likely to be significant. Demersal trawling has been shown to have a detrimental effect on tropical seabed communities elsewhere (e.g. North West Shelf Australia, Sainsbury, 1987). This could be indirectly affecting elasmobranch populations.

Foreign fleets are taking large catches in Indonesian waters. Their technological sophistication makes them more efficient and fundamentally different from much of the domestic fishing fleet. More attention needs to be paid to these activities to ensure that any present monetary gains they generate, are not at the expense of the continued sustainability of fisheries.

Recommendation 4. That the Indonesian government review the processes for the granting of Approvals for the Utilisation of Foreign Vessels (PPKAs) to ensure that they do not result in the overexploitation of elasmobranch, and other fish stocks.

Although not reviewed yet, TRAFFIC Southeast Asia has received information that there are new regulations for fishing fleets and the fishing industry. A knowledge of each stock's population dynamics is a fundamental requirement for effective management of fisheries resources. Unfortunately, data is lacking with respect to elasmobranch fisheries in Indonesia. For many of the species caught, even their taxonomy is unclear. More research on elasmobranch stocks is a primary need for reaching the constitutional goal of their sustainable utilisation.

Recommendation 5. That more research be done on the taxonomy, stock structure and population dynamics of Indonesian elasmobranchs.

Inferences made during this report concerning the sustainability of elasmobranch fisheries in Indonesia are based upon a simple examination of fisheries catch and export data, anecdotal evidence and generalisations about elasmobranch population dynamics. A thorough assessment of sustainable catch levels requires expensive and time consuming research into population dynamics. However, the Indonesian statistics available provide a detailed means of quantifying changes in the elasmobranch fishery. This presents a quicker and cheaper means of assessing its sustainability. For example, an analysis of the elasticity in the price of exports could aid in determination of whether supply or demand has restricted export quantities. More detailed statistics available at the provincial level allows the calculation of more interpretable catch rates.

Recommendation 6. That there be a more formal and rigorous statistical analysis of catch and export statistics be undertaken to more formally asses the sustainability of Indonesia's elasmobranch fisheries.

Fisheries statistics provide an important tool for fisheries management. Unfortunately, research suggests that there were inaccuracies in the Indonesian data collection program. It is not clear whether such problems still exist, however the importance of these data warrants further attention to their accuracy. Dudley and Harris (1987) claimed that improvements could be made with better training of field staff, but monitoring is also important.

Recommendation 7: That the system of fisheries statistics collection in Indonesia be reviewed and action taken to improve it's accuracy and precision.

One deficiency of the current statistics collection system is its lack of detail in the specification of some species groups. 'Sharks' and 'rays' are the only statistical category used which include more than one family. Most families of elasmobranch are readily distinguished. Indeed many species which appear to dominate the shark and ray catch are distinctive. These include the white-spotted guitarfish, shark ray, zebra shark, blue-spotted maskray, blue-spotted fantail ray, leopard whipray and reticulate whipray. The hardest group to separate are the carcharhinids. However species such as the tiger shark and blue

shark are easily identifiable and the remainder could be divided into separate groups based upon simple characters such as fin colour. Any reclassification could be readily implemented through appropriate staff training.

Recommendation 8: That fisheries statistics be collected for elasmobranchs at more specific taxonomic levels, supported by the training of field staff.

There is increasing fishing pressure on coral reef and coastal habitats in Indonesia. Many of these areas have already been severely denuded of a variety of species. The overfishing of elasmobranchs is only part of the general overexploitation of these marine environments. However in some respects, it represent the worst case of this. The fishing of sharks for fins, like that for trochus, sea cucumbers, and live fish, is driven, not for the provision of food for local inhabitants but by luxury overseas markets. These products fetch high prices but much of the profit goes to traders rather than fishermen. Fishing communities still derive benefit from the activity, but to the potential detriment of future food supplies. The high price of fins, means that shark fishing remains economically viable despite low catch rates. The peculiar population dynamics of sharks mean that they are vulnerable to overfishing and that stocks may take generations to recover. The wastage of more than 90% of the catch when carcasses are dumped represents a gross inefficiency in the use of a vulnerable resource. The effects on the whole marine ecosystem of removing large numbers of these apex predators are unpredictable but could potentially be drastic. Unfortunately it appears that much damage has already been done to elasmobranch stocks.

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APPENDICES

Appendix 1: English and Bahasa Indonesia versions of questioned asked to interviewees in Indonesia.

Place: Date:

Do you catch sharks or rays?

Are sharks or rays the main species you catch? If no what other species?

What methods are used? Longline, gillnet, handline.

Longline or gillnet

Longlines: How many? (If more than one are they all set at once?)
How long?
How many hooks?
What size are the hooks?

Gillnets: How many? (If more than one are they all set at once?)
How long?
How wide?
What size are the meshes?

Surface or bottom? What depth?

Are there government regulations on the gear you use e.g. on the length or number of nets?

How many gillnet or longline sets do you do per day?

How long is each set (hours)?

What shark or stingray species do you catch? How much catch of each of these species do you take each longline or gillnet set?

	Species	Size (m)	Number	Weight (kg)
eg.	40.12	0.5 - 1	20	500

Handlines

How many handlines are used at one time?

One handline per person or more?

Do you use anything to attract the sharks e.g. rattles or blood?

How many hours per day do you fish?

What shark or stingray species do you catch? By looking at guide about how much catch of each of these species do you take each hour per handline?

Species	Size (m)	Number	Weight (kg)

Has there been a change in the number of sharks or rays you catch per day or in their size?

Species	Change in number	Change in size

What time do you fish? Night, day, dawn, dusk?

What is the best season for fishing? How many more sharks and rays do you catch at this time than in the low season?

How long is your boat?

Do you own it?

How many crew on your boat?

How many boats in your, or other areas, do the same type of fishing as you?

Area	Number of boats

Are there foriegn boats fishing in the area?

Where do you fish? Has there been a change in the areas you fish? **Map**

How much time and feul do you use in travelling to where you fish? Time (hours/days): Feul (litres):

If travel far: Why do you need to travel so far?

What parts of the sharks or rays do you keep. Fins, meat, liver etc? What form are they in. Dried, fresh etc?

Are some species preferred for certain parts e.g. fins? If so which species?

Where and to who do you sell your catch?

What prices do you receivefor each species and part?

	Species	Part	Price (Rp/kg)
e.g.	16.1	fins	4,500

Do you know where the product is sent to after you sell it?

Lokasi : **Tanggal :**

Apakah saudara menangkap hiu atau ikan pari?

Apakah hiu atau ikan pari adalah tangkapan utama saudara? Apabila bukan, jenis lain apa saja tangkapan saudara?

Cara tangkap apa yang saudar gunakan?

Longlines (pancing dengan benang pancing yang panjang dan banyak mata kailnya) atau **gillnets** (jaring insang)

Longline
- Berapa banyak?(apabila lebih dari satu kali, apakah dilakukan sekaligus?)
- Berapa panjang?
- Berapa jumlah mata pancingnya?
- Apa ukuran mata pancingnya?

Gillnet
- Berapa banyak?(apabila lebih dari satu kali, apakah dilakukan sekaligus?)
- Berapa panjang?
- Berapa besar/lebar?
- Berapa ukuran mata jaringnya?

Apakah dilakukan di permukaan atau di dasar? Berapa kedalamannya?

Apakah ada peraturan pemerintah terhadap alat tangkap yang saudara gunakan? Misalnya ukuran panjang atau jumlah dari jaring?

Berapa banyak gillnet atau longline yang saudara kerjakan setiap hari?

Berapa lama (jam) masing-masing alat tangkap dikerjakan setiap kali?

Jenis hiu atau ikan pari apa yang tertangkap?

Jenis hiu/ikan pari	**Ukuran (m)**	**Jumlah**	**Berat (kg)**

Handline (pancing)

Berapa banyak pancing yang digunakan sekali pancing?

Apakah satu orang menggunakan satu pancing? Atau lebih?

Apakah saudara menggunakan umpan untuk memancing hiu/ikan pari? Misalnya bunyi-bunyian atau darah?

Berapa jam setiap hari saudara mencari ikan?

Jenis hiu atau ikan pari apa yang tertangkap?

Jenis hiu/ikan pari	**Ukuran (m)**	**Jumlah**	**Berat (kg)**

.....

Selama saudara menangkap hiu atau ikan pari, apakah ada penurunan atau kenaikan jumlah tangkapan saudara per hari? Atau apakah ada perbedaan ukuran tangkapan hiu/ikan pari, sekarang ini, dibandingkan dengan hasil tangkapan terdahulu?

Jenis hiu/ikan pari	**Perubahan dalam jumlah**	**Perubahan dalam ukuran**

Jam berapa saudar mencari ikan? Malam hari, siang, subuh atau sore hari?

Apakah musim terbaik dalam mencari ikan? Berapa banyak hiu atau ikan pari yang tertangkap saat ini dibanding pada saat musim yang kurang baik?

Berapa panjang perahu/kapal yang saudar gunakan untuk menangkap ikan?

Apakah perahu/kapal itu milik saudara?

Berapa banyak anak buah kapal saudara?

Berapa banyak perahu/kapal, atau dilain tempat, yang juga menangkap hiu atau ikan pari?

Lokasi	Jumlah perahu/kapal

Apakah ada kapal asing mencari ikan di daerah saudara?

Dimana anda mencari ikan? Apakah ada perubahan ditempat saudara mencari ikan? Lihat peta dan tunjukkan dalam peta

Berapa waktu yang saudara tempuh untuk mencapai tempat mencari ikan?, dan berapa banyak bahan bakar yang dibutuhkan? Waktu (jam/hari) Bensin/solar/minyak tanah (liter)

Apabila tempat mencari ikan tersebut sangat jauh, mengapa saudara harus pergi sejauh itu?

Bagian badan yang mana dari ikan pari atau hiu yang anda simpan? Sirip, daging atau hati? Sebutkan apabila ada bagian badan yang lain? Dalam bentuk apa saudara menyimpannya? Dikeringkan, atau segar?

Adakah jenis hiu atau ikan pari tertentu, yang lebih disukai untuk bagian-bagiannya, misalnya hiu tertentu lebih baik diambil siripnya?

Jenis hiu/ikan pari	Bagian yang diambil

Dimana dan kepada siapa saudara menjual hasil tangkapan itu?

Berapa bayaran yang saudara terima untuk masing-masing jenis dan bagian-bagiannya?

Jenis	bagian yang diambil	Harga(Rp/Kg)	
hiu gergaji	sirip	4,500	(contoh)

Apakah saudara tahu kemana biasanya hiu atau ikan pari yang anda jual itu dijual kembali?

Appendix 2: Catches of sharks and rays and number of units of set gillnets and set longlines in various regions/provinces of Indonesia from 1976 to 1993. Data obtained from *Fisheries Statistics of Indonesia 1976* to *1993*.†: Value estimated from graph in Bonfil (1994).

Sharks

Coastal area	Province	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
	Aceh	179	218	918	564	714	1581	702	1114	1168	852	2390	1064	1272	1474	868	1250	1720	1865
	North Sumatra	1584	1360	1037	1193	1199	1630	1643	1848	1941	2094	2176	2128	2336	2185	1894	1827	1699	2098
Western Sumatra	West Sumatra	0	174	333	246	283	333	364	492	579	612	788	764	756	773	695	721	951	1311
	Bengkulu	208	185	175	168	137	268	118	125	141	205	312	291	349	396	416	471	617	633
	Lampung	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	168
	West Java	710	626	629	522	1133	1353	2745	2878	3014	2062	2256	1467	1796	1508	1230	1491	1801	1912
Southern Java	Central Java	44	125	306	130	2265	97	168	536	131	166	243	316	963	374	676	809	555	693
	Yogyakarta	4	5	15	11	7	6	3	17	24	26	27	36	39	28	39	62	122	134
	East Java	651	812	362	542	501	827	581	1149	2524	2109	2144	2536	2737	5161	2324	1334	1455	971
	Aceh	281	222	201	143	148	147	275	185	42	376	231	320	496	769	601	433	1214	915
Strait of Malaka	North Sumatra	335	611	516	550	606	390	537	518	500	867	403	809	748	804	795	1195	1309	1851
	Riau	1119	1331	1169	1163	1498	872	1890	541	388	439	511	807	323	541	671	456	894	951
	Jambi	138	209	293	135	250	216	249	197	172	211	165	293	88	151	0	94	78	86
Eastern Sumatra	South Sumatra	760	452	500	772	692	1711	1426	2073	1984	2321	2689	2500	2685	3026	3155	3222	3295	4170
	Lampung	841	508	110	203	361	859	1055	957	1625	884	925	1166	1702	1991	1678	2009	1970	2591
	DKI Jakarta	286	233	366	500	647	484	377	591	433	265	98	527	169	472	508	382	244	769
Northern Java	West Java	1405	1397	1470	1080	1292	2514	3018	2969	5055	3625	2456	2525	2497	2914	2857	3037	2763	3756
	Central Java	320	439	599	769	1416	2607	1675	1811	1131	1347	822	1008	1189	1254	1520	1633	2236	2063
	East Java	1797	1193	1537	1806	2369	1651	2162	1935	2634	3035	3340	2857	2289	2207	1976	2454	2552	1856
	Bali	629	940	902	780	1949	895	388	315	652	534	420	184	179	387	394	319	294	117
	NTB	226	195	297	213	338	447	679	1151	841	414	797	557	610	1105	1531	2444	2555	1879
	NTT	516	392	490	454	454	391	279	432	439	675	966	821	1084	1268	1384	1555	1591	1286
	East Timor	0	0	0	0	0	0	0	14	17	12	10	10	16	16	20	104	150	150
	West Kalimantan	1171	1668	1786	1938	2462	2458	1966	1917	2021	2704	1864	1583	2615	3173	3209	2600	3129	3877
	Central Kalimantan	890	1008	1125	906	1043	1124	842	1287	1902	1958	1908	2029	2118	2228	2457	2523	3185	2675
	South Kalimantan	878	1058	1389	1411	1740	1646	1570	2176	2453	2522	1284	1567	804	561	488	383	542	847
	East Kalimantan	396	436	739	678	811	839	2132	1025	1029	1088	1118	1109	1170	1092	912	991	848	792
	South Suluwesi	716	776	1112	2315	2386	2444	2229	2502	2694	2633	2594	3539	2134	2653	2315	2198	2204	2187
	Southeast Suluwesi	97	163	187	209	244	271	76	355	96	150	349	376	420	277	395	1000	970	740
	North Suluwesi	328	382	214	211	604	451	496	1046	731	671	832	1099	1371	1097	2981	2090	3218	1860
	Central Suluwesi	11	13	0	0	15	54	0	5	13	12	75	70	74	76	76	59	383	259
	Muluku	292	325	273	374	386	361	377	430	473	545	560	940	3518	4868	4834	4911	5115	4173
	Irian Jaya	99	75	139	268	224	80	329	1029	151	148	190	1586	508	3168	2216	2068	947	1817
	Total	16911	17531	19189	20254	28174	29007	30351	33620	36998	35562	34943	36884	39055	47997	45115	46125	50606	51452

Rays

Coastal area	Province	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
	Aceh	95	5	74	25	135	504	173	259	285	248	310	322		413	331	546	355	333
	North Sumatra	1009	470	445	696	709	599	483	465	769	769	1937	1868		1957	1838	1853	1564	2221
Western Sumatra	West Sumatra	0	1	11	4	1	6	17	56	40	34	55	103		242	236	251	819	1082
	Bengkulu	39	16	21	23	74	112	46	59	72	123	152	148		252	265	265	288	405
	Lampung	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	78	167
	West Java	360	345	239	255	330	350	765	694	824	445	420	547		754	766	626	488	605
Southern Java	Central Java	162	181	227	110	1017	108	41	804	81	100	81	95		259	235	267	113	216
	Yogyakarta	4	2	0	6	0	0	0	13	10	16	16	23		13	30	37	55	113
	East Java	108	192	24	41	126	507	350	314	287	257	385	171		250	179	284	558	498
	Aceh	116	0	47	55	43	27	46	83	119	374	201	324		579	392	232	421	594
Straits of Malaka	North Sumatra	1410	2626	1171	1361	1069	1046	758	688	979	1224	1652	1555		1437	1352	1764	2097	2351
	Riau	1672	1521	1228	1067	1660	323	537	579	564	274	341	1202		699	736	857	1080	738
	Jambi	132	56	84	222	327	242	330	439	549	583	206	432		359	329	389	364	387
Eastern Sumatra	South Sumatra	551	629	772	736	406	1113	1011	1402	1544	2109	2114	2076		2559	2548	2561	2683	3389
	Lampung	552	101	122	126	465	125	552	560	410	1394	1059	823		1295	1605	2296	2206	2673
	DKI Jakarta	66	63	163	722	740	299	116	48	21	9	17	14		2	227	350	6	182
Northern Java	West Java	513	591	676	831	963	1578	1496	1712	1634	1870	2140	2905		1934	2014	1745	1503	2533
	Central Java	612	830	581	430	819	985	1232	1098	397	668	613	1083		1594	1903	2504	2402	2071
	East Java	958	1353	1005	929	904	833	1300	1526	1469	1741	1713	1331		1775	1865	2243	2317	2238
	Bali	5	3	6	4	0	0	6	0	18	4	0	28		47	34	1	15	7
	NTB	99	106	115	54	97	98	130	245	380	377	380	265		465	578	947	1078	471
	NTT	590	621	525	417	417	315	282	391	390	678	1045	468		1714	1723	1137	1119	3770
	East Timor	0	0	0	0	0	0	0	0	9	11	7	7		4	5	9	8	8
	West Kalimantan	815	830	1393	748	1190	1397	1043	1111	993	1523	1012	906		1848	1795	1565	1777	1614
	Central Kalimantan	464	28	378	242	569	525	1093	670	1141	1333	979	1615		1470	1457	2490	1639	1617
	South Kalimantan	229	101	157	233	285	202	198	222	364	218	430	459		871	865	604	668	917
	East Kalimantan	369	409	398	448	555	732	547	572	550	611	581	676		1360	1303	1239	937	621
	South Suluwesi	374	481	510	824	1210	1520	1556	1621	1343	1260	1395	1718		1128	1337	995	1003	1122
	Southeast Suluwesi	148	92	410	167	156	173	53	60	61	142	237	268		241	325	574	730	1120
	North Suluwesi	37	29	14	17	58	78	134	146	128	136	136	133		108	112	125	106	96
	Central Suluwesi	4	13	12	14	6	3	7	1	4	19	65	56		82	82	84	158	83
	Muluku	187	178	202	210	217	223	238	304	234	313	321	221		681	716	746	668	725
	Irian Jaya	128	81	138	130	133	144	128	115	97	111	144	161		518	974	1116	230	719
	Total	11808	11954	11148	11147	14681	14167	14668	16257	15766	18974	20144	22003	25417†	26910	28157	30702	29533	35686

Gillnets

Coastal area	Province	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Western Sumatra	Aceh	76	141	217	210	57	179	164				428	579		247	247	789	1404	1248
	North Sumatra	845	859	1172	582	658	860	770				765	741		892	700	734	734	1407
	West Sumatra	131	304	692	1117	659	799	577				266	486		416	424	425	427	400
	Bengkulu	519	460	570	171	234	830	830				211	210		485	1386	1386	1377	3084
	Lampung	15	26	7	276	313	400	434				378	378		385	385	96	0	0
Southern Java	West Java	539	508	513	602	599	605	672				593	1091		1784	2111	1539	1571	1715
	Central Java	578	394	432	767	1030	236	790				659	0		1203	876	174	174	2232
	Yogyakarta	0	0	0	0	0	0	0				0	0		0	0	0	0	0
	East Java	0	82	69	218	254	188	484				726	798		874	917	835	985	1105
Straits of Malaka	Aceh	71	0	0	0	0	0	0				150	254		955	955	144	145	444
	North Sumatra	15	36	24	71	102	313	898				1584	1557		850	1672	1855	1942	1353
	Riau	131	139	152	575	560	624	507				964	970		1581	1524	1696	1637	1732
Eastern Sumatra	Jambi	26	0	0	18	5	8	11				46	53		63	0	45	45	46
	South Sumatra	0	64	152	167	187	185	185				326	338		345	319	335	335	424
	Lampung	399	1600	350	190	250	158	379				421	421		446	446	71	62	62
Northern Java	DKI Jakarta	0	0	0	0	0	6	19				18	22		30	45	0	0	0
	West Java	284	226	347	157	688	587	436				230	299		344	664	647	847	795
	Central Java	45	1269	2318	2887	1794	1547	1536				1246	475		973	914	1050	2130	619
	East Java	2980	2225	2841	2319	2127	1995	2143				1955	1797		1494	1552	1832	2391	2959
	Bali	476	442	583	765	1103	1290	1455				460	684		823	919	1252	963	2220
	NTB	1372	459	878	841	1103	341	392				2576	2572		3963	3864	4557	3970	4356
	NTT	717	937	1462	1149	1199	1696	1884				2552	2658		3514	2676	2886	2604	1997
	East Timor	0	0	127	148	217	0	0				129	129		256	418	2268	2268	2268
	West Kalimantan	663	724	864	704	1452	1162	1386				1492	1061		1431	1247	1283	1341	1251
	Central Kalimantan	184	18	122	891	1043	798	676				399	392		381	0	0	0	273
	South Kalimantan	213	166	157	150	219	244	375				263	180		291	1056	194	196	194
	East Kalimantan	471	0	876	1031	593	1689	1201				1376	1443		1356	1235	1132	1132	1380
	South Suluwesi	2692	1887	2901	2262	3069	3164	3359				3610	3257		3338	3438	4144	4144	4032
	Southeast Suluwesi	1475	2940	3003	2233	2109	2423	2455				2499	2250		2135	2706	2984	3269	3873
	North Suluwesi	431	756	943	654	1393	1658	2303				2660	2692		2930	2747	2747	2785	2804
	Central Suluwesi	223	41	167	356	768	1057	698				1096	873		861	861	675	1516	1516
	Muluku	419	1244	1306	1307	1509	1582	1605				1727	3911		2546	2686	2300	2579	2641
	Irian Jaya	1330	927	324	618	1316	1014	1256				3810	2001		2949	4074	3389	3389	5198
	Total	17320	18874	23569	23436	26610	27638	29880				35615	34572		40141	43064	43473	46362	53628

Longlines

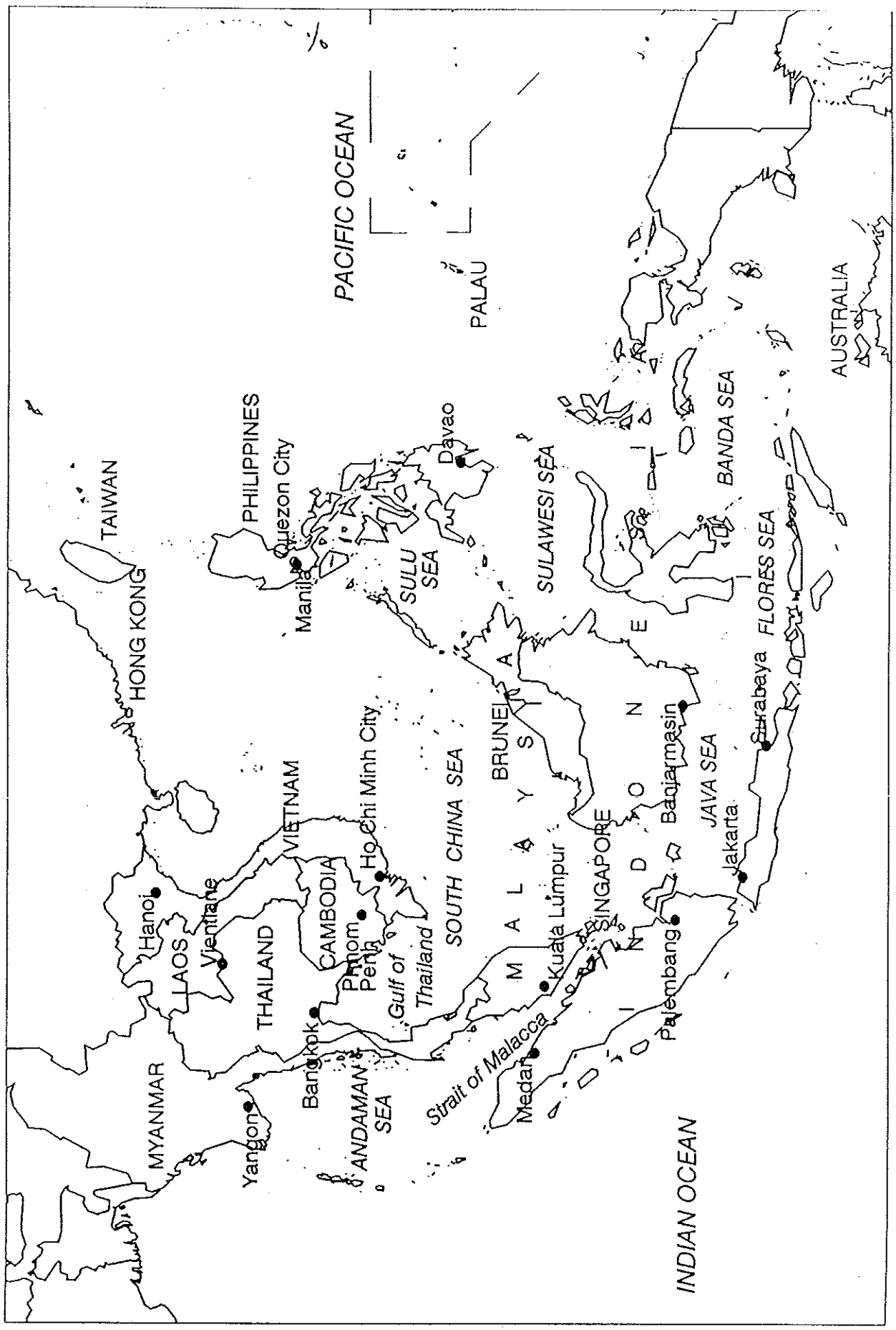
Coastal area	Province	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
	Aceh	0	0	0	0	0	0	0		492		41	175		34	34	0	215	207
	North Sumatra	0	0	68	62	167	181	24		34		499	499		840	301	272	272	271
Western Sumatra	West Sumatra	10	54	23	23	23	23	44		44		69	79		158	40	317	231	216
	Bengkulu	203	0	130	75	45	45	45		0		13	44		44	152	148	792	0
	Lampung	0	0	0	0	0	0	0		0		0	0		0	0	0	0	0
	West Java	318	175	187	234	492	522	574		661		200	128		0	349	305	323	442
Southern Java	Central Java	12	12	190	0	0	0	187		0		0	0		0	0	0	0	796
	Yogyakarta	0	0	0	0	0	0	0		0		0	0		0	0	0	0	0
	East Java	0	48	13	1	24	26	2		27		27	89		0	0	0	16	41
	Aceh	0	0	0	0	0	0	0		0		0	0		165	165	45	34	65
Straits of Malaka	North Sumatra	76	95	153	463	113	236	484		115		357	356		299	370	214	353	123
	Riau	34	40	29	377	342	515	409		801		483	455		1803	1830	2175	1824	2163
	Jambi	0	0	0	0	0	0	0		0		81	74		0	0	0	0	0
Eastern Sumatra	South Sumatra	0	0	0	0	0	0	0		0		0	0		0	0	0	0	0
	Lampung	381	604	772	457	375	266	387		733		798	798		820	820	1107	1002	1002
	DKI Jakarta	0	0	0	0	0	0	0		0		0	0		0	0	0	0	0
Northern Java	West Java	120	120	128	93	78	97	113		0		42	79		77	81	0	34	34
	Central Java	415	976	261	566	432	346	413		475		201	253		151	236	0	710	155
	East Java	206	206	0	0	0	0	0		0		0	0		0	0	0	0	0
	Bali	0	0	0	5	3	8	0		10		385	43		25	15	19	15	12
	NTB	0	0	0	0	0	0	215		255		99	106		341	44	223	41	41
	NTT	0	0	0	0	0	0	0		0		1	32		0	0	0	0	120
	East Timor	0	0	0	0	0	0	0		0		0	0		0	58	0	0	0
	West Kalimantan	276	630	736	666	498	538	485		577		662	569		250	607	74	121	95
	Central Kalimantan	731	73	239	309	380	496	828		238		406	544		0	495	0	0	329
	South Kalimantan	272	248	672	270	307	313	321		414		368	398		482	934	605	536	620
	East Kalimantan	75	0	102	47	0	0	0		0		0	0		493	0	366	366	446
	South Suluwesi	318	1293	1091	1944	2027	2785	2481		1563		2277	1469		1648	1545	1896	1896	2038
	Southeast Suluwesi	88	0	0	0	0	0	32		34		24	24		179	224	174	174	270
	North Suluwesi	0	111	0	0	225	229	0		0		0	7		2	0	0	0	0
	Central Suluwesi	0	0	0	0	0	0	0		0		40	48		48	48	54	812	812
	Muluku	396	403	417	432	432	456	657		2472		2453	2742		2781	2781	2711	2834	2842
	Irian Jaya	2	2	0	0	0	0	0		0		0	14		4	4	187	187	362
	Total	3933	5090	5211	6024	5963	7082	7701		8945		9526	9025		10644	11133	10892	12788	13502

Appendix 3: Maps, tables and figures referred to in the report.

Maps
Tables and Figures

Arranged following the chapters in the text:

Regional, Malaysia, Thailand, Philippines, Singapore, and Indonesia



Map 1

Map of Southeast Asian countries

Map 2

Map of Philippines indicating the main areas of fishery referred to in this report.

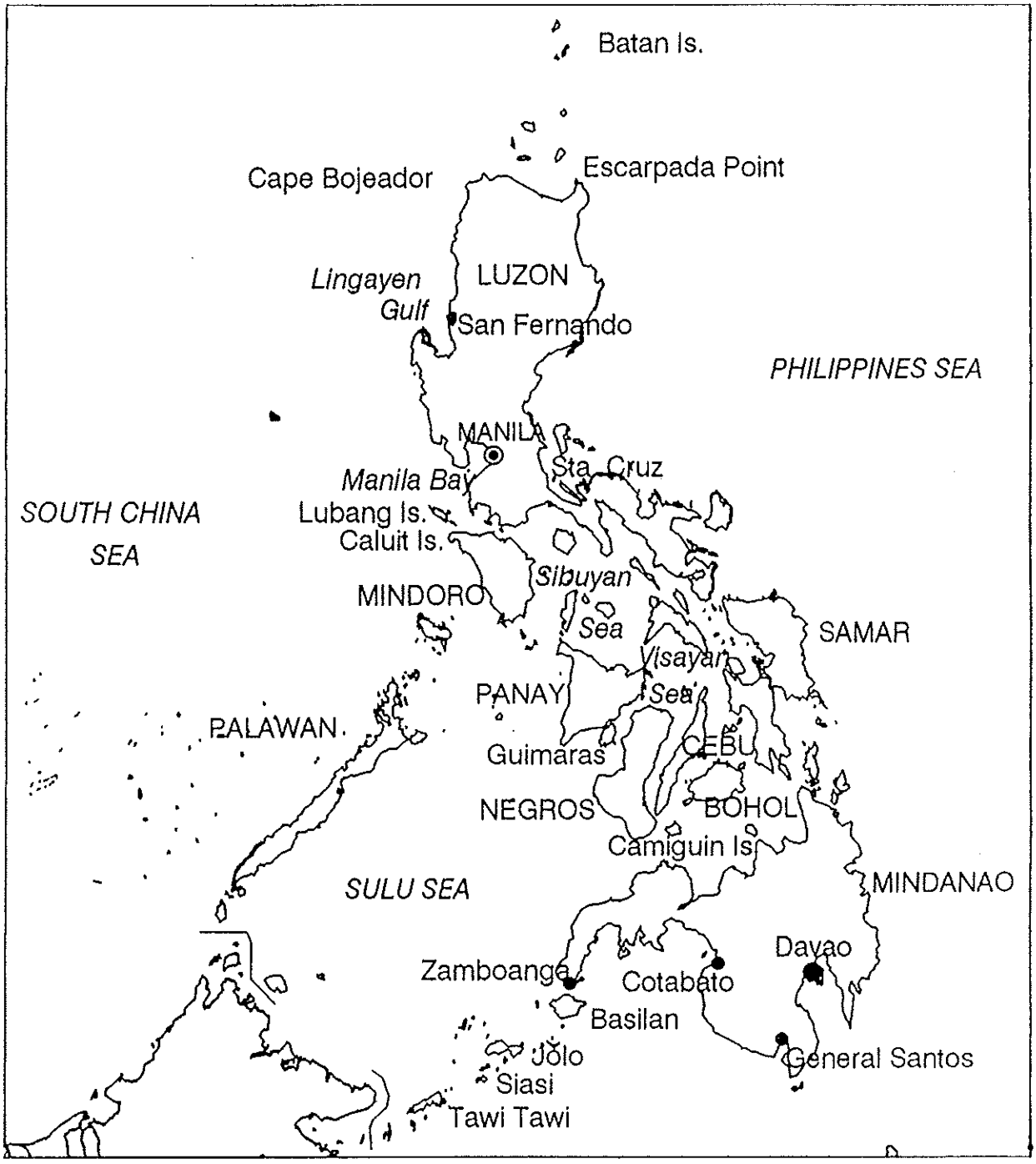


Table 1.0.1

Commercial elasmobranch fisheries, reported world catches in thousand tonnes

Year	*Thailand**	*Malaysia**	*Indonesia***	*Philippines**
1947	1			
1948	2			
1949	3			
1950	2			
1951	2			
1952	2			
1953	2.2			
1954	2.3			
1955	1.6			
1956	1.6			
1957	3.1			
1958	2.7			
1959	2.8			
1960	4.3			
1961	4	3.2		
1962	4.5	3.2		
1963	5.1	4.4		
1964	5.8	4.7		
1965	12.4	4.6		
1966	12.8	6.4		
1967	8	7		
1968	12.3	6.5		
1969	18.8			
1970	22.4	3.6		6.9
1971	12.5	6.4	10.3	7.3
1972	14.4	6.7	9.2	8.2
1973	13.6	7.7	16.3	9
1974	13.7	8.2	18.5	9.4
1975	12.1	8.5	27	10.4
1976	11.4	12.2	28.7	9.1
1977	12.2	12.2	29.5	8.9
1978	9.8	13.7	30.3	21.2
1979	9.3	11.9	33.3	9
1980	9.5	10.9	42.9	9.7
1981	10.2	11.5	43.2	12.6
1982	9.6	9.9	45	11.4
1983	8.5	10.3	49.9	8.2
1984	8.1	10	52.8	11.3
1985	9.2	10.3	54.3	10.9
1986	13.5	11.2	55.1	18.1
1987	14.4	11.7	58.2	16.2
1988	11.4	16.8	63.9	17.9
1989	11.2	13.4	74.9	19
1990	11	16.8	73.3	18.4
1991	11.8	16.9	79.8	19
Total	**376.1**	**280.8**	**896.4**	**272.1**
Mean	**8.4**	**9.4**	**42.7**	**12.4**
1	**1.74**	**2.2**	**10.18**	**2.63**
2	**0.43**	**2.46**	**2.41**	**0.85**

Source: ** data from SEAFDEC (Appendix 1)*

*** data from SEAFDEC and FAO (Appendix 1)*

1= % of worldwide elasmobranch catch, 1967-1991

2= % importance of elasmobranchs in country, 1987-1991

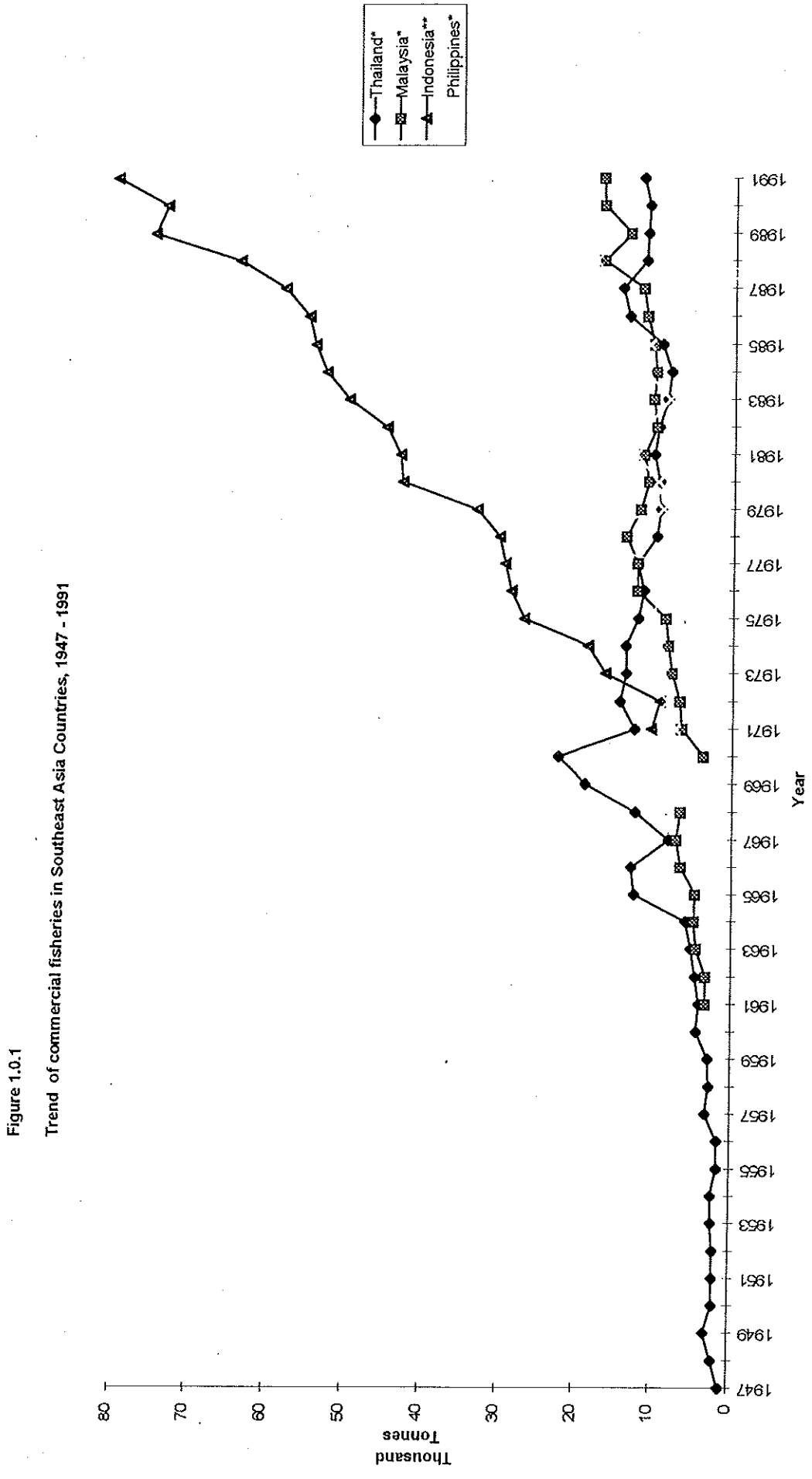


Figure 1.0.1

Trend of commercial fisheries in Southeast Asia Countries, 1947 - 1991

Table 2.2.1

Shark, rays, chimaeras: Nominal catches by species and fishing areas in Malaysia, 1983 - 1992

Year	Rays		Skates		Sharks
	Area 71 Quantity(mt)	Area 57 Quantity(mt)	Area 71 Quantity(mt)	Area 57 Quantity(mt)	Area 71 Quantity(mt)
1983	606	3504	2328	3285	600
1984	912	3400	2440	2788	500
1985	905	2985	2191	2681	1500
1986	1050	2833	2969	3353	1000
1987*	1050	2833	2969	3353	1500
1988*	1050	2850	2969	3353	1500
1989*	1050	2850	3000	3350	1500
1990*	1050	2850	3000	3350	1500
1991*	1050	2790	2940	3280	1470
1992*	1050	2790	3030	3380	1510

Area 71 = West Central Pacific Ocean
Area 57= East Indian Ocean
* Forecast

Source: FAO Fishery Statistics, 1992,Vol 74: Catches and Landings

Table 2.2.2.

Landings of sharks and rays in tonnes by region in Malaysia, 1993

Species	Peninsular Malaysia		East Malaysia			Total
	West Coast	East Coast	Sarawak	Sabah	WP Labuan	
Rays	5608	5240	1881	1614	261	14604
Sharks	694	1485	1679	2112	324	6294

WP = Federal Territory
Source: Annual Fisheries Statistics 1993, Department of Fisheries, Malaysia

Table 2.2.3

Landings of rays in tonnes by month and region in Malaysia, 1993

Region		Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec	Total
Peninsular Malaysia	West Coast	389	434	394	415	461	397	558	527	453	595	532	453	5608
	East Coast	347	364	313	281	423	346	600	701	630	632	336	267	5240
East Malaysia	Sarawak	112	99	137	218	271	141	169	223	187	175	109	40	1881
	Sabah	87	148	176	111	140	112	133	162	146	118	130	151	1614
	WP Labuan	30	14	30	12	25	23	26	19	23	23	18	18	261

WP = Federal Territory

Source: Annual Fisheries Statistics 1993, Department of Fisheries, Malaysia

Table 2.2.4

Landings of sharks in tonnes by month and region in Malaysia, 1993

Region		Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec	Total
Peninsular Malaysia	West Coast	44	53	53	85	54	59	66	60	62	57	53	48	694
	East Coast	110	102	103	127	124	121	155	142	151	167	111	72	1485
East Malaysia	Sarawak	44	133	190	187	179	156	144	146	185	132	127	56	1679
	Sabah	121	140	120	142	162	136	177	151	250	272	137	304	2112
	WP Labuan	26	30	31	26	25	33	18	10	25	32	33	35	324

WP = Federal Territory

Source: Annual Fisheries Statistics 1993, Department of Fisheries, Malaysia

Figure 2.2.2

Landings of Sharks and Rays by region in Malaysia, 1993 (Tonnes)

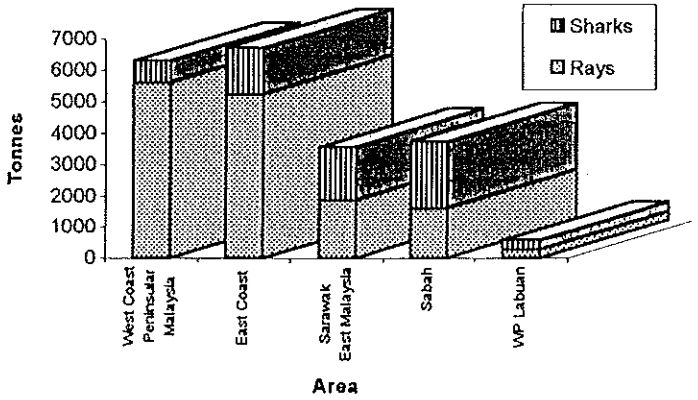


Figure 2.2.3

Monthly variation of rays landings by region in Malaysia, 1993 (Tonnes)

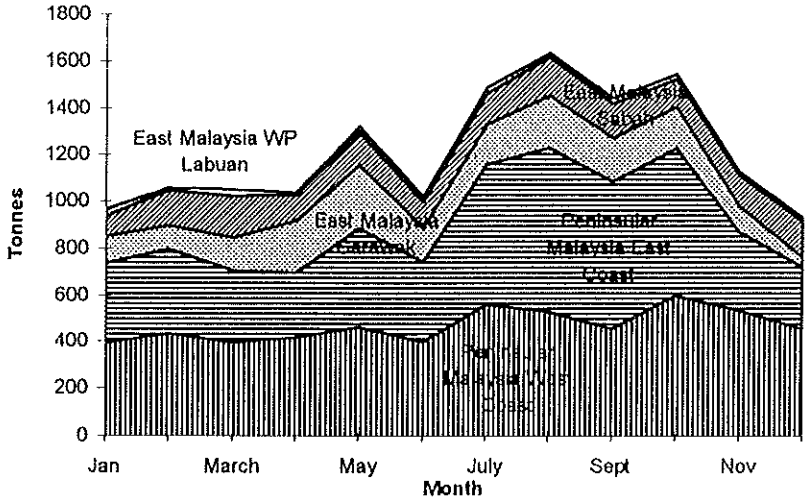


Figure 2.2.4

Monthly variation of sharks landings by region in Malaysia, 1993 (Tonnes)

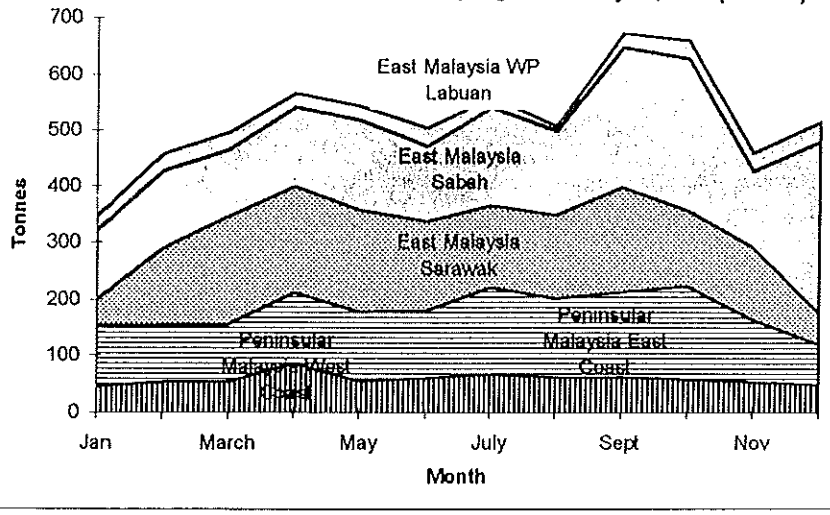


Table 2.3.1

Landings of marine fisheries by gear group and species (Quantity in tonnes) in Peninsular Malaysia, 1990 - 1994

Rays												
Year	Trawl Net	Seine Nets		Drift/Gill Nets	Traps							Trawl Nets
			Other Seines		Stationary Traps	Portable Traps	Hooks and Lines	Bag Nets	Barrier Nets	Misc	Total	%
1990	7579	17	27	821	3	53	744	2	6	0	9252	82
1991	6884	0	5	620	2	79	872	4	0	0	8466	81
1992	10938	2	33	961	80	50	1439	10	14	4	13531	81
1993	10296	3	31	1776	90	116	2289	1	2	0	14604	70
1994	9632	2	11	1964	60	74	2230	26	1	0	14000	69

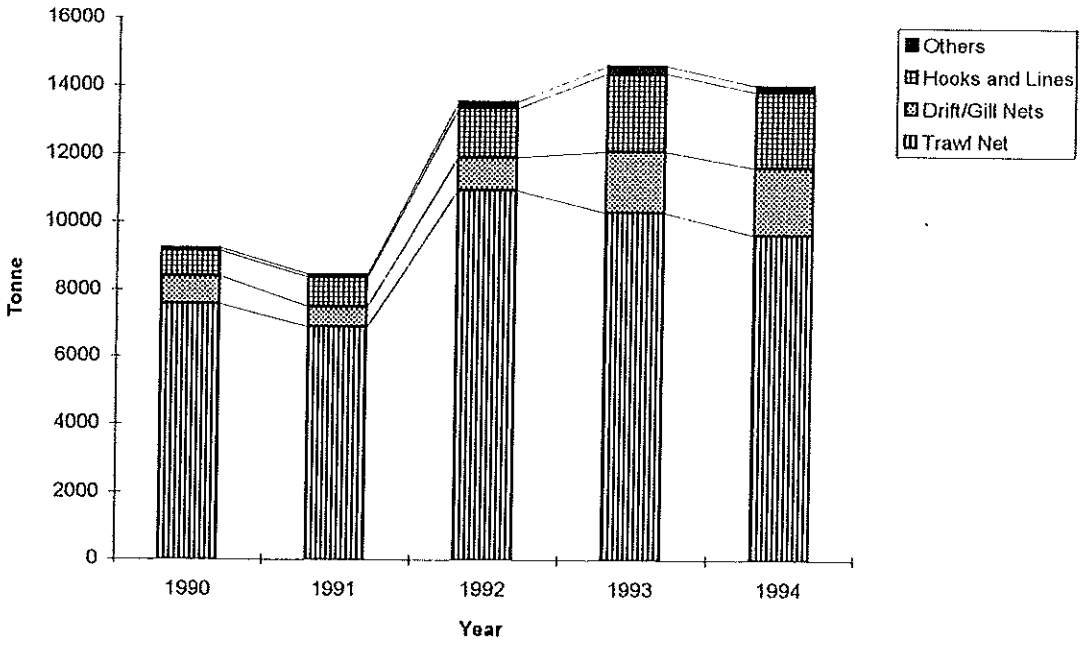
Sharks										
Year	Trawl Nets	Seine Nets			Drift/Gill Nets	Traps				Trawl Nets
		P S Fish	P S Anchovy	Other Seines		Stationary Traps	Portable Traps	Hooks and Lines	Barrier Nets	Total	%
1990	1727	1	2	0	294	0	7	166	0	2197	78
1991	1665	7	0	0	206	0	12	178	0	2068	80
1992	4036	5	0	10	2588	9	7	585	0	7240	56
1993	3216	4	0	7	2381	89	15	582	0	6294	51
1994	3188	0	0	1	2786	6	21	876	11	6889	46

P S = purse seine

Source: Fisheries Statistics

Figure 2.3.1a

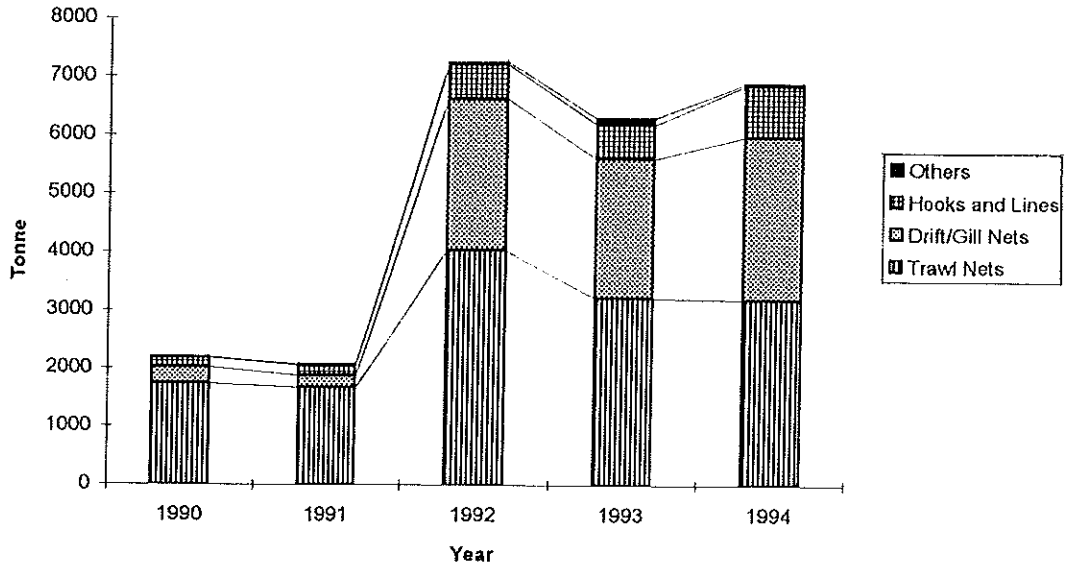
Landing of rays by gear group (in tonnes) in Peninsular Malaysia, 1990-1994



Source: Fisheries Statistics

Figure 2.3.1b

Landings of sharks by gear froup (in tonnes) in Peninsular Malaysia, 1990-1994



Source: Fisheries Statistics

Table 2.3.2a

Landings of rays in tonnes by group gear and region in Malaysia, 1993

Region		Trawler	Seine Nets			Drift/Gill Nets	Traps						Total
			PS Fish	PS Anchovy	Other Seines		Stationary Traps	Portable Traps	Hooks and Lines	Bag Nets	Barrier Nets	Misc	
Peninsular	West Coast	3910		0	12	429	0	80	1176	1	0	0	5608
Malaysia	East Coast	3610	1			861	2	36	730				5240
East Malaysia	Sarawak	1502				337	5	0	37				1881
	Sabah	1019	2		19	149	77		346		2		1614
	WP Labuan	255					6						261
Total		10296	3	0	31	1776	90	116	2289	1	2	0	14604

PS = Purse Seine

WP = Federal Territory

Source: Annual Fisheries Statistics 1993, Department of Fisheries, Malaysia

Table 2.3.2b

Landings of sharks in tonnes by group gear and region in Malaysia, 1993

Region		Trawl Net	Seine Nets		Drift/Gill Nets	Traps			Total
			P S Fish	Other Seines		Stationary Traps	Portable Traps	Hooks and Lines	
Peninsular	West Coast	539			90		3	62	694
Malaysia	East Coast	959	1		363		12	150	1485
East Malaysia	Sarawak	888			779	2	0	10	1679
	Sabah	591	3	7	1149	2		360	2112
	WP Labuan	239				85			324
Total		3216	4	7	2381	89	15	582	6294

PS = Purse Seine

WP = Federal Territory

Source: Annual Fisheries Statistics 1993, Department of Fisheries, Malaysia

Table 2.5.1

Dogfish and other sharks excluding livers and roes, frozen in Malaysia, 1989 - 1993 (Value in RM, quantity in tonnes)

Country	1989				1990				1991				1992				1993			
	Import		Export		Import		Export		Import		Export		Import		Export		Import		Export	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Australia	13.33	215757			2.71	46436														
Japan															3	9215				
Korea					0.2	1667														
Netherlands																	0.02	48		
New Zealand	4.02	57976																		
Norway					13.1	37335														
Singapore																			0.02	40
Taiwan									19	18979			26	104009					8.1	5670
United Kingdom											33.5	115456			44.5	139124	24	95998		
United States of America													0.68	8837						
Total	17.35	273733	No data	No data	16.01	85438	No data	No data	19	18979	33.5	115456	26.68	112846	47.5	148339	24.02	96046	8.12	5710

Source: Exports and Imports of Commodities, Malaysia

Table 2.5.2

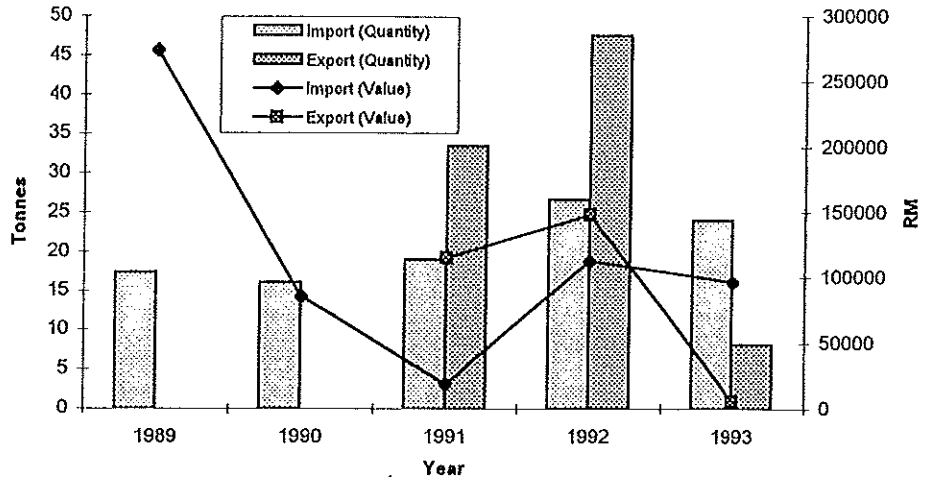
Shark's fin, dried, whether or not salted but not smoked in Malaysia, 1989 - 1993 (Value in RM, quantity tonnes)

Country	1989				1990				1991				1992				1993			
	Import		Export		Import		Export		Import		Export		Import		Export		Import		Export	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Australia	0.49	26266	0.04	480	0.1	3200	0.03	481	0.5	8742	0.14	1296	0.14	3828			0.63	11339		
Bangalesh									0.25	3239			0.61	1041						
Brunei					0.08	2700					0.37	5815			0.71	15078			0.2	6000
Chile							0.01	50									2.55	7650		
China	0.05	770							0.03	1424			0.5	2534			0.45	4509		
Fiji																	0.05	4879		
Hong Kong	1.12	34402	0.15	5064			1.29	48159	1.63	50294	0.07	4005	0.6	20730	0.01	1045	0.65	9916	9.01	280659
India							0.63	8999	0.33	4627			0.21	3089						
Indonesia	44.87	570782					40.05	478462	56.02	640435			129.19	759462			57.82	766067		
Iran							0.02	676					0.13	666						
Japan	0.01	966							4.58	47704			6.67	21533	0.01	1386	3.09	6470		
Korea			0.1	2040					0.05	1240	0.08	2240			0.12	2400			0.11	2000
New Zealand									0.03	673			0.29	2462						
Papua New Guinea													0.17	2588						
Philippines	0.01	3							0.02	40			0	8			2.63	32208		
Singapore	31.98	438695	0.87	3484					47.31	647312	1.48	7280	69.09	1045949	0.89	8839	75.58	1224307		
Sri Lanka													1.66	11100			0.66	3482		
Switzerland									0.3	4121										
Taiwan			0.04	1200													6.98	188516	20.57	408830
Thailand	0.43	12680							0.44	9805	2.78	40440								
United States of America									0.52	1549			0.23	2135	0.42	42923				
Total	78.96	1084564	1.2	12268	0.18	5900	42.03	536827	112.01	1421205	4.92	61076	209.49	1877125	2.16	71671	151.09	2259343	29.89	697489

Source: Exports and Imports of Commodities, Malaysia

Figure 2.5.1

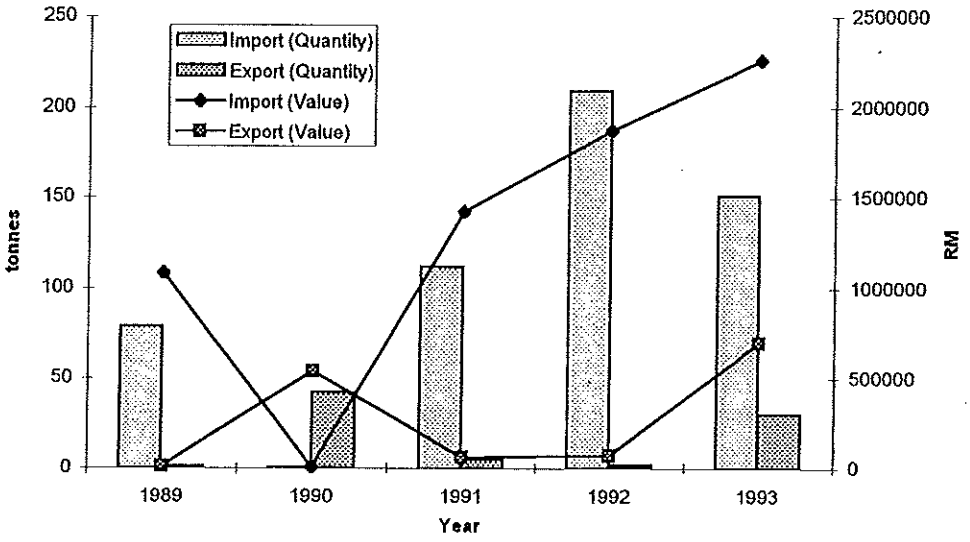
Import-Export of dogfish & other sharks excluding livers & roes, frozen (in tonnes) in Malaysia, 1989-1993



Source: *Exports and Imports of Commodities, Malaysia*

Figure 2.5..2

Shark's fin, dried, whether or not salted but not smoked (in tonnes) in Malaysia, 1989-1993



Source: *Exports and Imports of Commodities, Malaysia*

Table 3.1.1

Production of sharks (in tonnes) landed in Thailand, 1987 - 1993

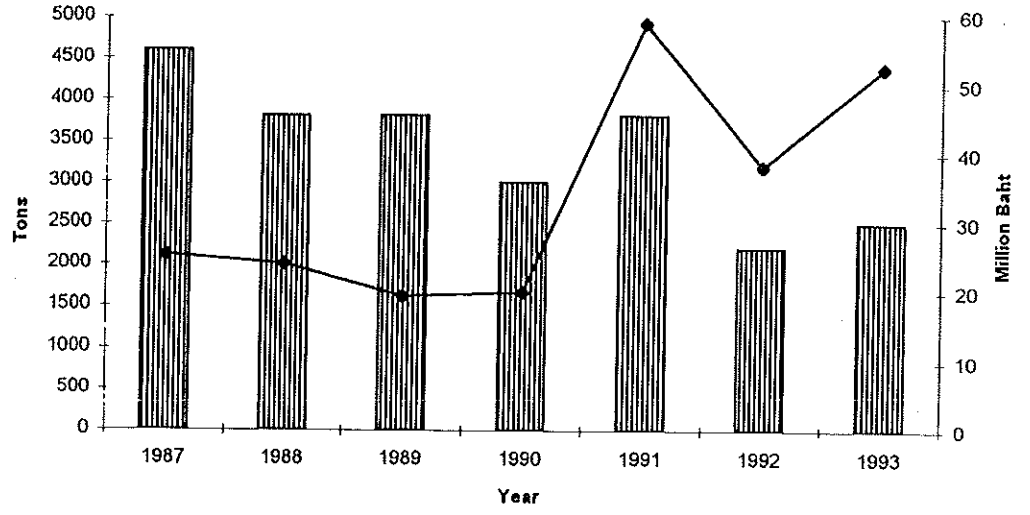
Year	Production Value		
	Tonnes ('000)	(Million Baht)	1000US$*
1987	4.6	25.4	654
1988	3.8	24.1	610
1989	3.8	19.4	499
1990	3.0	20	511
1991	3.8	59.1	1508
1992	2.2	38.2	970
1993	2.5	52.5	1329

*Exchange Rate based on FAO Statistics Series No. 121, 1993

Sources: *1) Department of Fisheries, 1992*
Fisheries Statistics of Thailand
2) Department of Fisheries, 1993
Fisheries Statistics of Thailand (Manuscript)

Figure 3.1.1

Production of sharks (in tonnes) landed in Thailand



Source: Fisheries Statistics of Thailand

Table 3.2.1

Nominal catches of sharks and rays (Rajiformes) in Thailand by areas, 1983 - 1992

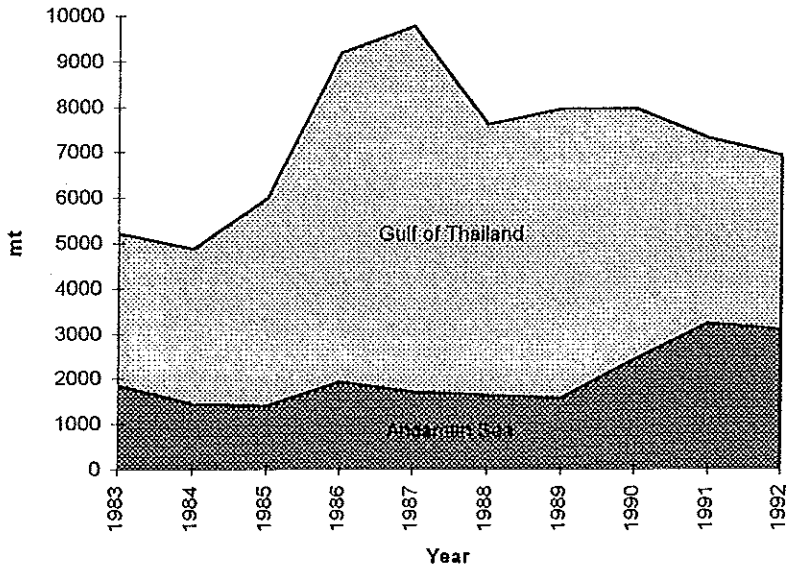
Year	Quantity(mt)	
	Area 57	Area 71
1983	1841	3365
1984	1435	3434
1985	1397	4583
1986	1927	7263
1987	1708	8054
1988	1631	5963
1989	1556	6386
1990	2432	5521
1991	3237	4050
1992	3100	3800

Area 57: Indian Ocean, Eastern (Andaman Sea)
Area 71: Pacific, Western Central (Gulf of Thailand)

Source:

Figure 3.2.1

Nominal catches of sharks and rays (Rajiformes) in Thailand by areas, 1983-1992



Source: *FAO Fishery Statistics, 1992, Vol 74: Catches and Landings*

Table 3.5.1

Trade of shark fins, dried or salted (in Metric tonnes) in Thailand, 1983 - 1992

	Import		Export	
Year	Quantity(mt)	Value(1000US$)	Quantity(mt)	Value(1000US$)
1983	147	1845	33	1021
1984	84	1071	21	389
1985	97	1614	22	647
1986	95	2020	37	1102
1987	106	2235	37	1046
1988	124	2178	51	1323
1989	84	1028	35	1079
1990	67	792	25	1229
1991	20	263	28	814
1992	60	686	18	616

Source: FAO Fishery Statistics, 1992, Vol 75: Commodities

Figure 3.5.1

Trade of sharks' fin dried or salted (in metric tonnes) in Thailand, 1983-1992

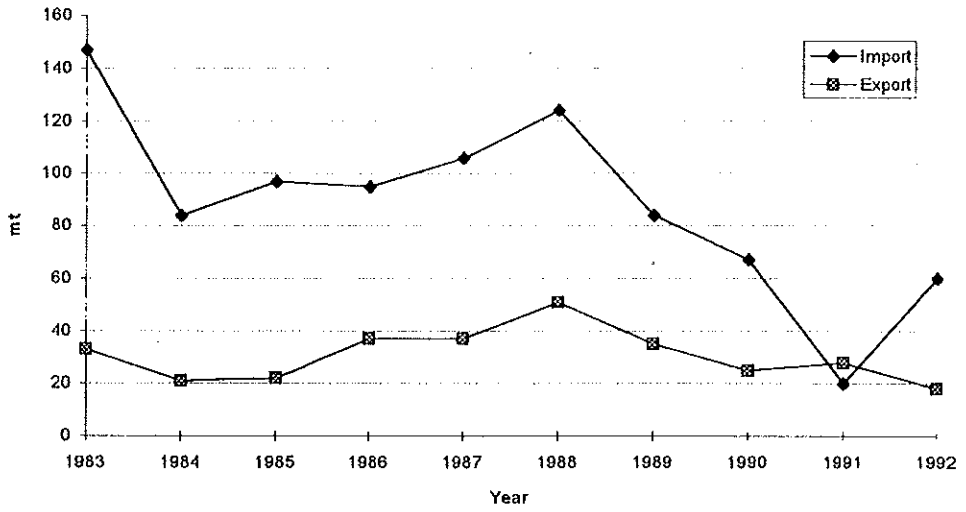


Table 3.5.2a

Import of dogfish and other sharks, excluding liver, roes, frozen (in kg) in Thailand, 1990 - 1994

Country	1990		1991		1992		1993		1994	
	Quantity	Value (Baht)	Quantity	Value (Baht)	Quantity	Value (Baht)	Quantity	Value (Baht)	Quantity	Value (Baht)
Canada	175528	5980694	198626	6741907	277999	9369352	245223	8232330	356969	11894109
Germany	123360	3966651	49547	1642089	22102	687238	95279	2616966	97037	2627736
Denmark	158589	4742781	90371	2602700	112375	3099296	121891	3422005	109697	3074636
Netherland	63819	2209964	116858	3788462	81089	2492404				
Norway	17371	400704	31643	730548	11500	262596				
U.S.A	75251	2532830	142049	4812707	25777	862792			37843	1253364
Australia	200	5203	0	0					12675	356165
Turkey	18200	707684	3460	133228						
U. Kingdom			44644	1017359	530842	16773678				
Singapore			1800	26179						
			678998	21495179						
TOTAL	632318	20546511	1357996	42990358	1061684	33547356	462393	14271301	614221	19206010

Source: Foreign Trade Statistics, Thailand

Table 3.5.2b

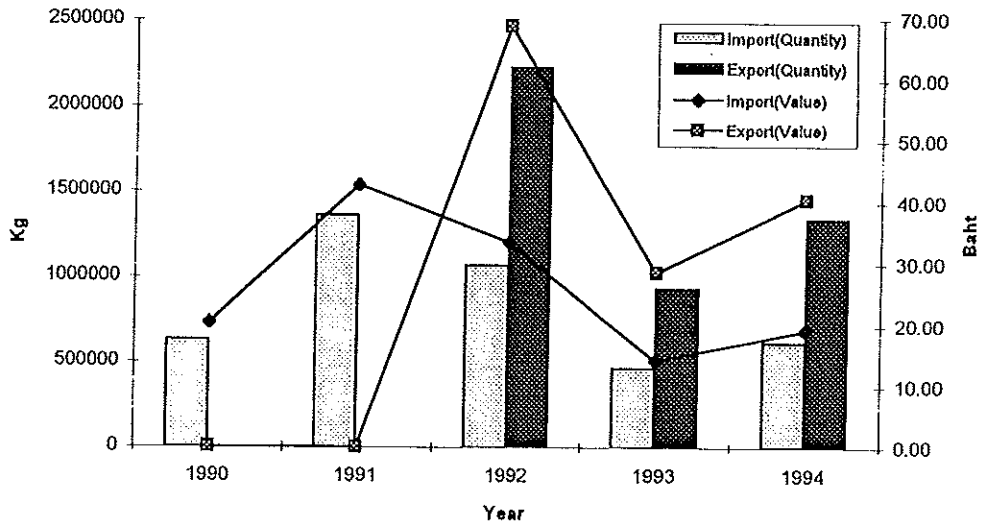
Export of dogfish and other sharks, excluding liver, roes, frozen (in kg) in Thailand, 1990 -1994

Country	1990		1991		1992		1993		1994	
	Quantity	Value (Baht)	Quantity	Value (Baht)	Quantity	Value (Baht)	Quantity	Value (Baht)	Quantity	Value (Baht)
Australia					100	3403				
Singapore					69708	1824533			18000	104059
Sweden							50	25090		
China									84000	2036706
Greece	1720	133469								
Italy			200	7866						
TOTAL	1720	133469	200	7866	69808	1827936	50	25090	102000	2140765

Source: Foreign Trade Statistics, Thailand

Figure 3.5.2

Import-Export of dogfish and other sharks, excluding liver, roes, fozen (in kg) in Thailand, 1990-1994



Source: Foreign Trade Statistics, Thailand

Table 3.5.3a

Import of shark fins, dried, whether or not salted (in kg) in Thailand, 1990 - 1994

	1990		1991		1992		1993		1994	
	Quantity	Value (Baht)	Quantity	Value (Baht)	Quantity	Value (Baht)	Quantity	Value (Baht)	Quantity	Value (Baht)
Canada	0	0			5575	1,852,777	1918	2317068	26890	14565421
China, PE	360	339448	168	26253	558	107,300	2311	2116682		
U. Kingdom	0	0			1343	960300	0	0		
Hong Kong	9793	3067705	869	527084	11361	4054400	19218	7036461	26768	7968417
India	6200	1580380			12603	3642848	15713	6469721		
Japan	700	614123	3600	1831152	21420	4285106	28390	7568445	38213	6570914
Korea	0	0			1087	359376	0	0		
Norway	1302	453324	3598	1203722	2000	969079	3471	1592460	2240	1357343
New Zealand	0	0			1608	440635	0	0		
Pakistan	500	218197			1729	481548	7254	2086475	6427	1961724
Singapore	8000	2890720			893	249477	2894	772489	8564	2617636
Tanzania	0	0			50	30852	0	0	80	46243
Denmark	0	0					742	132707		
Fiji	0	0					158	22368		
Indonesia	33210	9871723	5479	1664124			12048	4170578	13795	3755571
Peru	0	0					414	194345		
U.S.A.	35	16685					3073	861328		
Viet Nam	0	0					2146	516666	250	60401
Argetina	0	0							2460	817222
Turkey	0	0							930	258935
Uruguay	3577	923275							825	358304
Kenya	3250	279346								
Taiwan			5800	1469720						
Total	66,927	20,254,926	19,514	6,722,055	60,227	17,433,698	99,750	35,857,793	127,442	40,338,131
Average Prices Baht/Kg		303		344		289		359		317

Source: Foreign Trade Statistics, Thailand

Table 3.5.3b

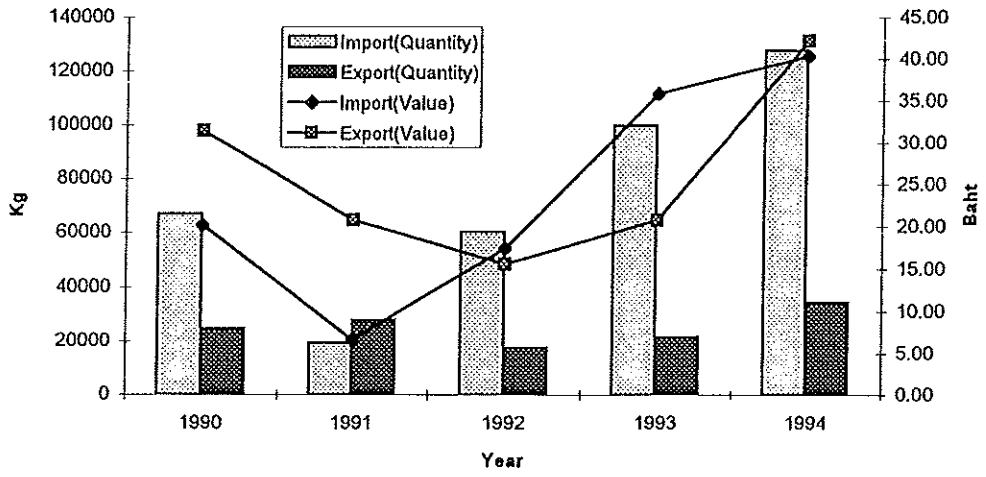
Export of shark fins, dried, whether or not salted (in kg) in Thailand, 1990 - 1994

Country	1990		1991		1992		1993		1994	
	Quantity	Value (Baht)	Quantity	Value (Baht)	Quantity	Value (Baht)	Quantity	Value (Baht)	Quantity	Value (Baht)
Austria					26	83,631	13	43652		
Australia	20	155800	10	50314	6	46,446	17	20373		
Switzerland					2	1255	0	0		
Greece					12	3307	0	0		
Hong KOng	9022	14747944	2428	3548611	8072	4957376	5491	1601778	12569	11741410
Japan	80	224616	2080	1321233	235	440376	661	1181598	6642	5604932
Singapore	15505	16068951	23310	15418185	9111	10047838	15651	17891630	14833	24641458
U.S.A.	279	220255	269	426296	332	72950				
Canada	28	8380	7	714			9	4550	5	3198
Chile							3	10650		
Papua New Gunea							11	42228		
Brunei									2	10070
Denmark									3	10449
Myanmar									432	67560
Malaysia									2	10070
New Zealand									50	86043
Saudi Arab	12	925								
Total	24946	31426871	28104	20765353	17796	15,653,179	21856	20796459	34538	42175190
Average Prices Baht/Kg		1260		739		880		952		1221

Source: Foreign Trade Statistics, Thailand

Figure 3.5.3

Import-Export of sharks' fin, dried, whether or not salted (in kg) in Thailand, 1990-1994



Source: Foreign Trade Statistics, Thailand

Table 4.1.1

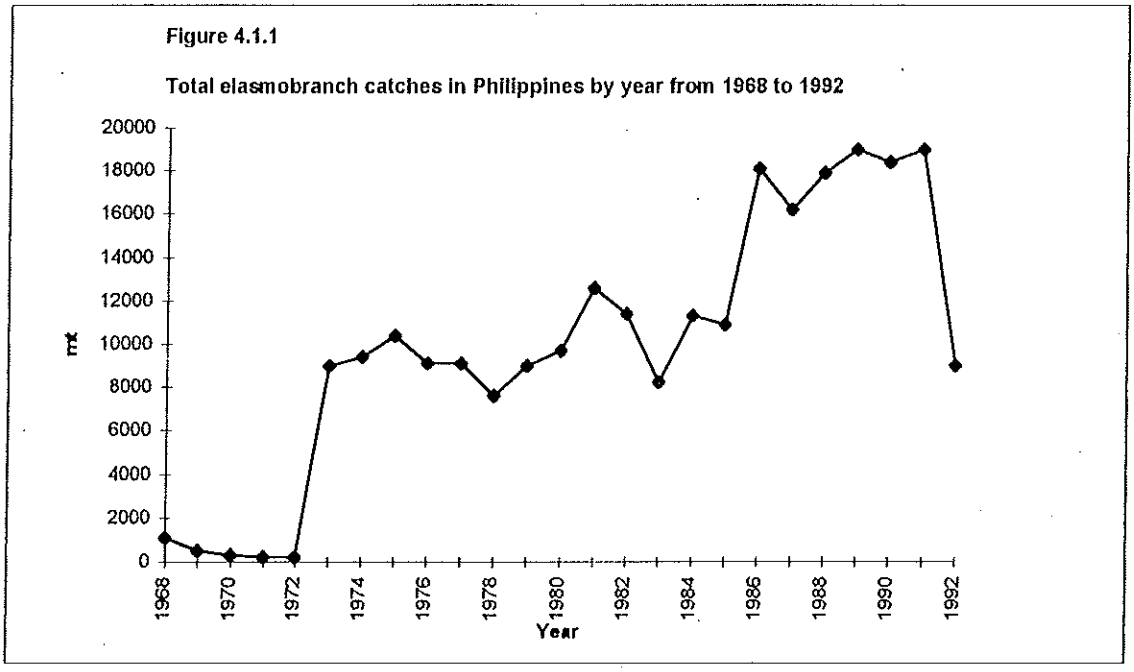
Total elasmobranch catches (in mt) in Philippines, 1968 - 1992

Year	Catch (mt)
1968	1100
1969	500
1970	300
1971	200
1972	200
1973	9000
1974	9400
1975	10400
1976	9100
1977	9100
1978	7600
1979	9000
1980	9700
1981	12600
1982	11400
1983	8200
1984	11300
1985	10900
1986	18100
1987	16200
1988	17900
1989	19000
1990	18400
1991	19000
1992	9000

Source: FAO fisheries statistics

Figure 4.1.1

Total elasmobranch catches in Philippines by year from 1968 to 1992



Source: FAO fisheries statistics

Table 4.1.2

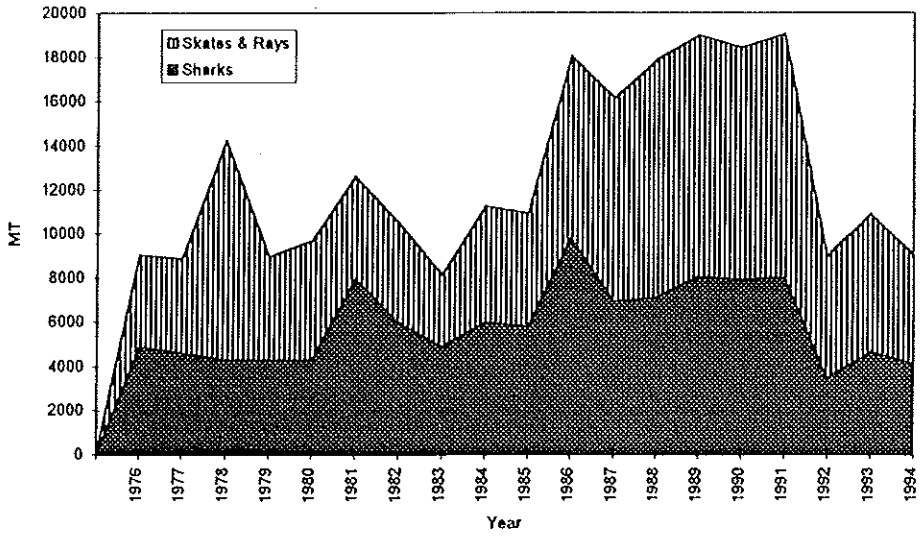
Sharks, skates and rays fishery production (MT) in Philippines, 1976 - 1994

Year	Sharks	Skates & Rays	Total	Municipal			Commercial		
				Sharks	Skates & Rays	Total	Sharks	Skates & Rays	Total
1976	4902	4163	9065	4883	3966	8849	19	197	216
1977	4620	4255	8875	4604	4192	8796	16	63	79
1978	4302	9973	14275	3876	9774	13650	426	199	625
1979	4328	4637	8965	3608	4325	7933	720	312	1032
1980	4306	5392	9698	3702	4914	8616	604	478	1082
1981	7989	4635	12624	7545	4389	11934	444	246	690
1982	6010	4531	10541	5593	5111	10704	417	320	737
1983	4887	3275	8162	4661	3019	7680	226	256	482
1984	5983	5292	11275	5817	5106	10923	166	186	352
1985	5801	5147	10948	5490	4827	10317	311	320	631
1986	9853	8205	18058	9386	7708	17094	467	497	964
1987	6967	9188	16155	5709	8708	14417	1258	480	1738
1988	7134	10745	17879	6379	9875	16254	755	870	1625
1989	8103	10877	18980	7440	9794	17234	663	1083	1746
1990	7958	10484	18442	7706	10059	17765	252	425	677
1991	8060	10989	19049	7800	10661	18461	260	328	588
1992	3497	5488	8985	3229	5165	8394	268	323	591
1993	4685	6243	10928	4376	5717	10093	309	526	835
1994	4175	4906	9081	3846	4129	7975	329	777	1106

Source: Bureau of Agriculture Statistics (BAS), Departure of Agriculture (DA)

Figure 4.1.2

Sharks, skates and rays fishery production (in MT) in Philippines, 1976-1994



Source: Bureau of Agriculture Statistics (BAS), Departure of Agriculture (DA)

Table 4.2.1

Percentage catches of sharks and rays according to fishing and zones in Philippines (data from SEAFDEC) 1988)

Type of fishery and Gear	Philippines					
	Luzon		Visayas		Midanao	
	Sharks	Rays	Sharks	Rays	Sharks	Rays
LARGE SCALE						
Purse seine	3	2	11	8		
Trawl	30	6	1	23		
Otter trawl						
Gill Net						
Hook & line	2					
Others		0	0			
SMALL SCALE						
otter trawl				1		0
Gill/drift net	21	30	8	42	15	81
Hook/long line	38	42	76	22	57	7
Trap		7		3	0	1
Others	6	12	3	4	28	10
TOTAL CATCH (mt)	1513	3132	1742	1924	3879	5689

Source: SEAFDEC 1988 as reported in Bonfil, 1994

Table 4.2.2

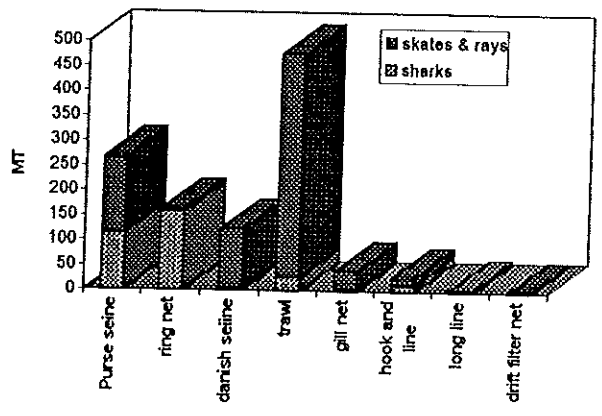
Skates & rays commercial production (in MT), Philippines, 1990 & 1994

Gear	1994			1990		
	Species		Total	Species		Total
	sharks	skates & rays		sharks	skates & rays	
bagnet				2.938	3.121	6.059
Purse seine	116	152	268	163.521	262.097	425.618
ring net	158	6	164	6.007	8.521	14.528
round haul seine				4.305	1.763	6.068
danish seiine	5	118	123	3.354	11.726	15.080
beach seine				1.104	0.399	1.503
trawl	29	447	476	60.094	123.799	183.893
gill net	3	37	40	0.207	0.256	0.463
hook and line	13	16	29	8.249	11.559	19.808
long line	5		5	1.999	1.133	3.132
troll line					0.001	0.001
drift filter net		1	1	1.607	0.107	1.714
TOTAL	329	777	1106	250.447	421.361	671.808

Source: Bureau of Agricultural Statistics (BAS), Department of Agriculture (DA)

Figure 4.2.2

Skates & rays commercial fishery production (in MT), Philippines, 1994



Source: Bureau of Agricultural Statistics (BAS), Department of Agriculture (DA)

Table 4.3.1

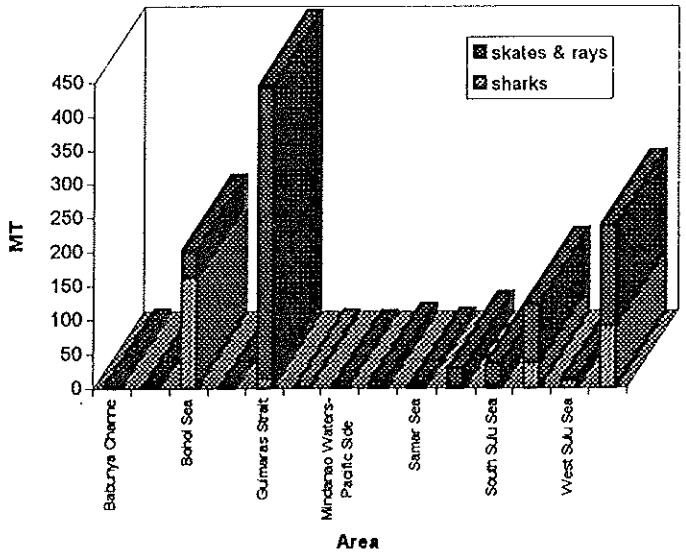
Sharks, skates and rays commercial fishery production (in MT) by fishing area and gear in Philippines, 1990 & 1994

Area	1994			1990		
	Species		Total	Species		Total
	sharks	skates & rays		sharks	skates & rays	
Babunya Channe		3	3	10.839	3.560	14.399
Batangas Coast	1	1	2			
Bohol Sea	163	39	202	0.265	2.370	2.635
Camotes Sea				0.017	0.003	0.020
Cuyo Pass				2.110	2.934	5.044
Davao Gulf		1	1	0.076	0.005	0.081
East Sulu Sea				3.545	10.752	14.297
Guimaras Strait	14	430	444	0.325	3.033	3.358
Lamon Bay				5.994	16.818	22.812
Leyte Gulf				0.043	0.007	0.050
Lingayan Gulf				2.745	0.538	3.283
Manila Bay	2		2	4.140	0.495	4.635
Mindanao Waters-Pacific Side		1	1			0.000
Moro Gulf	2	9	11	10.527	0.528	11.055
Ragay Gulf				0.572	0.661	1.233
Samar Sea	1	3	4	0.108	3.608	3.716
Sibuyan Sea	1	27	28	5.612	21.485	27.097
South Sulu Sea	5	31	36	14.704	7.140	21.844
Visayan Sea	38	84	122	62.207	218.155	280.362
West Sulu Sea	11	1	12	32.896	16.200	49.096
West Palawan Waters	91	147	238	96.660	116.190	212.850
Total	329	777	1106	253.385	424.482	677.867

Source: *Bureau of Agricultural Statistics (BAS), Department of Agriculture (DA)*

Figure 4.3.1

Sharks, skates and rays commercial fishery production (in MT) by fishing area, Philippines, 1994



Source: *Bureau of Agricultural Statistics (BAS), Department of Agriculture (DA)*

Table 4.3.2

Navotas Port Sharks Unloadings (MT), wholesale, Philippines, 1991 - 1995

Month	Shark unloadings (MT)				
	1991	1992	1993	1994	1995
January	14.45	11.93	8.06	9.18	0.72
February	11.3	11.43	2.3	6.48	2.39
March	10.49	5.09	7.16	4.19	0.59
April	4.64	6.12	2.7	6.84	0
May	5.76	3.2	6.84	4.28	0.5
June	3.47	5.94	7.11	2.61	14.09
July	10.71	13.28	8.15	7.65	1.58
August	5.81	7.47	4.37	7.52	3.65
September	2.7	18.45	6.08	6.03	1.49
October	11.79	1.8	6.26	1.08	0.81
November	7.92	8.37	8.69	2.61	0
December	8.6	8.24	4.95	0.63	2.34
Total	97.64	101.32	72.67	59.1	28.16

Source: Philippine Fisheries Development Authority, WWF Philippine Program

Table 4.3.3

Navotas Port Sharks Unloadings (MT), retail & overland, Philippines, 1987 - 1995

Month	Shark unloadings (MT)								
	1987	1988	1989	1990	1991	1992	1993	1994	1995
January	0.135			0.225		6.83	10.94	5.85	4.19
February	0.09					23.21	9.27	6.48	6.75
March	0.495		0.315			7.28	8.78	8.33	20.66
April	0.72		1.215		1.575	15.93	12.51	3.15	5.63
May	0.135		0.765		5.895	90.55	17.46	19.13	2.7
June	2.07		0.225	0.585	0.45	28.67	13.73	12.15	17.51
July	1.215				0.855	39.59	17.55	10.04	21.11
August	0.045					84.18	14.13	6.39	3.65
September	0.675					20.48	7.47	7.2	0
October			1.845		1.665	45.05	6.44	7.38	4.46
November					1.935	90.55	14.81	3.74	0.23
December		0.135			1.215	60.52	5.63	1.44	6.35
Total	5.58	0.135	4.365	0.81	13.59	512.84	138.72	91.28	93.24

Source: Philippine Fisheries Development Authority, WWF Philippine Program

Table 4.5.1

Export of sharkfins, dried or not salted (quantity in nk), Philippines, 1990 - 1994

Country	1990		1991		1992		1993		1994	
	Quantity (nk)	Value FOB$	Quantity (nk)	Value FOB$	Quantity (nk)	Value FOB$	Quantity (nk)	Value FOB$	Quantity (nk)	Value FOB$
Australia									20	200
Brunei							698	5214	478	5974
China RP									350	3500
Hong Kong	6064	53641	5332	50517	35001	382997	30837	295464	9478	92097
Japan							461	17854		
Korea							500	9750	1800	52380
Singapore			3482	23844	1174	30386	186	1860	481	8502
Taiwan			67	270	63	1580				
Total	6064	53641	8881	74631	36238	414963	32682	330142	12607	162653
Average Price $/Kg		8.85		8.40		11.45		10.10		12.90

Source: *National Statistics Office (NSO)*

Table 4.5.2

Export of shark liver oil & franctions not chemically mofified, solidfied/hardened, mechanical means (quantity in nk & value in F.O.B US$), Philippines, 1990 - 1994

Country	1990		1991		1992		1993		1994	
	Quantity (nk)	Value FOB$	Quantity (nk)	Value FOB$	Quantity (nk)	Value FOB$	Quantity (nk)	Value FOB$	Quantity (nk)	Value FOB$
Hong Kong	91187	653166	696	6960						
Japan			133433	1120652	107916	994562	97349	806070	26875	207228
Korea			4320	4369	2340	18720	39017	39017	14400	148104
Taiwan					189	465	190	1000		
Total	91187	653166	138449	1131981	110445	1013747	136556	846087	41275	355332
Average Price $/Kg		7.16		8.18		9.18		6.20		8.61

Source: *National Statistics Office (NSO)*

Table 4.5.3

Export of squalene oil (Quantity in kg & value in Pesos), Philippines, 1973 - 1981

Year	Quantity(Kg)	Value(Pesos)
1973	7300	59300
1974	11412	150867
1975	45364	636895
1976	252386	4363710
1977	95546	1570572
1978	83622	1376395
1979	261743	5596588
1980	336079	11849896
1981	190190	6519156

Source: *Fisheries Statistics of the Philippines*

Table 4.6.1

Initial Data on the Studies of abundance and size-weight relationship of sharks in Zamboanga, Philippines

Species	Length (cm)	Weight (Kg)	Date caught
Galeocerdo cuvier	239	92.5	14/5/95
	150	15	31/3/96
Negaprion brevirostris	188	75	14/5/95
Galeorhinus zyopterus	183	42.5	13/6/95
	187	30	17/6/95
	234	70	22/6/95
	108	9	30/6/95
	167	43	30/6/95
	182	47	30/6/95
	165	38.5	13/7/95
	142	33	11/9/95
	168	40	3/10/95
	150	36	24/10/95
	186	46	22/11/95
	152	31	20/12/95
	147	36	21/12/95
	130	27	21/12/95
Carcharhinus milberti	189	60	15/6/95
	145	35	13/7/95
	228	51	3/8/95
	157	37	11/9/95
	145	35	3/10/95
	200	42	22/11/95
Carcharhinus longimanus	218	45	8/8/95
Carcharhinus limbatus	400	90	2/4/96
	100		
	150	25-30	3/4/96
Triaenodon obesus	150		1/4/96
	100		2/4/96
Rhinobatidae	100		2/4/96
Alopias vulpinus	400-500	45	2/4/96
Sphyrna mokarran	400-500	120	2/4/96
Carcharhinus amblyrhynchos	100		3/4/96
	150		3/4/96
	200		3/4/96
Isurus oxyrinchus		187	February

Source: Zamboanga State College of Marine Science and Technology

Table 4.6.2

Market survey of species used and prices between March to April, 1996 in Zamboanga City, Philippines

By-product	Specific Item	Size	Price (PhP/Kg)		
			Market	Fisherman Trader	Trader to Manila
Dried Fine	Black fin (moon cut)	XLarge (16" & up)		2300	2500
	e.g. hammerhead & tiger	Large (12" & below 16")		2100	2300
		Medium (8" & below 12")		1400	1700
		Small (5" & below 8")		700	1000
		XSmall (Below 5")		300	400
	White fin (straight cut)	Large (12" & up)		3100	3400
	e.g. guitar fish	Medium (8" & below 12")		1700	1900
		Small (below 8")		1100	1300
Fresh fins	Small tiger		120		
Dried Meat			40		
Fesh Meat			35		
Liver Oil	Squalus acanthias	200 liters		2000	3000
Fresh Jaws	medium tiger		110		
Dried Jaws	large bull shark		1200		
	spiny dogfish		800-1000		
Whole Shark	guitar fish		10000		
	3 sharks weighing 300 k (2- hammerheads (S. mokarran) & 1-C. limbatus)		2400		
Dried skin			50		

Source: WWF Philippine Programs

Table 4.6.3

Market survey of species utilized from March - April, 1996 in Zamboanga, Philippines

Date	Common Name	Local Name	Scientific Name	No	TL (m)	WT(kg)	Sex	Others
31-Mar	tiger shark	kaitan mengali	*Galeocerdo cuvier*	1	1.5	15	M	
				1		130		only the meat was observed
	nurse shark	kaitan tutungan	*Traenodon obesus*	3	1			
	whitetip reef shark	mangkeso	*Carcharhinus melanopterus*	2	1.5			
1-Apr	blackfin reef shark	tutungan		1	1.5			
	nurse shark	kaitan tutungan	*Traenodon obesus*	5	1.5			
	whitetip reef shark	mangkeso	*Carcharhinus melanopterus*	1	1			
2-Apr	nurse shark	kaitan tutungan	*Traenodon obesus*	16	1.5			
	tiger shark	kaitan mengali	*Galeocerdo cuvier*	1	11			
	whitetip reef shark	mangkeso	*Carcharhinus melanopterus*	3	1			
	guitar fish	malu-malo	*Rhinobatidae*	4	1			
	thresher skark	lukay	*Alopius vulpinus*	1	4-5	45	F	wt-w/o head, fins and rntrails
								w/2 non-full term pups & several eggs
	great hammerhead	pamingkungan	*Sphyrna mokarran*	1	4-5	120	M	
				1	4-5	90	F	
	blacktip shark	tuntungan	*Carcharhinus limbatus*	1	4	90	F	
3-Apr	nurse shark	kaitan tutungan	*Traenodon obesus*	4	1			
	blacktip			2	1			
	blacktip shark	tuntungan	*Carcharhinus limbatus*	2	1.5	25-30		
	grey reef shark	atungan	*Carcharhinus amblyrhynchos*	19	1			
				2	1.5			
				1	2		M	
February	mako shark	kalang-kalang	*Isurus oxyrinchus*	1		187		2nd data; wt-w/o head, fins and entrails
No date	spiny dogfish	dogfish	*Squalus acanthias*					

Source: WWF Philippine Programs

Table 5.2.1

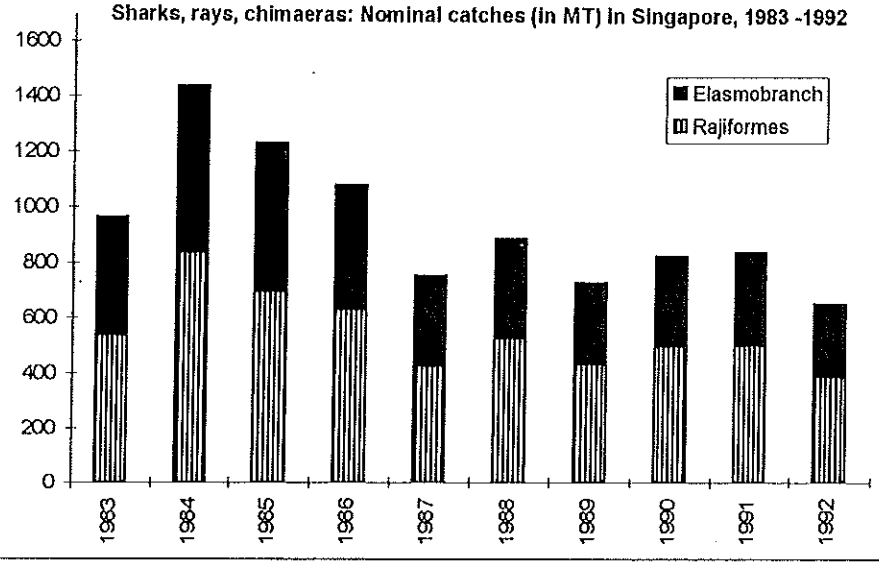
Sharks, rays, chimaeras: Nominal catches by species, fishing areas and countries areas, 1983 - 1992

Year	Quantity(mt)			% of total	
	Rajiformes	Elasmobranch	Total	Rajiformes	Elasmobranch
1983	538	425	963	55.9	44.1
1984	838	598	1436	58.4	41.6
1985	695	533	1228	56.6	43.4
1986	631	445	1076	58.6	41.4
1987	425	327	752	56.5	43.5
1988	526	358	884	59.5	40.5
1989	433	293	726	59.6	40.4
1990	498	322	820	60.7	39.3
1991	500	335	835	59.9	40.1
1992	388	262	650	59.7	40.3
Total				585.4	414.6
Mean				58.5	41.5

Source: *FAO Fishery Statistics, 1992, Vol 71: Catches and Landings*

Figure 5.2.1

Sharks, rays, chimaeras: Nominal catches (in MT) in Singapore, 1983 -1992



Source: *FAO Fishery Statistics, 1992, Vol 71: Catches and Landings*

Table 5.3.1

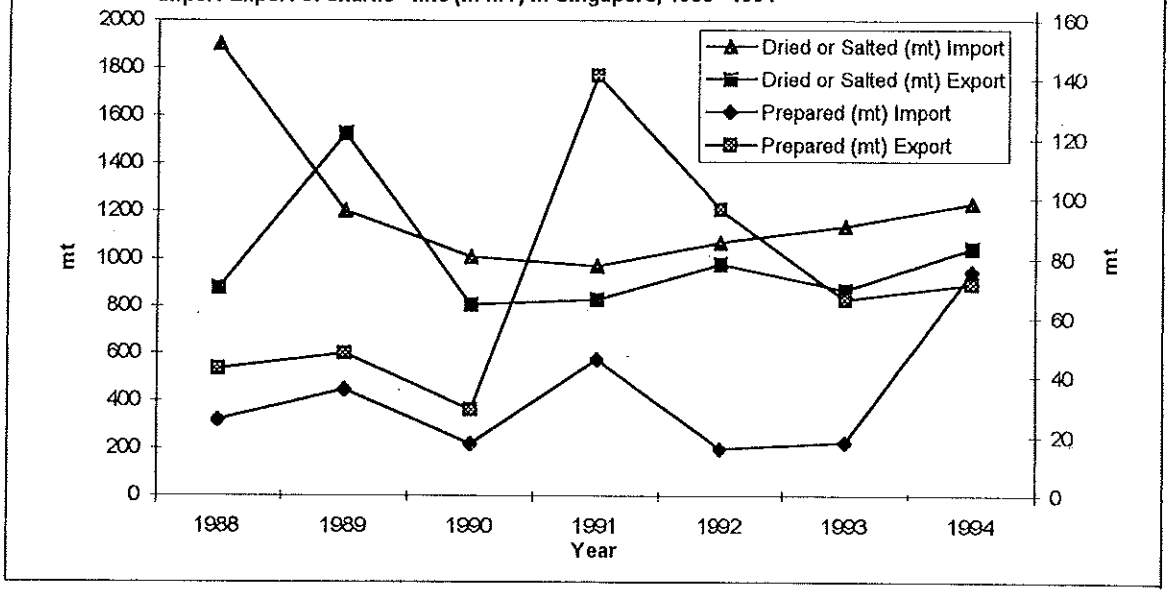
Import and export of shark fins (in mt) in Singapore, 1988 - 1994

Year	Dried or Salted (mt)		Prepared (mt)	
	Import	Export	Import	Export
1988	1899	877	26	43
1989	1198	1525	36	48
1990	1006	806	18	29
1991	968	828	46	141
1992	1066	977	16	96
1993	1133	869	18	66
1994	1230	1042	76	71

Source *City Veterinary Centre, Primary Production Deprtment*

Figure 5.3.1

Import-Export of sharks' fins (in MT) in Singapore, 1988 - 1994



Source *City Veterinary Centre, Primary Production Deprtment*

Table 5.3.2

Import of sharks' fin, dried or salted (quantity in tonnes & values in S$) in Singapore, 1990 - 1995

Country	1990		1991		1992		1993		1994		1995*	
	Quantity(tonne)	Value (S$'000)	Quantity(tonne)	Value (S$'000)	Quantity(tonne)	Value (S$'000)	Quantity(tonne)	Value (S$'000)	Quantity(tonne)	Value (S$'000)	Quantity(tonne)	Value (S$'000)
Australia	15	595	11	617	5	311	15	1075	8	561	6	473
Bahrain									1	30		33
Bangaladesh	7	187	9	327	10	428	5	222	2	41	1	27
Brazil	36	781	12	763	2	142	2	132	1	38		
Burma			5	199	1	45						
Canada			4	158	1	58						
Chile									2	152	1	68
China, PE	8	413	23	1286	3	306	9	742	2	152	16	430
Colombia	3	177										
Costa Rica											2	324
Democratic Yemen			9	342	1	50						
Djibouti	3	79			1	26	5	173				
Ecuador	1	29			2	205						
Egypt					1	48	2	88	2	132	1	46
Fiji			4	243	3	161	3	145	5	198	2	114
Germany			1	50								
Ghana	7	203	1	41	1	65	2	101	2	116	1	26
Guam									2	93	1	29
Guatemala							3	303				
Hong Kong	100	6642	113	11002	124	12170	130	11449	90	7752	102	6826
India	149	3396	121	3166	176	4961	162	4047	135	5360	106	5044
Iran									1	27		
Japan	88	2544	104	4664	95	6719	81	5293	118	6087	50	3018
Kenya	26	653	13	346	11	510	15	587	29	1052	6	307
Korea Rep. of	43	1172	82	3056	39	2003	36	2047	63	2571	28	1377
Kuwait									2	29	2	35
Liberia	1	40										
Madagascar	4	107	2	62	6	261	5	176	11	191		
Malaysia	9	52	5	36	4	59	11	135	6	264	2	298
Maldives Rep. of	4	127	13	726	17	1030	16	1142	23	985	11	946
Mauritius	7	132	18	314	8	282	35	373	92	517		
Mexico					n/a	57						
Mozambique	2	123	4	148								38
New Zealand	20	462	11	303	14	488	12	563	23	1101	14	1000

Table 5.3.2

Import of sharks' fin, dried or salted (quantity in tonnes & values in S$) in Singapore, 1990 - 1995 (continued)

Country	1990		1991		1992		1993		1994		1995*	
	Quantity(tonne)	Value (S$'000)	Quantity(tonne)	Value (S$'000)	Quantity(tonne)	Value (S$'000)	Quantity(tonne)	Value (S$'000)	Quantity(tonne)	Value (S$'000)	Quantity(tonne)	Value (S$'000)
Noethern Mariana Islands											3	138
Norway	1	26	10	316	6	293	2	139	1	43	1	44
OC Africa	2	42			4	324	6	429	16	420	1	85
OC America	1	47	5	310	1	142			2	198		
OC Asia	9	773	10	524	9	543	1	227				
OC Oceania									4	99	3	177
Oman	15	432	20	1030	32	1709	37	278	3	121	2	70
Other Countries	4	67	3	91	3	44	8	184	2	71	2	66
Pakistan	106	3081	75	2587	108	4497	72	2078	78	2635	83	3712
Papua New Guinea					3	107	3	89	5	118	4	257
Peru			1	88	3	165	4	219	6	138		
Philippines					1	30			1	94	1	41
Portugal									6	259		
Qatar												43
Saudi Arab	5	134	9	317	13	348	10	271	11	322	7	217
Seychelles	9	520	9	498	11	845	11	925	9	792	10	891
Soloman Islands					1	147	2	195	1	92	2	156
Somali Dem Rep	3	56	3	102	4	259						
South Africa											16	424
Spain	62	2238	40	1472	36	1953	77	2073	66	1546	47	1585
Sri Lanka	52	1793	45	1915	60	3812	55	3300	72	3196	75	3782
Taiwan	7	90	12	706	24	867	80	859	55	979	126	3112
Tanzania			1	83			2	83			2	74
Thailand	27	821	3	229	2	291	12	1046	16	994	3	153
Turkey	3	48	1	34								
United Arab Emirates	37	1210	14	706	34	2107	31	2145	24	1753	21	1396
United Kingdom					n/a	29						
United States	3	238	5	452	6	425	14	1454	37	1952	34	2064
Uruguay	11	448					2	46	33	369		
Venezuela							4	414	1	37		
Vietnam							5	579	3	763	6	2234
Yemen	116	3360	137	5338	181	7892	149	5821	160	5821	112	4710
Total	1006	33338	968	44647	1067	57214	1136	51647	1232	50261	913	45890

*Jan-Nov 1995

Source: Trade Development Board Statistics, Singapore

Table 5.3.3

Import of sharks' fin, prepared (quantity in tonnes and value in S$) in Singapore, 1990 - 1995

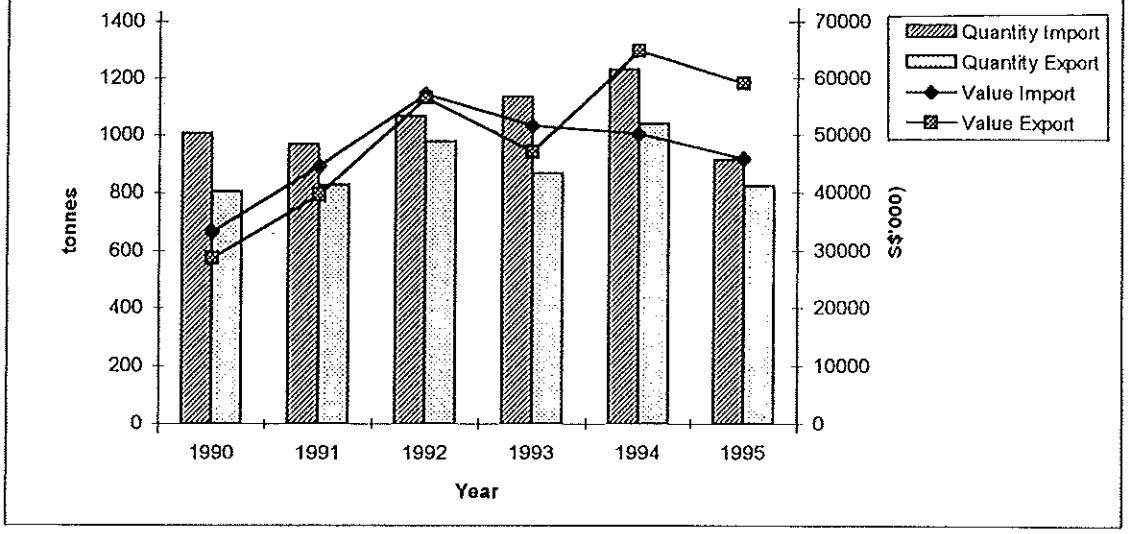
Country	1990		1991		1992		1993		1994		1995*	
	Quantity(tonne)	Value (S$'000)	Quantity(tonne)	Value (S$'000)	Quantity(tonne)	Value (S$'000)	Quantity(tonne)	Value (S$'000)	Quantity(tonne)	Value (S$'000)	Quantity(tonne)	Value (S$'000)
Australia			897	60			1868	114	19259	368	10205	255
Burma					380	25						
Chile												
China Rep of	150	27										
Hong Kong	7782	478	3152	328			5823	629	16595	1307	37314	3126
India							1745	33			917	98
Japan	521	40			322	40					2223	246
Maldives					2663	218			750	36		
Mexico					3320	433						
New Zealand											991	62
Oceania Africa					270	25	309	74	201	26		
Oceania America									879	60		
Other Countries	270	34	7386	55	2346	53	4042	73	3792	100	5257	57
Pakistan			6778	306	1275	93						
Papua New Guinea											2100	147
Peru			1820	45								
Spain									35136	459	53216	621
Sri Lanka	417	39			4272	307	2259	201			6098	285
Thailand	8744	319	14466	587	247	27	1737	202	178	24		
United Arab Emirates			2167	93	1032	37	417	27				
United Kingdom			10,010	90								
United States											12315	63
Uruguay											10900	100
Total	17884	937	46676	1564	16127	1258	18200	1353	76790	2380	141536	5060

*Jan-Nov 1995

Source: Trade Development Board Statistics, Singapore

Figure 5.3.2

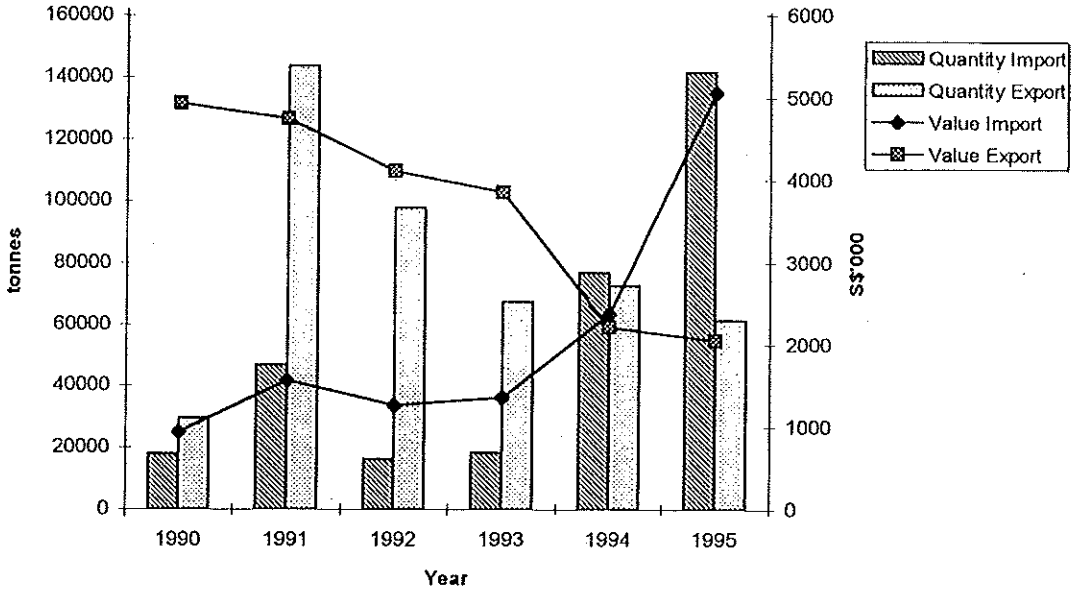
Import-Export of sharks' fins, dried or salted in Singapore, 1990 - 1995



Source: Trade Development Board Statistics, Singapore

Figure 5.3.3

Import-Export of sharks' fin, prepared in Singapore, 1990 - 1995



Source: Trade Development Board Statistics, Singapore

Table 5.3.4

Export of sharks' fin, dried or salted (quantity in tonnes and value in S$) in Singapore, 1990 - 1995

Country	1990		1991		1992		1993		1994		1995*	
	Quantity(tonne)	Value (S$'000)	Quantity(tonne)	Value (S$'000)	Quantity(tonne)	Value (S$'000)	Quantity(tonne)	Value (S$'000)	Quantity(tonne)	Value (S$'000)	Quantity(tonne)	Value (S$'000)
Australia	2	94	1	112	1	219	2	299	1	43		
Brunei Darussalam	16	171	6	94	1	42	1	43	3	270	2	274
Burma	96	3174	122	3230	110	2611	81	2042	59	2702	40	2895
Canada	1	112					n/a	50				
China			2	112	47	2256					8	273
France			1	142	n/a	67	1	279	n/a	83		
Germany					n/a	30						
Hong Kong	503	21883	554	31885	673	47742	632	40611	732	49422	583	42483
India							1	42				
Japan	3	326	33	1698	4	111	2	281	1	100	1	67
Korea Rep of	n/a	30			1	73	2	139		37		
Malaysia	133	1593	77	1577	110	1840	106	1516	112	7811	104	9578
Mauritius												
Other Countries			n/a	52	1	49	n/a	40			n/a	31
Philippines	1	28			3	53	5	104	6	112	6	128
Saudi Arab												
Seychelles					n/a	34						
Sri Lanka												
Soloman Islands								30				
Taiwan	18	566	17	509	5	171	4	166	66	544	35	1061
Thailand	31	697	11	240	12	580	30	1413	38	2681	33	2071
United Arab Emirates					2	96						
United Kingdom			2	26	n/a	32						
United States	2	97	1	27	8	533	n/a	28	6	66	10	241
Vietnam												
Yemen									17	965		
Total	806	28771	827	39704	978	56539	867	47083	1041	64836	822	59102

*Jan-Nov 1995

Source: Trade Development Board Statistics, Singapore

Table 5.3.5

Export of sharks' fin, prepared (quantity in tonnes and value in S$) in Singapore, 1990 - 1995

Country	1990		1991		1992		1993		1994		1995	
	Quantity(tonne)	Value (S$'000)	Quantity(tonne)	Value (S$'000)	Quantity(tonne)	Value (S$'000)	Quantity(tonne)	Value (S$'000)	Quantity(tonne)	Value (S$'000)	Quantity(tonne)	Value (S$'000)
Australia	413	102	3439	99	884	43					357	25
Brunei Darussalam	235	30			825	90			2000	184	2835	173
France	1210	161	316	38	401	78	134	34	3240	28	3240	26
Germany, Fed Rep of	1206	184	665	119	1139	234	1118	243	1000	216	1107	239
Hong Kong	3102	255	46867	1619	21636	795	28694	1535	43890	608	22660	540
Italy	440	42										
Japan	19101	3869	12612	2005	13132	2247	6816	1690	5872	789	1567	394
Malaysia			728	74	531	67	1294	32	5956	159	5233	149
Other Countries	572	48	2615	60	2209	44	945	43	752	39	1168	26
Philippines			10288	217	6730	117	3212	53	2160	39	5180	81
Taiwan	306	32	52464	354	42322	294	18233	136	5063	99	3800	50
Thailand											11608	106
United Kingdom			3671	51	3122	41						
United States	2815	211	10035	110	4882	62	6958	88	2607	54	2647	246
Total	29400	4934	143700	4746	97813	4112	67404	3854	72540	2215	61402	2055

*Jan-Nov 1995

Source: Trade Development Board Statistics, Singapore

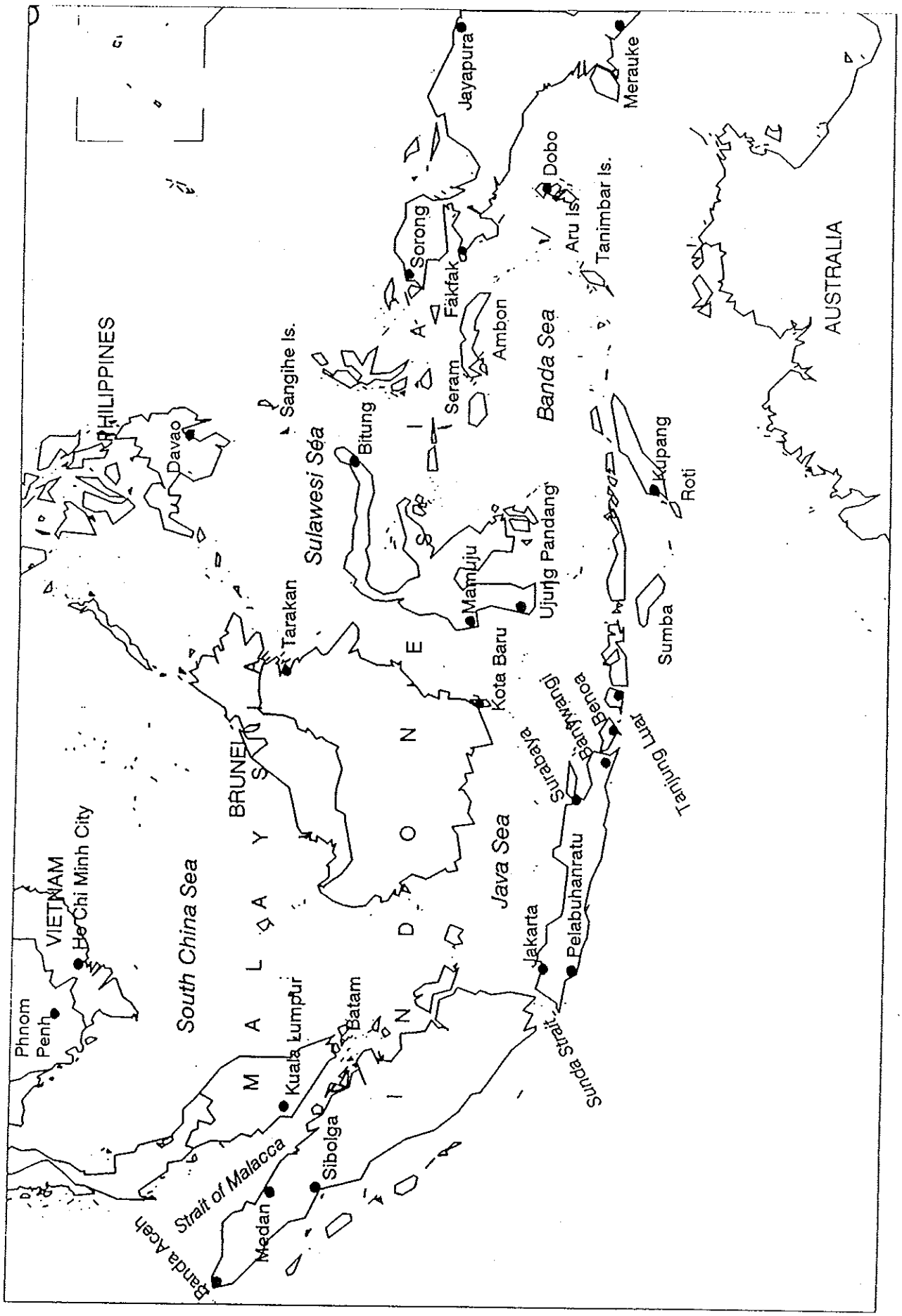
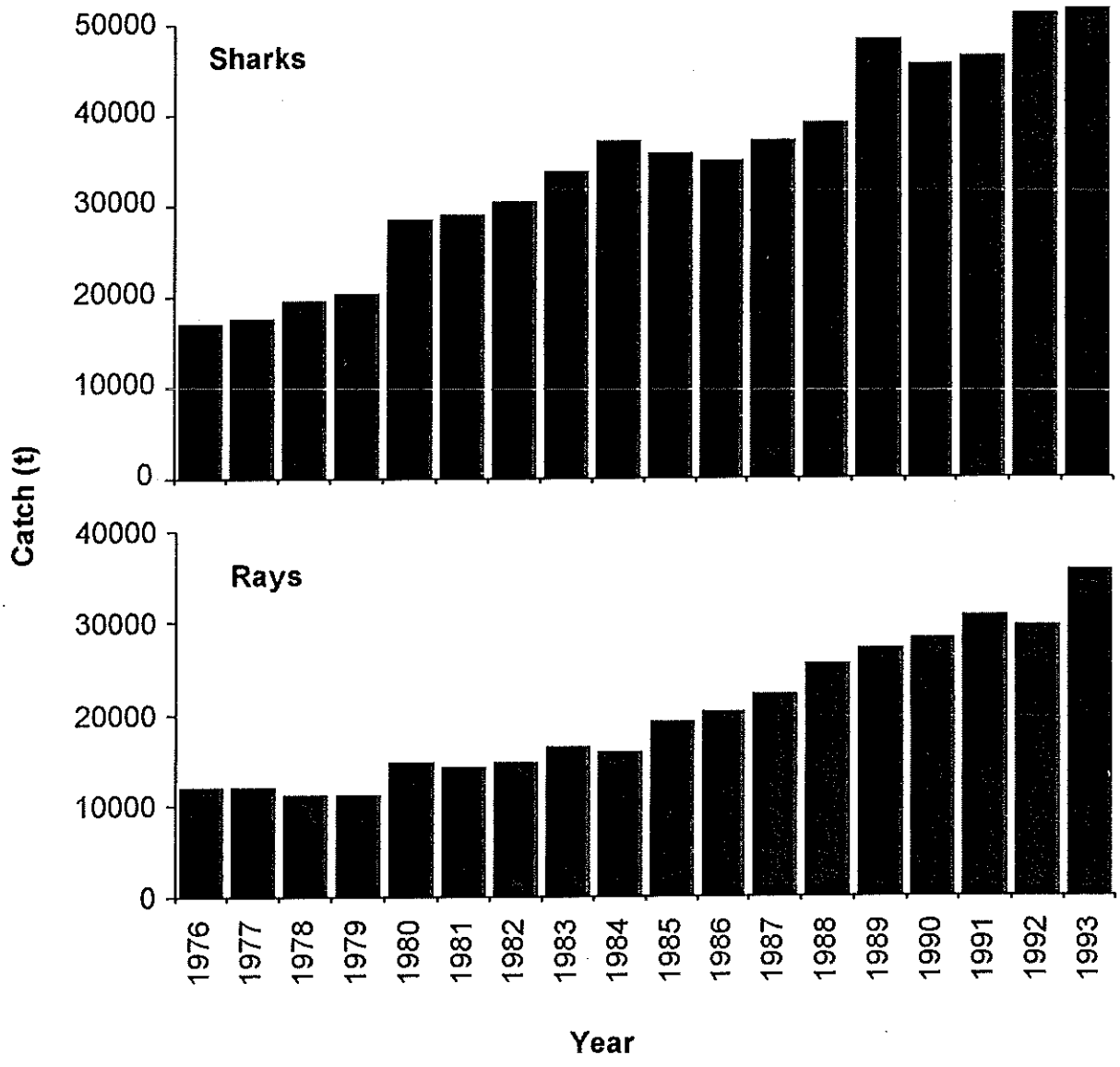


Figure 6.1.1

Map of Indonesia indicating cities, ports, seas and islands referred to in the text.

Figure 6.1.2

Total catches of rays and sharks in Indonesia, 1976-1993. The value for ray catch in 1988 was estimated from Figure 2.28 in Bonfil (1994).



Fisheries statistics

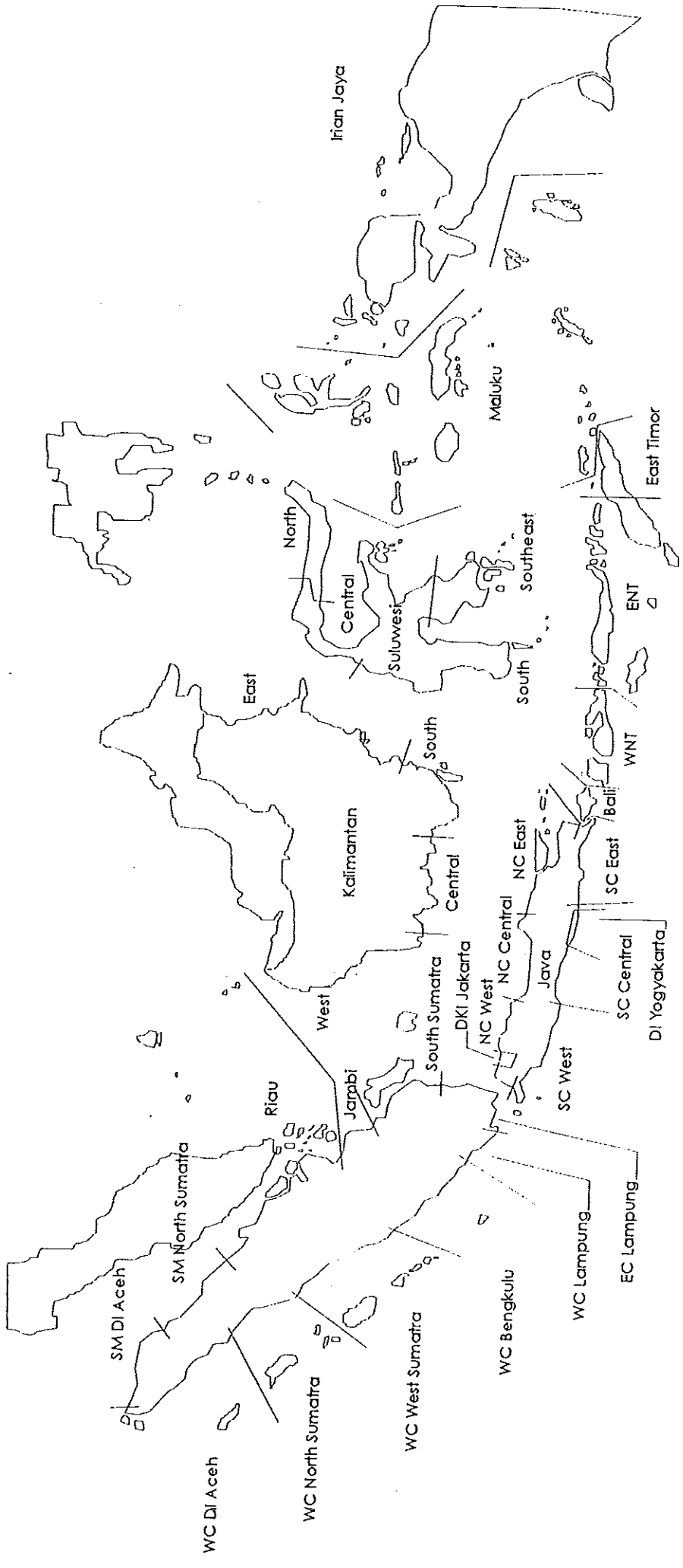


Figure 6.3.1

Map of Indonesia showing the regions and provinces for which separate data is provided in annual fisheries statistics summaries

Figure 6.3.2

Geographical distribution of shark catches in 1977, 1982, 1987 and 1991. The area of the circles is proportional to the amount of catch in that region/province.

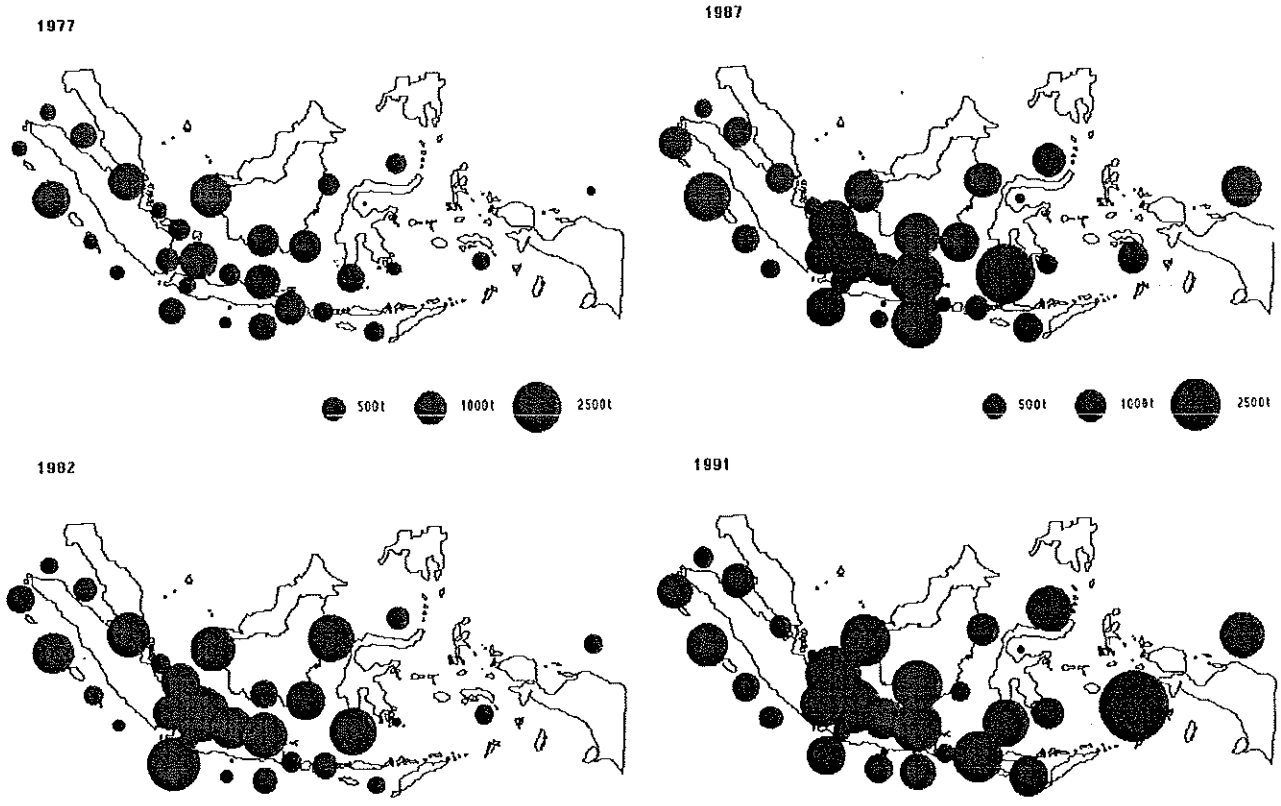


Figure 6.3.3

Changes in the catch of sharks in each region/province from 1976 to 1993. Lines represent a three year moving average, except for first and last years, where absolute values have been used.

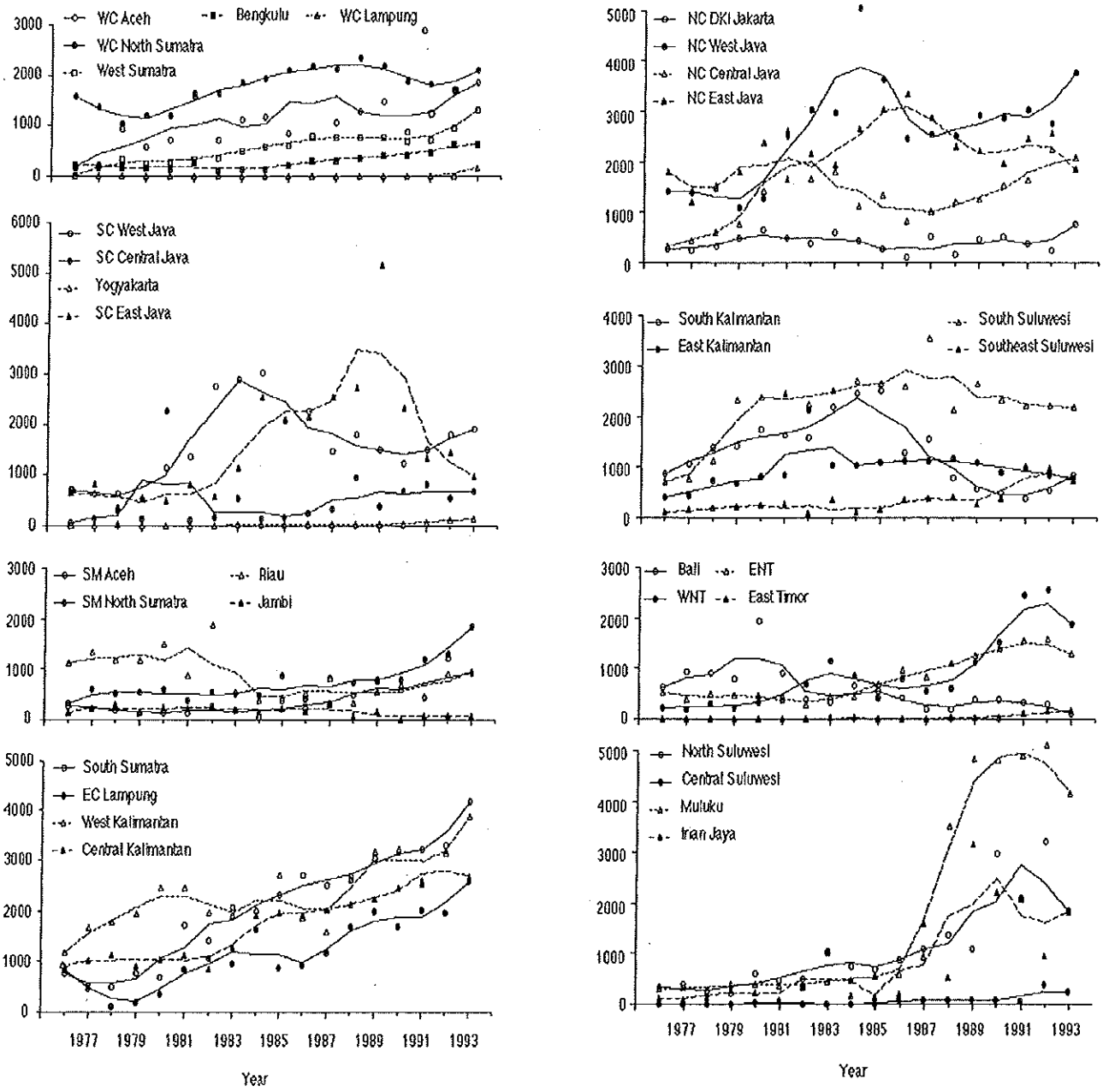


Figure 6.3.4

Geographical distribution of ray catches in 1977, 1982, 1987 and 1991. The area of the circles is propotional to the amount of catch in that region/province.

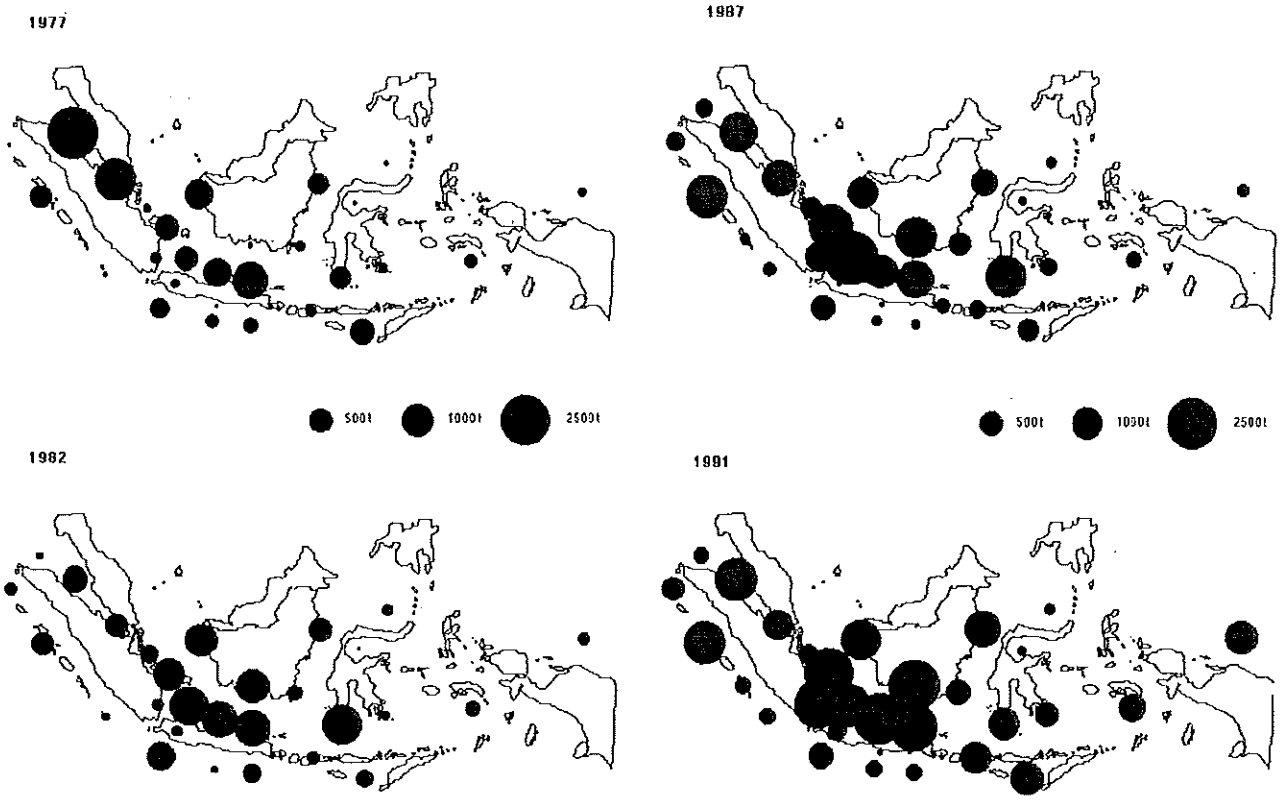


Figure 6.3.5

Changes in the catch of rays in each region/province from 1976 to 1993. Lines represent a three year moving average, except for first and last years, where absolute values have been used.

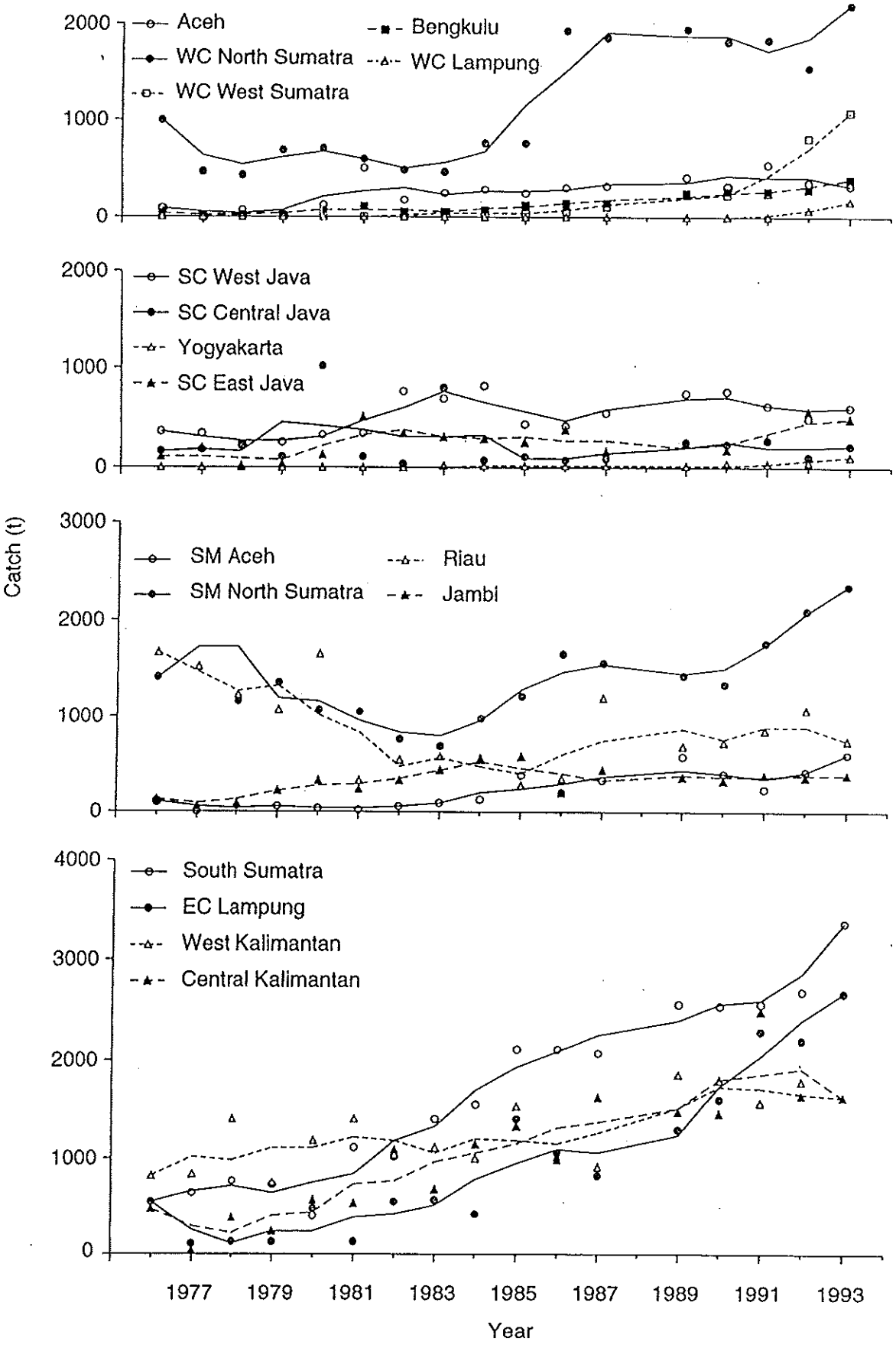


Figure 6.3.5 (cont)

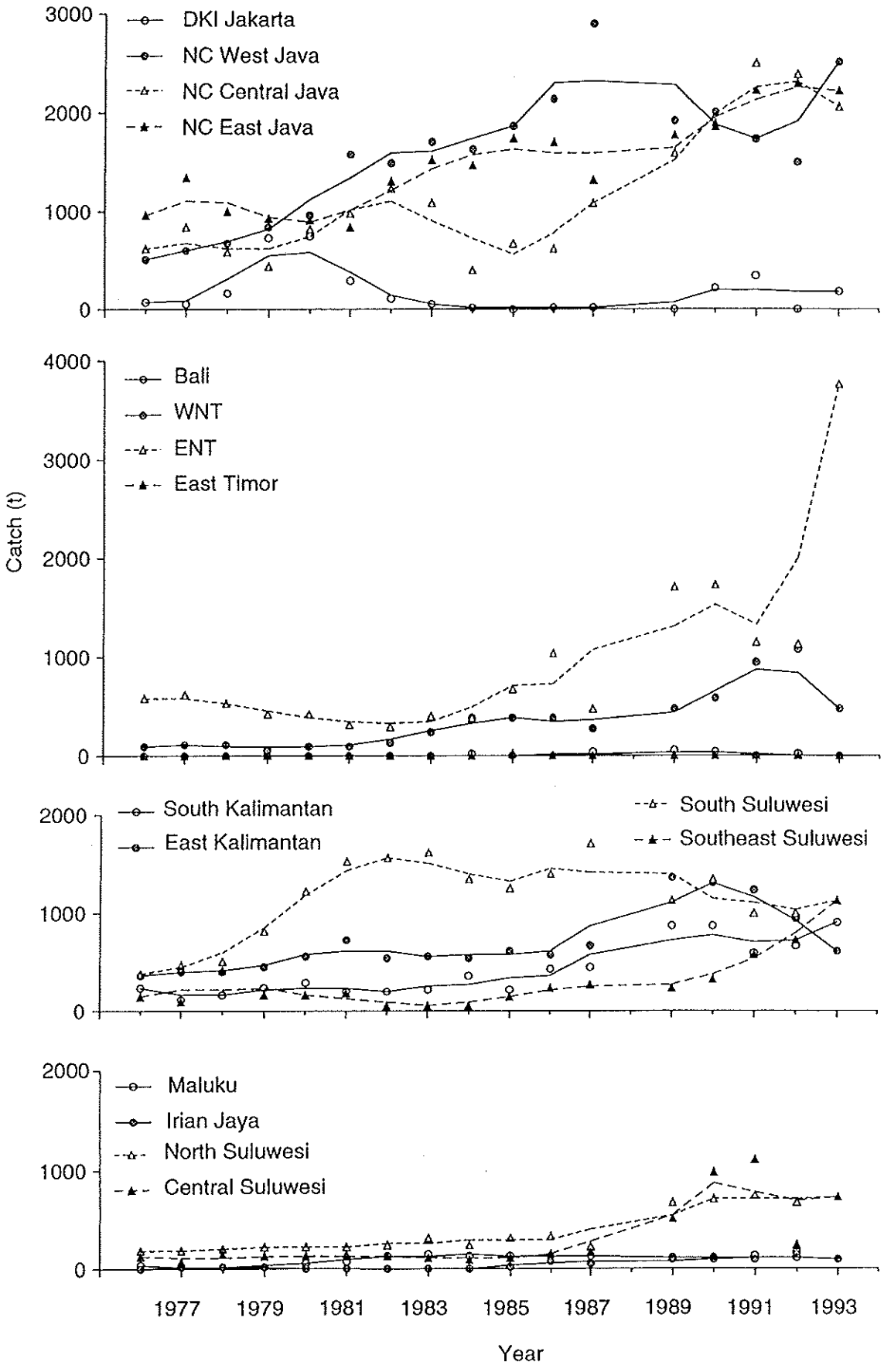
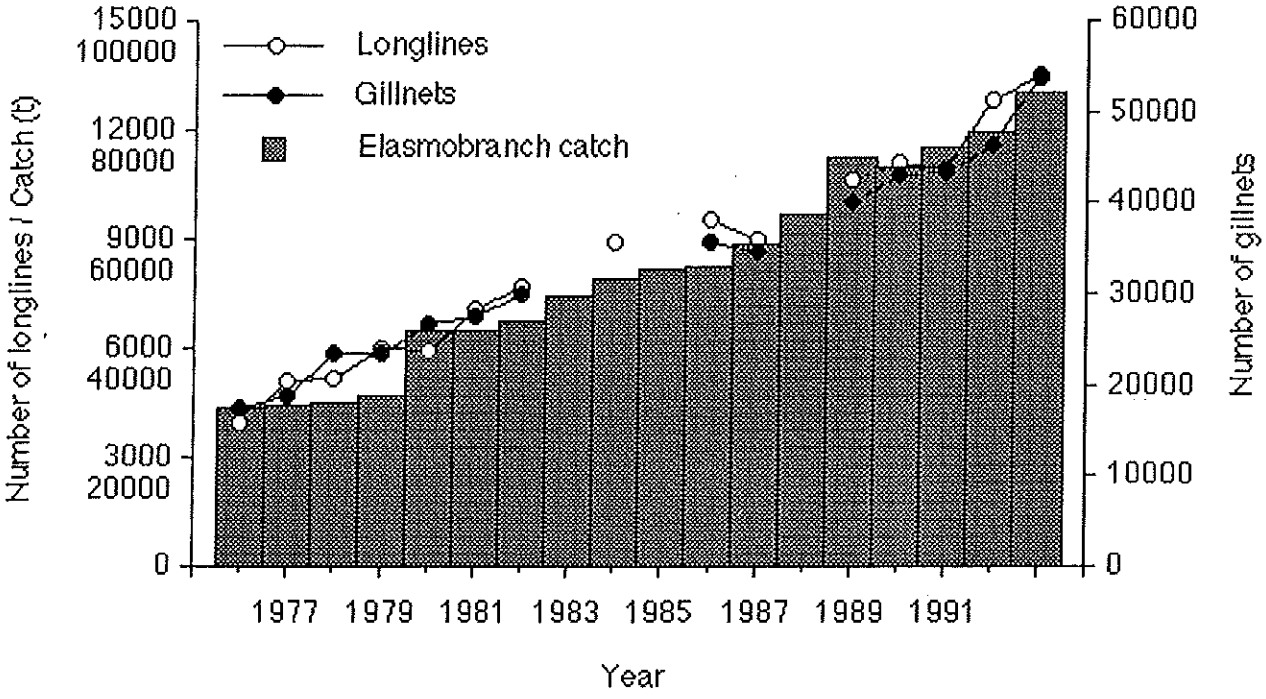


Figure 6.3.6

A. Correlation between total Indonesian elasmobranch catch and the total numbers of gillnets and longlines.
B. Changes in the average Indonesian catch rates of sharks and rays by gillnets and longlines.



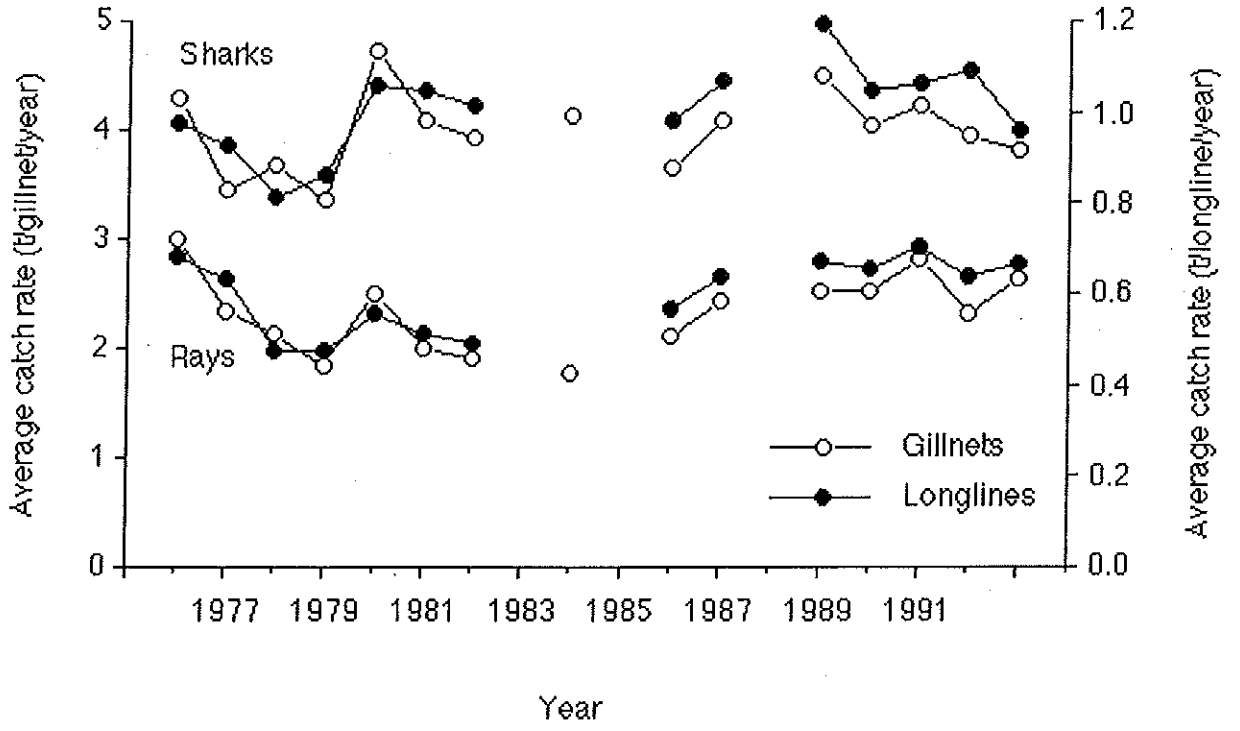


Figure 6.3.7

Correlations between shark catches and number of set gillnets and set longlines in selected provinces. Values for the number of set gillnets in Sumatra have been multiplied by ten. Some data was unavailable for some years.

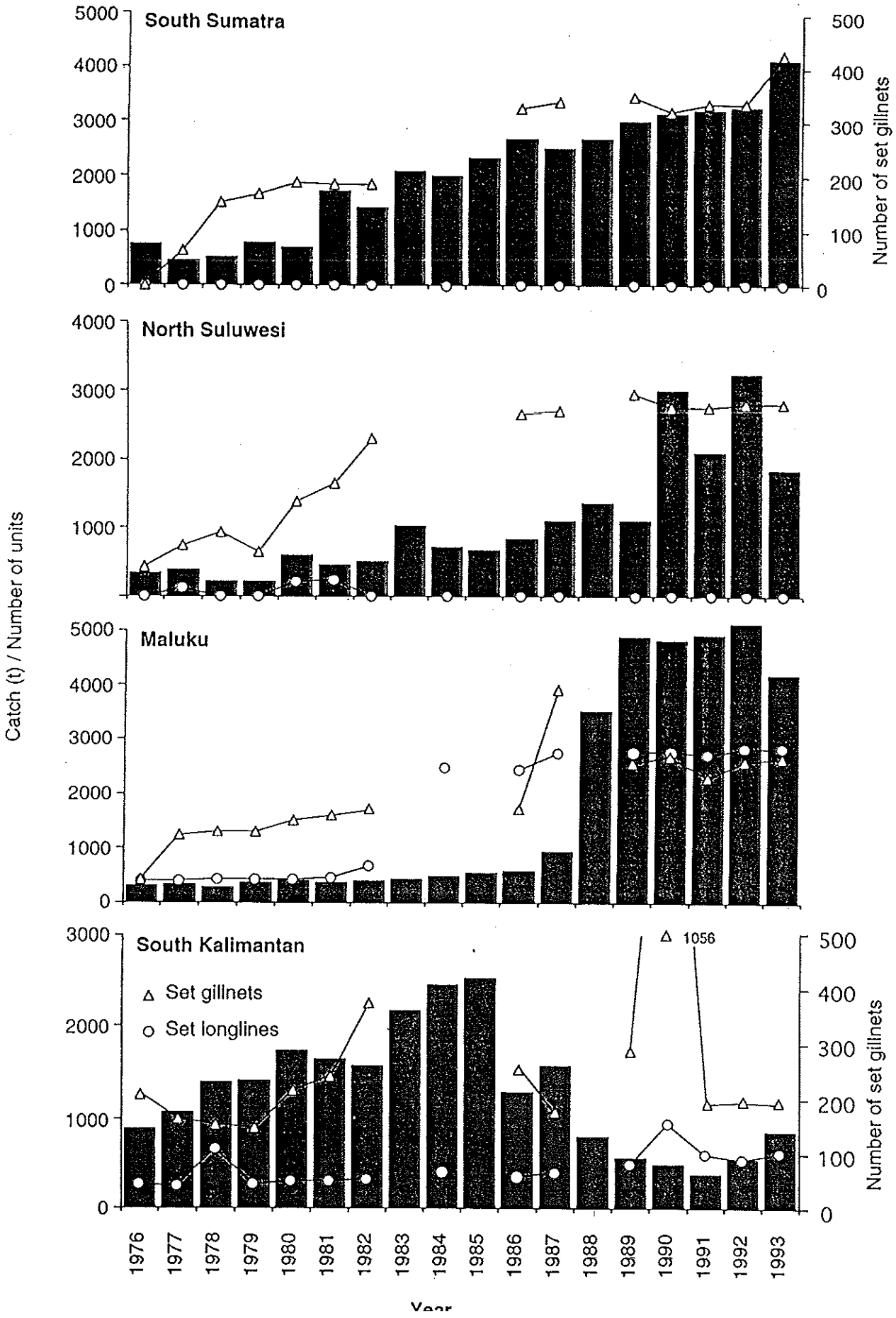


Figure 6.3.8

Correlations between ray catches and the number of set gillnets and set longlines in selected provinces. Some data was unavailable for some years.

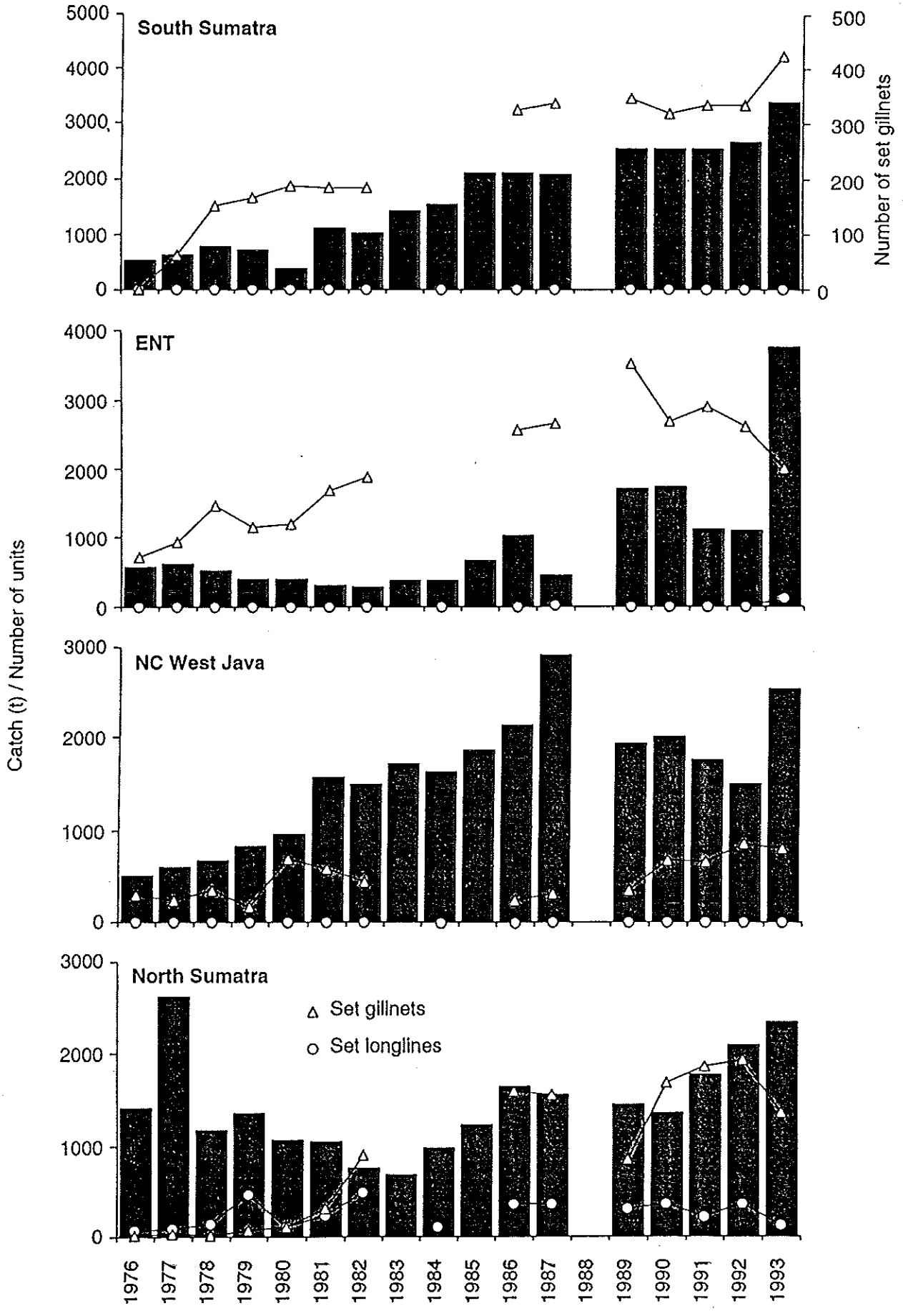


Figure 6.3.9

Average catch rates for various species group and gear combinations in a sample of provinces/regions.

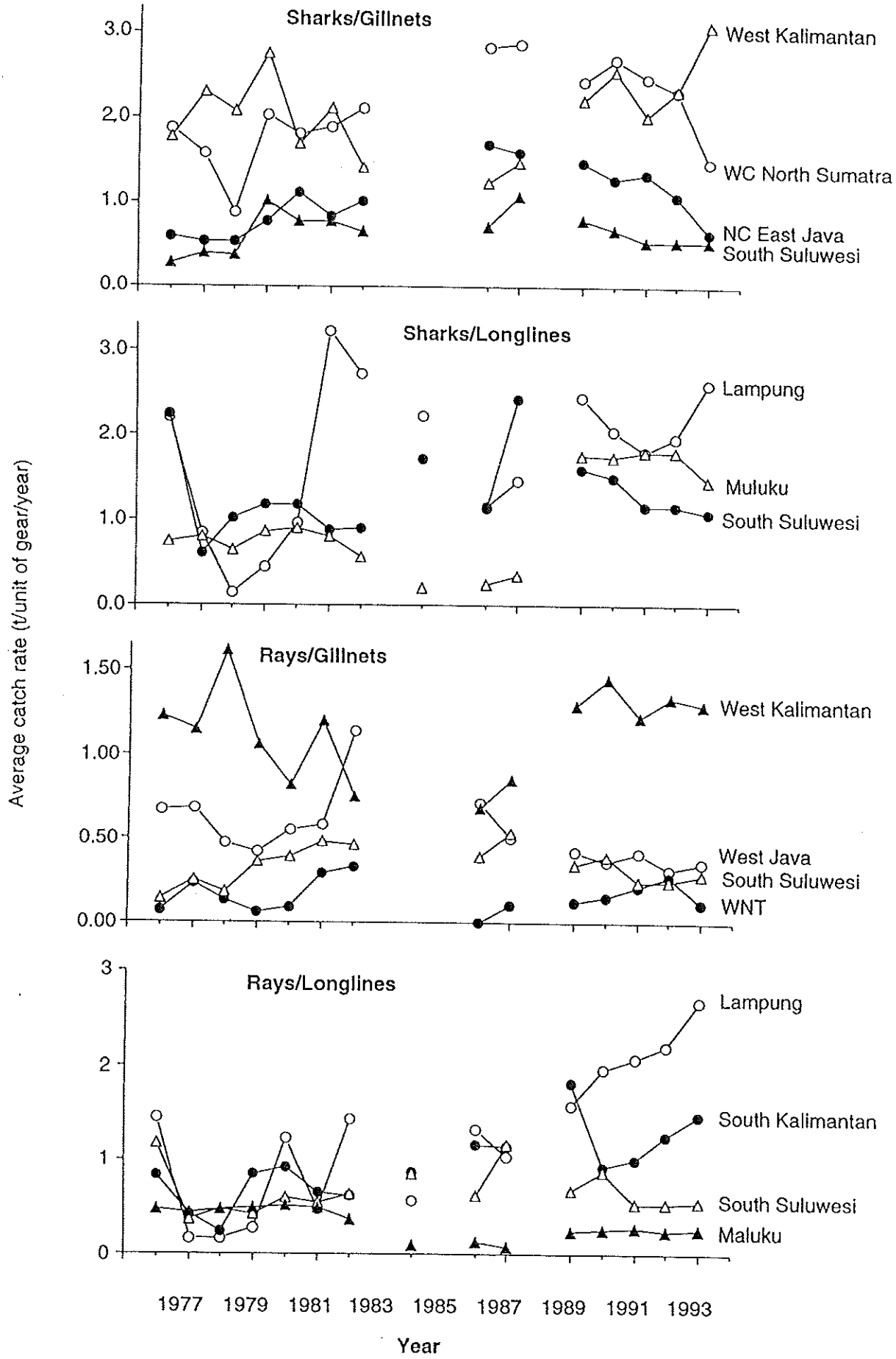


Table 6.4.1

Fluctuations in catch, effort and average catch rate in Southeast Maluku from 1976 to 1986 (Data from Amir, 1988)

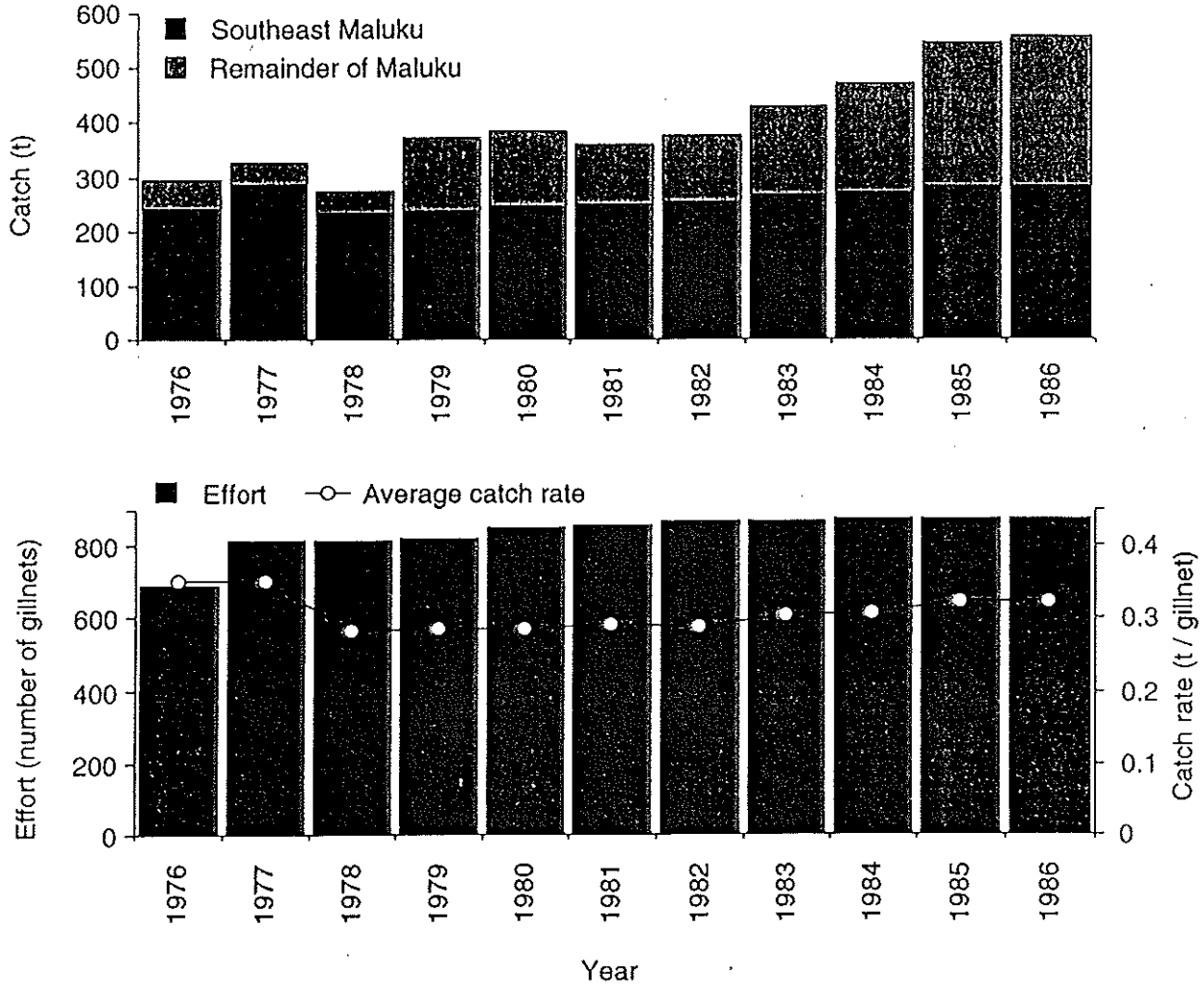


Figure 6.4.2

Approximate distribution of waters between 300 and 1000 m within the Indonesian Exclusive Economic Zone.

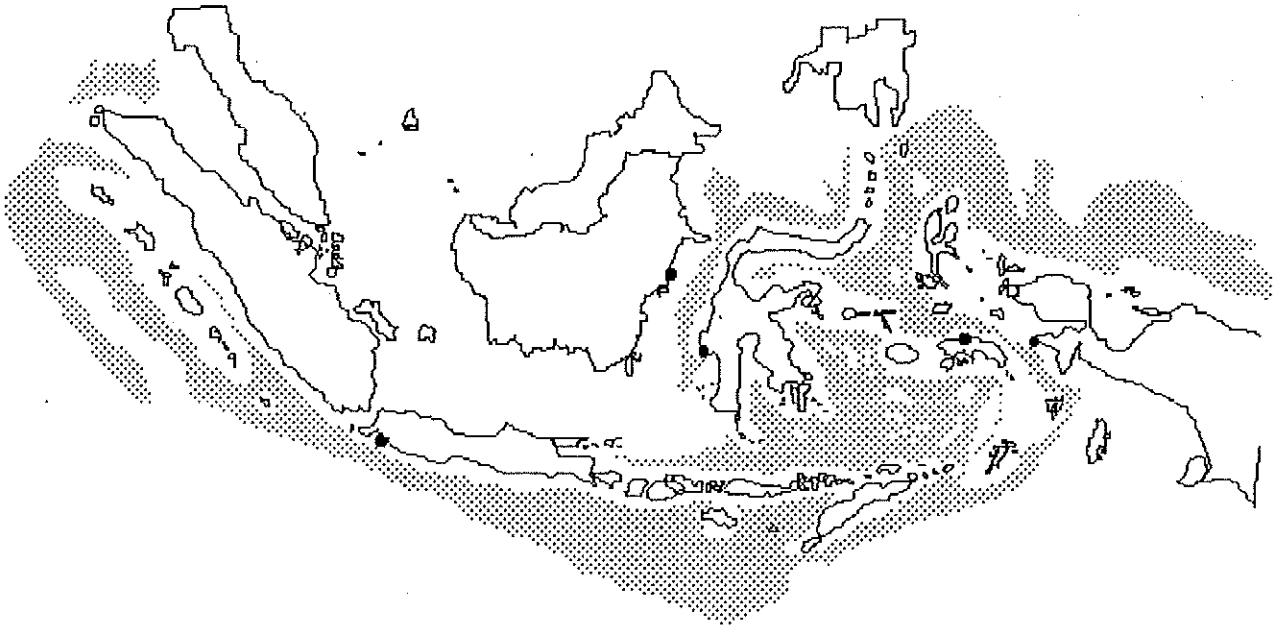


Figure 6.6.1

Changes in the volume and average price of dried shark fin exports from Indonesia 1980 to 1993

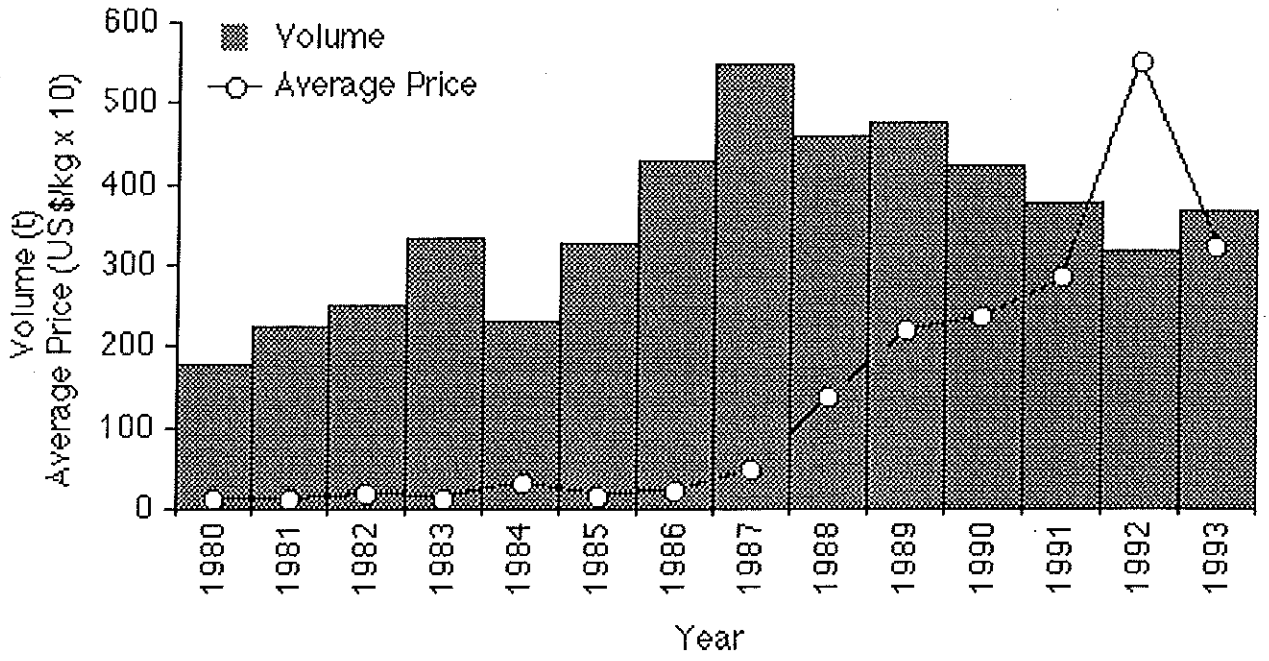


Figure 6.6.2

Spatial distribution of exports of various shark products in 1993. Light bars indicate export from an airport, solid bars indicate export from a seaport.

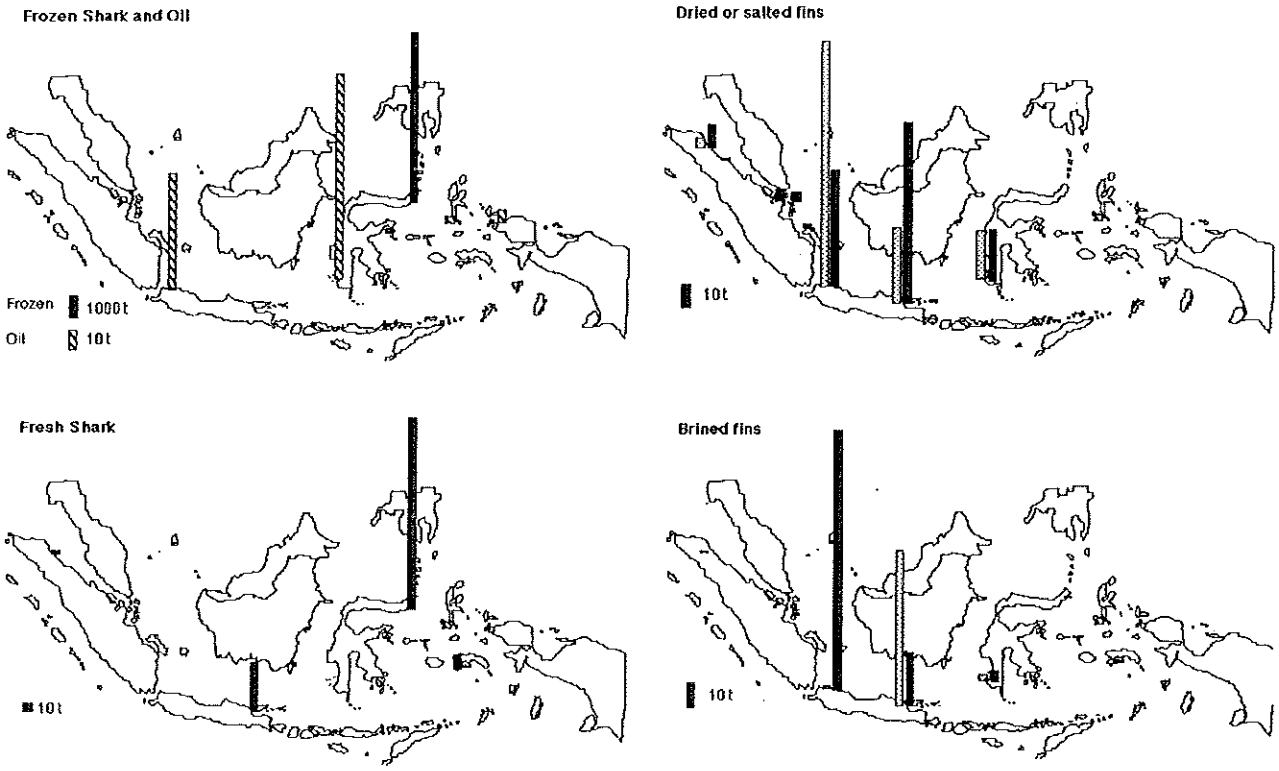


Figure 6.6.3

Dominance of dried shark fin export by a few points. This is similar to that for exports of dried or salted fish products in general.

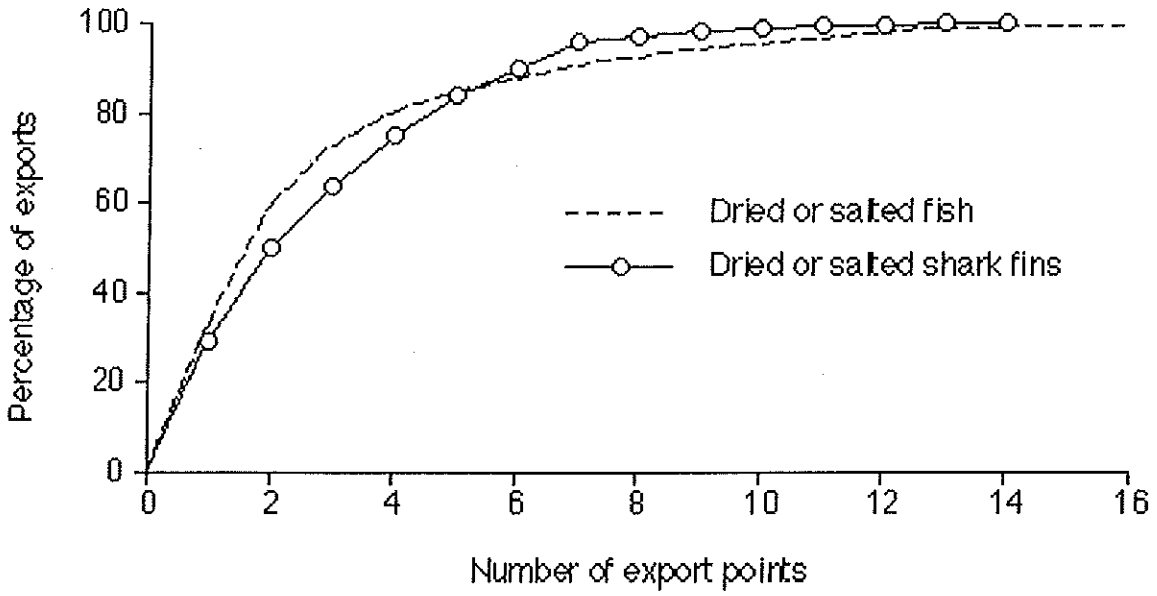


Table 6.2.1: The geographic and depth distributions of some Indonesian elasmobranch species.

		Distribution	
Common name	Scientific Name	Geographic	Depth
F. Hexanchidae			
Sharpnose Seven Gill Shark	*Heptranchias perlo*	wN	1,2,3
Bluntnose Six Gill Shark	*Hexanchus griseus*	S	2
F. Squalidae			
Endeavour Dogfish	*Centrophorus moluccensis*	wM	2,3
F. Heterodontidae			
Zebra Bullhead	*Heterodontus zebra*	S	1
F. Orectolobidae			
Tasselled Wobbegong	*Eucrossorhinus dasypogon*	I	1
Ornate Wobbegong	*Orectolobus ornatus*	I	1
F. Hemiscylliidae			
Grey Bamboo Shark	*Chiloscyllium grisium*	S,J,I,?All	1
Slender Bamboo Shark	*C. indicum*	S,J,?All	1
Whitespotted Bamboo Shark	*C. plagiosum*	S,J,?All	1
Brown Banded Bamboo Shark	*C. punctatum*	S,J	1
Indonesian Spekled Carpet Shark	*Hemiscyllium freycineti*	I	1
Epaulette Shark	*H. ocellatum*	I	1
F. Stegostomatidae			
Zebra Shark	*Stegostoma fasciatum*	S,J,N,?K,?U	1
F. Ginglymostomatidae			
Tawney Nurse Shark	*Nebrius ferrugineus*	S,J,N,I	1
F. Rhiniodontidae			
Whale Shark	*Rhincodon typus*	All	1
F. Alopiidae			
Pelagic Thresher Shark	*Alopias pelagicus*	All	1,2
Bigeye Thresher Shark	*A. superciliosus*	All	1,2,3
Thresher Shark	*A. vulpinus*	S,?All	1,2
F. Lamnidae			
Shortfin Mako	*Isurus oxyrinchus*	All	1,2
F. Scyliorhinidae			
Coral Catshark	*Atelomycterus marmoratus*	S,J,I	1
Speckled Catshark	*Halaelurus boesemani*	M	2
Brownspotted Catshark	*Scyliorhinus garmani*	All	1
F. Proscyliidae			
Graceful Catshark	*Proscyllium habereri*	J	1
F. Hemigaleidae			
Hooktooth Shark	*Chaenogaleus macrostoma*		
Sicklefin Weasel Shark	*C. microstoma*	J,eS	1,2
F. Carcharinidae			

Tiger Shark	*Galeocerdo cuvier*	S, J, N, ?K, ?U	1,2
Blue Shark	*Prionace glauca*	All	1,2
Sliteye Shark	*Loxodon macrorhinus*	S, J, N	1,
Australian Sharpnose Shark	*Rhizoprionodon taylori*	sI	1
Grey Sharpnose Shark	*Rhizoprionodon oligolinx*	S, J, ?M	1
Lemon Shark	*Negaprion acutidens*	S, J, N, I	1
Whitetip Reef Shark	*Triaenodon obesus*	All	1
Silvertip Shark	*Carcharhinus albimarginatus*	?J, nU	1,2,3
Oceanic Whitetip Shark	*C. longimanus*	All	1
Grey Reef Shark	*C. amblyrhynchos*	S, J, I	1,2
Spot-tail Shark	*C. sorrah*	S, J, K, ?M	1
Blacktip Reef Shark	*C. melanopterus*	All	1
Common Blacktip Shark	*C. limbatus*	S, J, K, I	1
Spinner Shark	*C. brevipinna*	S, J, N	1
Pigeye Shark	*C. amboinensis*	J, M, ?S, ?K,?I	1
Bull Shark	*C. leucas*	K, I	1,2
Hardnose Shark	*C. macloti*	I, ?J,?N, ?K	1,2
Whitecheek Shark	*C. dussumieri*	J, K, ?I	1,2
Spadenose Shark	*Scoliodon laticaudus*	S, J, K	1
F. Sphyrnidae			
Winghead Shark	*Eusphyra blochii*	S, J, K, M , N, U	1
Scalloped Hammerhead	*Sphyrna lewini*	All	1,2
F. Rhinobatidae			
Giant Shovelnose Ray	*Rhinobatos typus*	All	1
F. Rhynchobatidae			
Whitespotted Guitarfish	*Rhynchobatus djiddensis*	All	
Shark Ray	*Rhina ancylostoma*	All	1
F. Pristidae			
Narrow Sawfish	*Anoxypristis cuspidata*	All	1
Green Sawfish	*Pristis zijsron*	All	1
F. Dasyatidae			
Cowtail Stingray	*Patinachus sephen*	All	1
Blue-spotted Fantail Ray	*Taeniura lymma*	All	1
Bloched Fantail Ray	*T. meyeni*	All	1
Porcupine Ray	*Urogymnus asperrimus*	All	1
Blue-spotted Maskray	*Dasyatis kuhlii*	All	1
Mangrove Whipray	*Himantura granulata*	J, wI, ?S	1
Jenkins Whipray	*H. jenkinsii*	eS, wI, ?J	1
Blackspotted Whipray	*H. toshi*	wI, ?J, ?N	1
Reticulate Whipray	*H. uarnak*	All	1
Leopard Whipray	*H. undulata*	All	1
Pink Whipray	*H. fai*	?N	1
Whitespot Whipray	*H. gerrardi*		
Bleeker's Whipray	*H. bleekeri*		
Patchwork Whipray	*H. favus*		
F. Myliobatidae			

Whitespotted Eagle Ray	*Aetobatus narinari*	All	1
Banded Eagle Ray	*Aetomylaeus nichofii*	All	1
Ornate Eagle Ray	*A. vespertilio*	nJ, sK, sM	1
Eagle Ray	*A. maculata*		
F. Mobulidae			
Manta Ray	*Manta birostris*	All	1
Pygmy Devilray	*Mobula eregoodootenkee*	All	1
F. Rhinopteridae			
Javanese Cownose Ray	*Rhinoptera javanica*		

Geographic distribution: S:Sumatra, J:Java, K:Kalimantan, N:Nusa Tenggara, U:Sulawesi, M:Maluku, I:Irian Jaya, w:west, n:north, e:east, s:south.

Depth distribution: 1 = 0 to 100m, 2 = 100 to 1000m, 3 = >1000m

Species which are thought to be most important to fisheries are shaded.

Table 6.3.1

Pearson product-moment correlations between annual catches of sharks and rays and the number of set gillnets and set longlines in each region/province. Fourteen years of data were used: 1976 - 1982, 1987, 1989 - 1993. Insignificant correlations (<0.632) are not shown.

	Sharks		Rays	
Province	Longlines	Gillnets	Longlines	Gillnets
Aceh	0.67	0.83	0.59	0.78
North Sumatra	0.83	0.95	0.89	0.88
West Sumatra	0.87	0.71	0.80	
Bengkulu	0.66	0.90	0.56	0.91
Lampung				
West Java	0.87	0.85	0.84	0.95
Central Java		0.65		0.66
Yogyakarta				
East Java		0.83	0.58	0.86
Aceh	0.70	0.72	0.81	0.86
North Sumatra	0.77	0.86	0.80	0.78
Riau	0.54	0.65	0.57	0.67
Jambi		0.62		0.85
South Sumatra		0.98		0.98
Lampung	0.92		0.90	
DKI Jakarta		0.55		
West Java	0.77	0.93	0.71	0.87
Central Java	0.69	0.80	0.66	0.72
East Java		0.93		0.91
Bali		0.67		
NTB	0.64	0.95	0.64	0.94
NTT		0.95	0.75	0.79
East Timor		0.98		0.83
West Kalimantan	0.78	0.97	0.79	0.97
Central Kalimantan	0.61		0.59	
South Kalimantan	0.76	0.64	0.92	0.80
East Kalimantan		0.92	0.72	0.91
South Suluwesi	0.96	0.96	0.97	0.95
Southeast Suluwesi	0.83	0.86	0.86	0.86
North Suluwesi		0.88		0.98
Central Suluwesi	0.95	0.84	0.75	0.87
Maluku	0.90	0.80	0.94	0.90
Irian Jaya	0.55	0.84	0.65	0.86
Total	1.00	1.00	0.99	0.99

Table 6.4.1

Average catch weights and values of species caught by 15 shark fishing vessels around the Aru Islands in 1987 (Survey data from Amir, 1988)

	Average catch		Average price	
	Individuals	Weight (kg)	Rp / indiv.	Rp / kg
White-spotted guitarfish	925.5	1110.6	72249	60207
Giant shovelnose ray	192.4	77.0	13886	34714
Whale shark	86.7	62.2	32831	45763

Table 6.6.1

Grades and associated prices of dried sharks fins. *: Note these prices are for blacktip reef shark fins

		Price *	
Grade	Size	Rp	US $
'Super'	>30	175000	77
I	25-30	125000	55
II	20-25	100000	44
III	15-20	65000	29
IV	<15	0	0

Table 6.6.2

Total volume and average price of exports of various shark products from 1980 to 1993 -: Data not recorded

	Frozen		Fresh		Dried		Brined	
Year	Volume (t)	Value (US$/kg)	Volume (t)	Value (US$/kg)	Volume.(t)	Value (US$/kg)	Volume (t)	Value (US$/kg)
1980	-	-	-	-	179	1.45	-	-
1981	-	-	-	-	225	1.17	-	-
1982	-	-	-	-	249	2.00	-	-
1983	-	-	-	-	334	1.80	-	-
1984	-	-	-	-	232	3.44	-	-
1985	-	-	-	-	327	2.07	-	-
1986	-	-	-	-	429	2.41	-	-
1987	-	-	-	-	547	4.93	-	-
1988	-	-	-	-	458	13.74	-	-
1989	-	-	-	-	474	22.10	43	13.73
1990	240	0.45	0	-	422	23.60	136	9.07
1991	1438	0.65	0	-	376	28.44	18	47.21
1992	2679	0.80	0	-	316	54.94	148	17.81
1993	8293	0.44	971	1.98	367	32.41	193	11.21

Table 6.6.3

Volume and average price of exports of shark products to various countries in 1993

	Frozen		Fresh		Dried		Brined	
Country	Volume (t)	Value (US$/kg)	Volume (t)	Value (US$/kg)	Volume (t)	Value (US$/kg)	Volume (t)	Value (US$/kg)
Hong Kong	0.00	-	0.00	-	169.97	38.94	31.51	6.51
Singapore	23.30	0.26	1.00	1.65	139.12	23.55	160.21	12.01
Malaysia	0.00	-	0.11	3.00	38.31	4.69	0.00	-
Japan	0.00	-	0.00	-	16.61	105.90	0.40	25.00
Taiwan	945.95	1.99	8292.00	4.40	2.21	13.02	0.13	70.37
Korea	0.00	-	0.00	-	0.21	6.00	0.30	35.00
USA	2.00	15.58	0.00	-	0.00	-	0.00	-

Table 6.6.4

Volume and average price of imports of shark products from various countries in 1993

	Dried		Brined	
Country	Volume (t)	Value (US$/kg)	Volume (t)	Value (US$/kg)
Sri Lanka	0.58	5.40	1.50	4.02
Saudi Arabia	0.53	6.76	0.00	-
Korea	0.00	-	0.20	40.36
Batam	0.07	186.20	0.13	191.12
South America	0.07	127.91	0.00	-
Taiwan	0.07	10.33	0.00	-