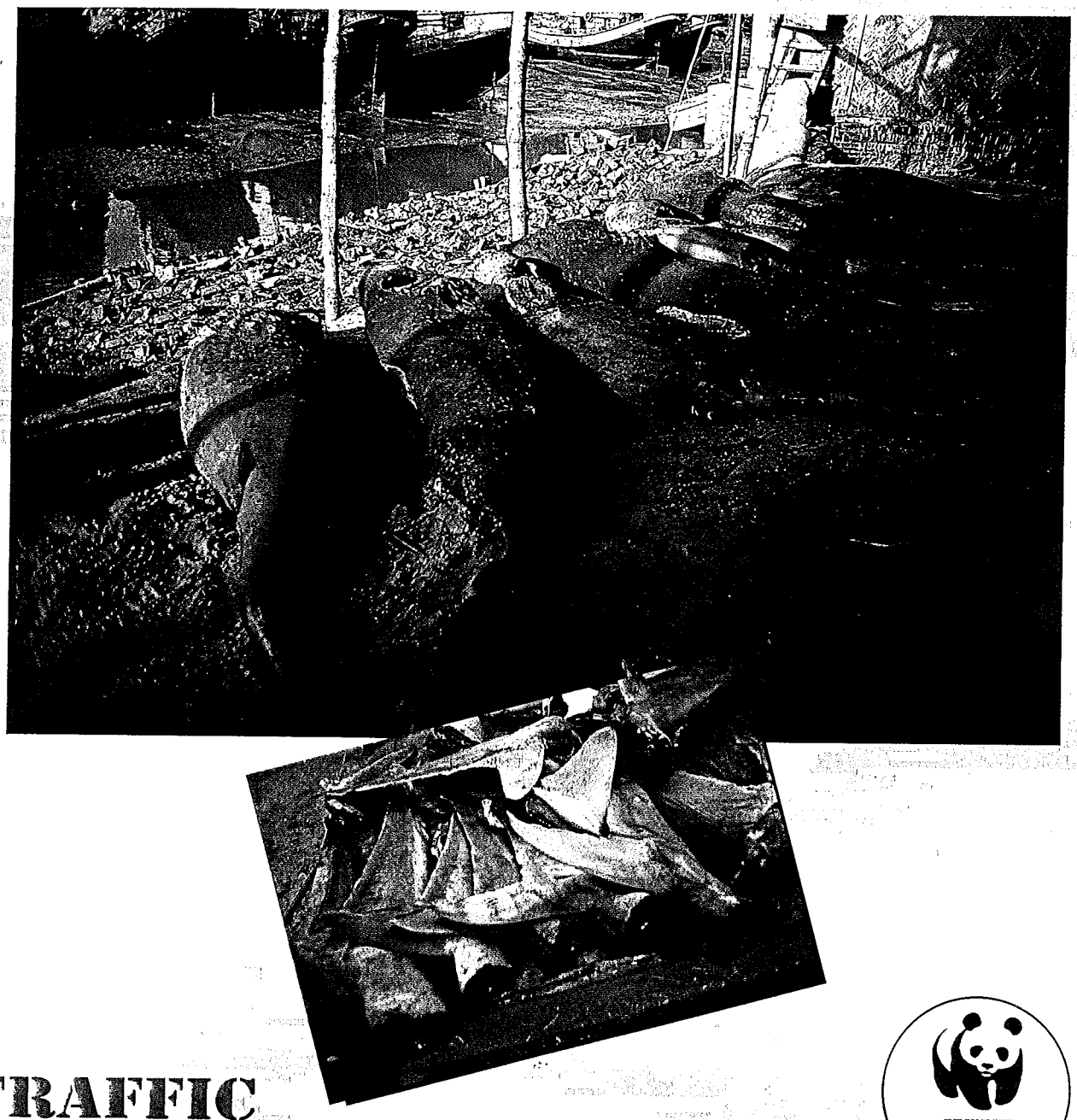
THE TRADE IN SHARKS AND SHARK PRODUCTS IN INDIA :

A PRELIMINARY SURVEY

FAHMEEDA HANFEE



TRAFFIC
INDIA

WWF
INDIA

Trade in sharks and shark products in India

A preliminary survey

Fahmeeda Hanfee

Export house : Dried shark meat and fins

ERRATA

1. First line of last para, page no.1 should read 'this chapter' instead of 'this report'
2. Source for fig.1 should read CMFRI,1995/MPEDA,1997
3. Source for fig.2 should read CMFRI,1993
4. For updated data fig.1page 3 and fig.3 page 24 refer page 50.

About WWF-India

The World Wide Fund for Nature - India (WWF-India), formerly known as the World Wildlife Fund-India, was established in 1969 as a Charitable Trust under the Bombay Public Trusts Act of 1950. Today, WWF-India is the country's largest conservation NGO with a network of State/ Divisional and Field Offices spread across the country. Its Secretariat in New Delhi. The organisation is part of the WWF family worldwide, with 25 independent WWF National Organisations. The coordinating international Secretariat, the WWF International, is located at Gland in Switzerland.

WWF-India started life as a modest wildlife conservation organisation with a focus on protecting particular species of wild fauna. Over the years, the perspective broadened to encompass conservation of habitats, ecosystems and support to the management of the country's protected areas network. In 1989, WWF-India articulated its Mission as follows, to suit India's specific ecological and socio-cultural circumstances:

"The promotion of nature conservation and environmental protection as the basis for sustainable and equitable development."

The WWF-India Mission has five broad *programme components* :

- Promoting India's ecological security; restoring the ecological balance.
- Conserving biological diversity
- Ensuring sustainable use of the natural resource base
- Minimizing pollution and wasteful consumption
- Promoting sustainable lifestyles

In ahieving its Mission, WWF-India uses the following *main programme methods:* **field programmes** that serve as demonstration projects, **public policy and analyses and debates** through independent research, consultation, and campaigns, **education** activities for key target group including the youth, professionals and administrators, **communication** through multimedia approaches, **networking** and supporting the work of fellow NGOs in India, and **mobilising** necessary financial, scientific and technical resources.

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FOREWORD

WWF-India's conservation programme is implemented through field projects, policy work, education, communications and NGO networking. As part of its biodiversity conservation focus, TRAFFIC-India was established on January 1, 1992 to monitor trade in wildlife species and its derivatives.

"Trade in sharks and shark products in India" is the seventh wildlife trade monitoring publication produced by TRAFFIC-India, and the first one dealing with marine species. It forms a part of Endangered Seas Campaign", a WWF global effort to address the chronic overfishing and destructive fishing practices, to rebuild depleted fisheries and implement long-term solutions. The emphasis is on the key species which are in critical need of better management i.e. tuna, shark, swordfish and marlin.

To raise awareness about overfishing of sharks, WWF supported a major TRAFFIC study of the world trade in shark parts and products, to which TRAFFIC-India has contributed significantly.

This report takes a close look at the situation in India, of the species in various states, trade, quantities exported to various countries, problems of conservation of the species and the control of the trade.

It analyses the approach that our country should follow if judiciuos and sustainable utilisation of this species is to be carried out and the loopholes that are to be plugged if the extinction of the species in the wild is to be prevented.

29th May, 1997
New Delhi.

Samar Singh
Secretary General
WWF-India

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AN OVERVIEW

With shark meat gaining popularity in both domestic and international market, sharks are being increasingly harvested all along the Indian coast. In many regions, growing trade in shark products like fins, livers oil, cartilage and skin has played a significant role in increased shark harvests. Such has been the rush in catching sharks, specially during the last five years, that over-exploitation is now beginning to threaten the very survival of the species.

Since much of the trade in shark meat and products is unregulated, intensive hunting for sharks is becoming environmentally and economically unsustainable. With hardly a little known about the biological status of the nearly 50 species found in the Indian Ocean, vulnerability of the sharks to intensive harvesting can upset the marine ecology. The steady decrease in the length of the sharks over the years is a clear indication that over-exploitation is beginning to leave a telling effect. Shark catches were earlier incidental. Sharks were in fact a byproduct of fishing. In the absence of any demand for shark meat, all that the fishermen would do was to extract the fins and throw the maimed sharks back into the sea. But with the advent of sophisticated fishing trawlers and with increasing demand for export of shark products, sharks have emerged as a valuable catch. India is now emerging as a major destination for shark harvests. Much of the trade is, however, still restricted to the west coast of India.

Trade in shark fins is fast multiplying. Thailand, Malaysia and Singapore are re-exporting unprocessed and processed fins in various forms to the western countries. Hong Kong, Japan, Europe and the United States have emerged as the major buyer of shark products. TRAFFIC-India is not calling for a boycott of the trade in shark products, but believes that it is possible to regulate the harvests without upsetting the marine environmental balance. It is important for the concerned ministries to monitor the impact of the growing shark trade over a long period. Concerted management procedures, including basic research and data collection, is important. All out efforts need to be made to ensure sustainable harvests of sharks.

The Indian scenario

In the absence of any elaborate study on sharks in the Indian Ocean, this report is based on a review of the available literature, even though it is limited. According to Sivasubramaniam (1992), there are about 40 species of pelagic sharks belonging to five families in the Indian Ocean,. Nearly 75 per cent of these species belong to the family - Carcharhinidae (requiem sharks). While 25 per cent of the species are found in small pockets, another 30 per cent are widespread in the Indian Ocean. The remaining are insular inhabiting the inshore and off shore waters of the Indian Ocean littoral.

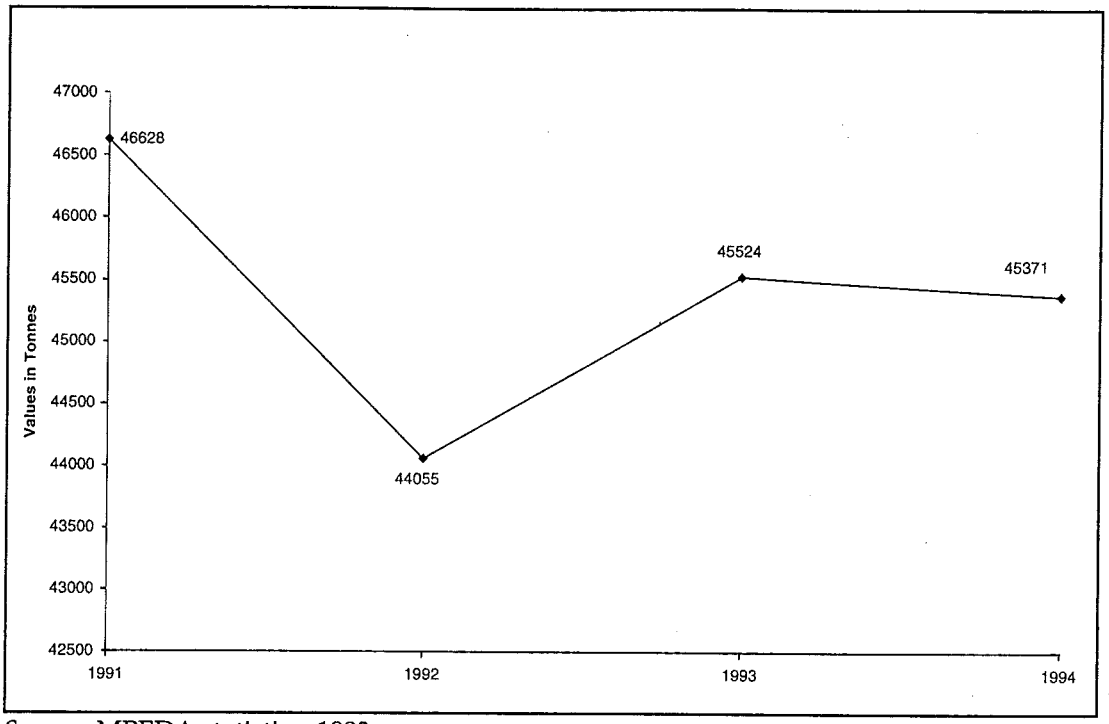
Indian sharks come in different sizes. Various researchers have tried to specify the size of shark in catches and that gives us a fair idea about the length of the species inhabiting the Indian waters. More than 50 per cent of the sharks found in the Indian Ocean are on an average some 2-4 meters in length. Some, like the Thresher sharks *Alopias* spp., measure about 3-5 meters. On the other hand, the Whale Sharks *Rhiniodon typus*, considered to be the largest living fish, attains a length of only about 12 meters. Whale Shark, however, is not important from the commercial point of view (Sivasubramaniam, 1992).

There are unconfirmed reports of Tiger Sharks *Galeocerdo cuvieri* reaching some 9 meters in length (Compagno, 1984). This is apparently rare; with most of them not exceeding five meters in length. Incidentally, Tiger Shark is the largest pelagic shark among the commercially valuable species. It can weigh up to 600 kg and is also the most dangerous, known to attack humans.

Indian sharks and rays represents 8.78 per cent of the global elasmobranch catches (Bonfil 1994). Before 1991, perhaps due to large freshwater yields, elasmobranchs comprised only 1.72 per cent of the total national catch. Earlier studies show that between 1983-1985, sharks comprised 55 per cent of the elasmobranch catch in the country (Appukuttan and Nair, 1988). Subsequently, data from state-wise landings of sharks for the years 1991-1993 and annual shark landings (1991-1995) were made available by Central Marine Fisheries Research Institute (Figures 1 and 2). An analysis of the available data shows that in India, Gujarat, Orissa and West Bengal have emerged as the major centers for shark production. It also indicates that annual shark landings, more or less stable from 1991-1994, increased significantly in 1995.

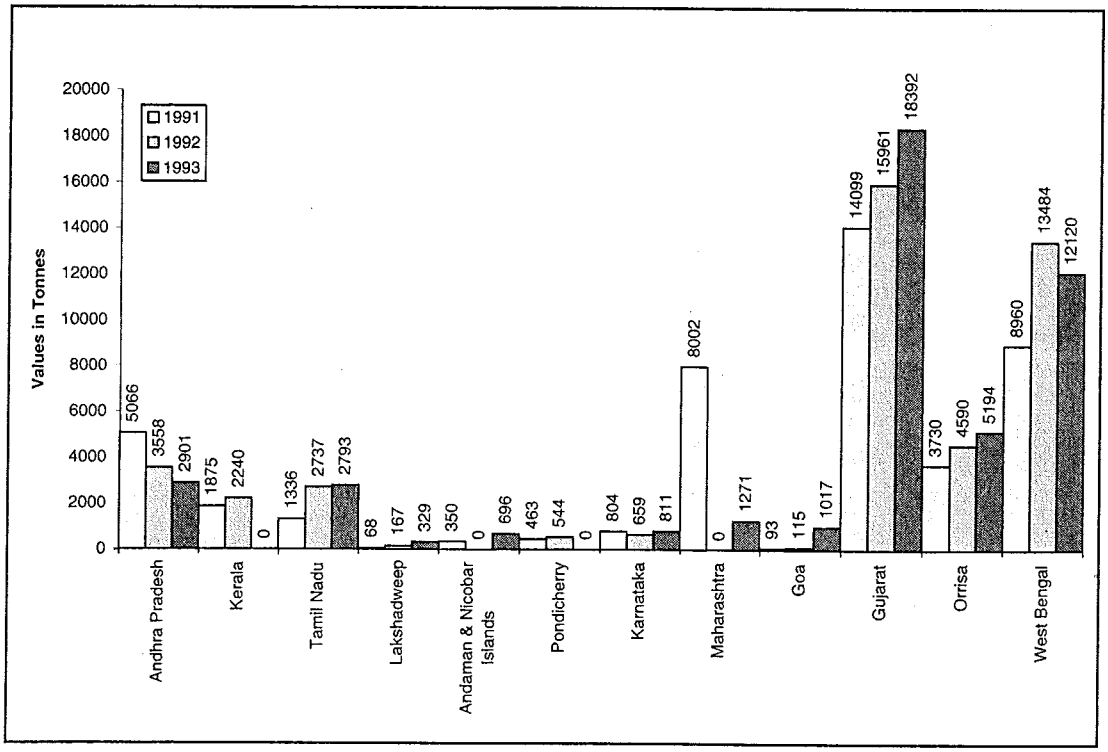
Although catch composition data is not readily available, the multi-species nature of these fisheries is evident from the published materials. Among the 20 most common species harvested are the *Carcharhinids* spp. and *Sphyrnids* spp., (Appukuttan and Nair, 1988). Their data also show that Milk Shark *Rhizoprionodon acutus;* Grey Sharpnose Shark *R. oligolinx;* Blacktip Shark *C. limbatus;* Spot-tail shark *C. sorrah;* Pondicherry Shark *C. hemiodon;* Scalloped Hammerhead *Sphyrna lewini;* and Winghead Shark *Eusphyra blochi* are the other important species. Among the remaining important species reported from catches are Blacktip Reef Shark *C. melanopterus* and Spadenose Shark *Scoliodon laticaudus* (Devadoss, 1983). Important batoid species are: Pygmy Devil Ray *Mobula eregoodootenkee;* Shovelnose Ray *Rhinobatus granulatus;* Reticulate Whipray *Himantura uarnak; H. bleekeri; Dasyatis sephen; D. jenkinsii;* White-spotted Eagle Ray *Aetobatus narinari; A. flagellum;* Banded Eagle Ray *Aetomylus nichofii;* and *Mobula diabolus* (Devadoss, 1978, 1983; Kunjipalu and Kuttapan, 1978).

Figure 1: Annual Shark Landings in India



Source : MPEDA statistics, 1993

Figure 2: State wise shark landings

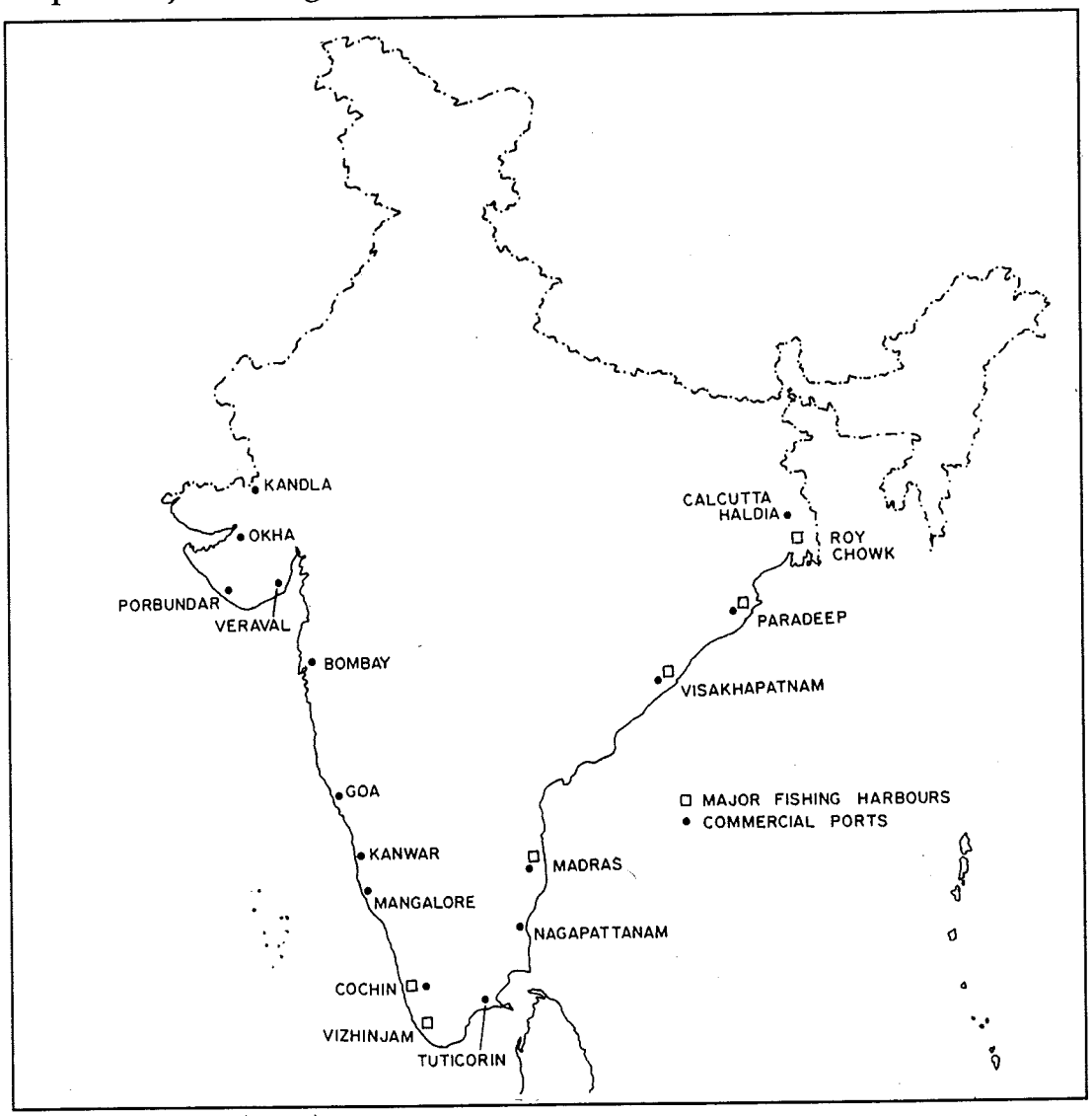


Source : MPEDA statistics, 1993

TRADE OVERVIEW

The export of marine products has a long history in India. The dry fish trade with neighbouring countries of South Asia has existed for a long time. Much of it was confined to shell fish, fin-fish and fishery products. During the period 1968-1977, Indian marine products were marketed in 93 countries. Marine exports were on decline and in 1978, only 35 countries imported from India (Jhingran, 1991). Subsequently over the years, India initiated several measures to diversify trade in marine products export, largely through the efforts of Marine Products Export Development Authority (MPEDA). The increased vigour for marine exports is reflected in introducing new products for export, developing all major Indian ports (Map 1) as potential marine products export centers, and in rapid expansion of the available market.

Map 1 : Major fishing harbours and commercial ports



Source : MPEDA(1991)

Sharks have always contributed to the marine fish trade. Initially, sharks were not a preferred species, often being a byproduct. However, with the advent and the expansion of bottom trawl fisheries in most of the countries along the Bay of Bengal and in the Indian Ocean, except Maldives, a significant increase in shark catch was observed. At the same time, large mesh driftnetting and hook and line fishing also caught small quantities of coastal/inshore sharks (Sivasubramaniam, 1992).

In the 1950s, elasmobranch fishing was quite popular in India. In the mid-1950s, with the introduction of the tuna longline fishery to distant nations pelagic shark catches increased significantly. The normal practice was that the harvested sharks were often thrown back into the sea after their fins were removed. Since fins always had a good market, and commanded a better price, it did not require any onboard cold storage facility like that for tuna and billfish, fishermen continued with this inhuman practice (Sivasubramaniam, 1992).

The widespread introduction of synthetic gillnets in the 1960s increased the large mesh driftnetting for large pelagic sharks expanding beyond the coastal waters towards the edge of the continental shelf (Sivasubramaniam, 1992). This actually ushered in the expansion and development of a longline fishery and specialised fishery for sharks resulting in significant increase in the catches and landings (Table 1 and 2). Consequently, on the east coast of India emerged a newly growing enchantment for pelagic shark fishing. In other words, the foundation for pelagic shark fishery was laid in the east coast of India.

Elasmobranch fishing became an important commercial enterprise on either side of the Indian coastline, earning a foreign exchange of Rs.21.79 million in 1984. A year earlier, in 1983, shark landings constituted 2.78 per cent of the total marine landings, with a catch of 39, 367 tonnes (Marine Fisheries Information Service No. 52). Shark catches continued to rise with the average annual production between 1976 and 1985 increasing to 58, 862 tonnes. Shark catch would have been much higher if the fishermen had access to different types of gear that are required to harvest big sharks (Devadoss et al., 1985).

Development of marine fisheries on more professional lines with a view to augmenting export of marine products began in 1959-1960 when several export incentive schemes were initiated., realising the potential, the Indian Government in 1961 constituted the MPEDA, with enlarged autonomy and executive powers. A noticeable feature of the establishment of the Authority was that the term "marine products" was used to imply aquatic products from fresh, brackish and sea-waters.

Table 1: Shark species occurring in longline catches

No	Common Name	Scientific Name	Maximum Length	Length at Maturity (meters) (meters)
1	Oceanic Whitetip shark	*Carcharhinus longimanus*	3	1.8
2	Blacktip Shark	*Carcharhinus limbatus*	2.2	1.35
3	Whitecheek Shark	*Carcharhinus dussumieri*	1	0.65
4	Blacktip Reef Shark	*Carcharhinus melanopterus*	2	1
5	Spot-tail Shark	*Carcharhinus sorrah*	1.6	1.1
6	Silvertip Shark	*Carcharhinus albimarginatus*	30	1.6
7	Hardnose Shark	*Carcharhinus macloti*	1	0.76
8	Spadenose Shark	*Scoliodon laticaudus*	0.74	0.35
9	Blue Shark	*Prionace glauca*	3.8	1.75
10	Milk Shark	*Rhizoprionodon acutus*	1.7	0.76
11	Tiger Shark	*Galeocerdo cuvier*	9	2.5
12	Broadfin Shark	*Lamiopsis temmincki*	-	-
13	Zebra Shark	*Stegostoma fasciatum*	-	-
14	Thresher sharks	*Alopias* spp.	5	3.76
15	Shortfin Mako Shark	*Isurus oxyrhinchus*	3.94	2.8
16	Hammerhead sharks	*Sphyrna* spp.	5	2.5

Sources: Sivasubramaniam (1992)

Table 2: Shark fin and fish maw exports from India during 1963-1987

Year	Quantity (Tonnes)	Value (Lakhs)	Year	Quantity (Tonnes)	Value (Lakhs)
1963	342	3 051	1976	268	15 294
1964	378	2 882	1977	287	22 469
1965	244	2 032	1978	423	34 676
1966	139	1 340	1979	372	29 432
1967	296	3 709	1980	332	32 526
1968	321	4 690	1981	406	39 812
1969	214	4 551	1982	165	20 307
1970	282	5 998	1983	244	31 857
1971	295	5 189	1984	258	35 165
1972	294	6 027	1985	242	31 380
1973	252	6 569	1986	223	35 326
1974	259	8 464	1987	191	30 474
1975	307	9 822			

Source: Jhingran (1991).

1 Lakh = 100,000 rupees 10 Lakh = 1 million rupees

HISTORICAL PERSPECTIVE

A brief introduction and history of fisheries in these states, along with the fishing craft and gears, drawn from CMFRI, Cochin (Table 3 and 4), is presented below.

West Bengal : The state has a coastline of 65 kms, constituting 1 per cent of the country's coastline. Traditionally, fish is an important part of the Bengali diet and, therefore, fisheries plays an important role in food security in West Bengal.

Out of the 1054 mechanised boats operating in West Bengal, 73 per cent were gillnetters and the remaining 27 per cent were carrier boats. The total number of non-mechanised craft were approximately 4,100, of which plank-built boat constituted 98 per cent and the remaining were dugout canoes. Different types of gear available for fishing operations comprises drift / gillnets, fixed bagnets, hooks and lines, shore-seines, traps and scoop nets.

Orissa : The state has a coastline of 480 Km, constituting 8 per cent of the coastline of India. In recent years, Orissa is emerging fast on the fisheries scene by introducing large number of mechanised boats and improving techniques of fishing.

Total number of mechanised boats in Orissa coast was 745 of which 470 were trawlers and rest gillnetters. Total number of non-mechanised craft in Orissa was 10,550. The types of gear found in this state are trawlnets, drift / gillnets, hooks and lines, shore seines, small purse-seines, fixed bagnets and boat-seines.

Andhra Pradesh : With a coastline of about 980 Km, Andhra Pradesh has a rich marine fishery resource making it rank fifth among the maritime states of India.

Catamaran is the major craft used. There are about 580 trawlers operating and about 36,000 non-mechanised boats. There are nearly 800 trawlnets in the state. The remaining gears are drift / gillnets, fixed bagnets, hooks and lines, boat-seines, shore-seines and scoopnets.

Gujarat : This state, on the western coast, has the longest coastline of about 1640 kms. It also has excellent estuarine potentials. Mechanised boats were first introduced in 1956, first at Veraval, one of the most important fisheries harbour of the state, though a few country craft fitted with outboard engines had been in operation since 1953.

There are nearly 2900 mechanised boats and almost half of them are trawlers. In addition, the state has about 4100 non-mechanised crafts.

Among the gears being used are 2700 trawlnets. The non-mechanised gears includes fixed bagnets which is more popular.

Karnataka : The state has a coastline of nearly 300 kms. In the fisheries atlas, this coast is often designated as the 'mackerel coast'. As the name suggests, mackerel is an important fish of this region.

Fishing crafts includes dugout canoes and outrigger canoes besides plank-built boats. Different fishing gears are distributed uniformly with two principal fishing gears — shore seines and gillnets. Line gears, few gillnets and cast nets were the native gears of this coast. All other gears were introduced from other areas.

Tamil Nadu : Tamil Nadu and Pondicherry have a combined coastline of about 1000 kms. Tamil Nadu has the unique advantage of facing three major bodies of water — Indian Ocean, the Arabian Sea, and the Bay of Bengal. It is perhaps for this reason that the state has a long tradition of maritime activity.

Some of the fishermen own mechanised crafts. The ownership of mechanised fishing craft also includes industrialists who do not reside in any of the fishing or maritime villages. The boats are highly migratory and often move to other states.

Among the non-mechanised fishing craft in Tamil Nadu, the catamaran is the most common, constituting nearly 73 per cent. Plankbuilt boats (21 per cent) and dugout canoes (5per cent) are the other important fishing craft. In this state, eight types of fishing gear are being used, viz. trawl nets, drift / set gillnets, boat seines, fixed bagnets, hooks and lines, shore seines, traps and scoop nets.

Kerala : This state is on the west coast, has a coastline extending to 590 kms, almost one-tenth of the Indian coastline. Marine fishing, using artisanal tackles like boat-seines, shore-seines and Chinese dip-nets, is an age old tradition.

Mechanisation began in the late 1950s. With the shift from cotton to nylon nets, an important technological development came in early 1960s. By mid-1960, individual entrepreneurs entered the scene, paving the way for fast development of trawl fishery in the coastal waters. During the late 1970s, commercial purse-seining started and in the early 1980s began the process of large-scale motorisation of country crafts.

Among the fishermen, at least twenty percent are solely dependent on fishing. Eighty-five per cent among them are engaged in full-time fishing (with 90 per cent time spent for fishing) 8 per cent in part-time fishing (30-90 per cent time

for fishing) and 7 per cent in occasional fishing (less than 30 per cent time for fishing). In the early 1980s, the process of motorisation started in Alleppey district and soon it spread in other parts.

In 1980, CMFRI conducted an all India census which revealed that there were about 980 mechanised fishing craft owned by fishermen families. Seventy-six per cent of these fell under the category of trawlers. Gillnetters, which constituted 22 per cent, formed the next major category. Of the 26 000 non-mechanised craft, catamarans accounted for 44 per cent, dugout canoes 40 per cent and plank built boats the rest. In the state there are a total of about 4000 trawl nets. The most commonly used gear in all the districts of Kerala is drift/set gillnet. Boat-seine is the next important gear found in all the districts. Hooks and lines, traps and scoop nets are mainly concentrated in Trivandrum district.

Goa : Goa state on the west-coast of India has a coastline of 153 km. It has the distinction of introducing the non-mechanised gear rampani and the mechanised purse seine, both of which still continue to be the dominant gear in operation in the respective areas.

According to the 1980 census, the mechanised fishing fleet in Goa consisted of 494 trawlers, 274 gillnetters, 66 purse seiners and 74 others. Of these, 231 trawlers, 39 purse seiners and 46 gillnetters were privately owned. Non-mechanised craft included 1054 dugout canoes, 1006 plank built boats and 6 others. Gear used by mechanised craft consisted of trawlnets and 69 purse seines. Drift/set gillnets constituted 51per cent of the 4500 indigenous gear, prominent among others being rampani (101) other shore seines (259) and boat seines (109).

Maharashtra : With a coast line of 720 km, Maharashtra ranks second among the maritime states of India in respect of marine fish landings. Fishing takes place almost throughout the year except during the monsoon period.

As per the 1980 survey by CMFRI, there were 12,485 boats comprising mechanised boats, plank-built boats and dug-out canoes. Among 4,557 mechanised boats, bagnetters constituted 46 per cent followed by trawl netters (29 per cent) and gillnetters (25 per cent), the rest being longliners and others. Out of 2,568 plank built boats, 46 per cent were gillnetters, 34 per cent bagnetters, 7 per cent rampanis and the rest longliners and others. About 43 per cent of 5,360 dugout canoes were gillnetters, 29 per cent were bagnetters and the rest were longliners, rampanis and others. Among the gears employed, gillnets numbered 2,44, 390, followed by bagnets (20, 525), trawl nets (4,152) and rampani (99). There were 7,676 hooks and 6,16, 842 lines. There were 43, 470 nets such as cast nets which are in the categories other than given above .

Table 3: Marine fishing vessels and gear by state (1980)

Item	KER	KAR	TN	A. P	ORI	W.B	MAH	GUJ
Coastline (km)	590	270	<1000	980	480	650	720	1640
No.of mechanised vessels								
Trawlers	745	808	2295	447	106	-	1185	1410
Gillnetters	215	23	324	9	-	6	1139	1225
Purse-seiners	9	173	-	-	-	-	-	-
Carrier boats	-	67	-	-	-	-	-	-
Dol netter	-	-	-	-	-	-	-	241
Others	14	7	8	-	-	2	2096	18
Total	983	1078	2627	456	106	8	4420	2894
No. of non-mechanised vessels								
Plank built boats	4376	1747	8957	11359	3262	2362	2568	3040
Dug out canoes	10415	4454	2210	1785	186	2	-	1080
Catamaran	11480	23	31851	22653	6276	-	-	-
Gillnetters	-	-	-	-	-	-	1181	-
Bag natters	-	-	-	-	-	-	873	-
Rampanis	-	-	-	-	-	-	180	-
Others	-	718	325	675	4	-	339	-
Total	26271	6942	43343	36468	9278	2364	5141	4120
No. of fishing gears								
Trawl nets	1454	1788	6219	823	-	-	4152	2672
Purse seines	9	188	-	-	-	-	-	-
Drift/Gillnets	23307	6571	118300	42832	10427	2195	244390	7383
Boat seines	9779	23	7220	9744	2516	-	-	-
Fixed bag net	-	941	1842	14631	2778	2286	20525	21857
Hooks & Lines	2949	1507	22111	10752	15265	488	624518	2376
Shore seines	2926	3924	4549	3050	2893	50	-	-
Traps	2239	-	8919	130	515	2	-	86952
Scoop nets	1371	-	1040	2925	37	-	-	-
Rampanis	-	86	6339	-	-	-	-	-
Others	2761	10925	-	37199	5201	554	43470	28013
Total	46795	25953	176539	122086	39632	5575	937055	149253

Source: Central Marine Fisheries Research Institute (1980)

Table 4: Description of fishing villages and fishermen population by state

State	Fishing villages	District with largest no. of fishing villages	Districts with fewest no. of fishing villages	Landing centres			Fishermen population
				Tot.no.	Max. no.	Min. no.	
KER	304	Cannarore (65)	Malappuram (18)	222	Trivandrum (24%)	Malappuram (5%)	6.4 lakhs
KAR	147	Dakshin Kannada (77)	Uttar Kannada (70)	105			1.13 lakhs
T. N	422	Thanjavoor (87)	Pudukottai (20)	352	Ramnath puram (73)	Madras (12)	3.96 lakhs
A. P	453	Srikakulam (24%)	Vizianagram and West Godavari (3%)	280	Srikakulum (55)	Prakashm and Vishakhapatnam (39)	3.30 lakhs
ORI	236	Balasore (169)	Cuttack (12)	68	Balasore (24)	Puri & Cuttack (12)	1.17 lakhs
W. B	303	Midnapore (148)	Murshidabad, Nadia and Hooghly (18)				0.84 lakhs
MAH				152			2.32 lakhs
GUJ	179	Kutch (29%)	Surat (8%)	173	Kutch (51)	Kheda (1)	1.52 lakhs

Source: Central Marine Fisheries Research Institute (1980)

Note: Where total numbers were not available, figures are indicated for the percentage of villages or landing centers within the state that are located in the district specified.

CURRENT FISHERIES STATUS

The focus of the present survey was confined to selected sites in the states of West Bengal, Orissa, Tamil Nadu, Maharashtra, Kerala, Goa, Andhra Pradesh and Gujarat. The selected sites on the east coast were Calcutta, Digha, Puri, Visakhapatnam, Kakinada, Chennai (Madras), Parangipettai, Nagapattinam, Mandapam, Tuticorin and Kanyakumari . On the west coast, the sites selected were Trivandrum (Vizhinjam), Cochin, Calicut, Mumbai (Bombay), Goa, Veraval, Okha and Jamnagar. The survey sites (Map 2) were selected on the basis of information collected from various reports, records of the Central Marine Fisheries Research Institute (CMFRI), Marine Products Export Development Authority (MPEDA), the Central Institute of Fisheries Technology (CIFT), and ofcourse on the basis of the recommendation of some scientists, fishermen and traders. The survey covered all the major ports of India.

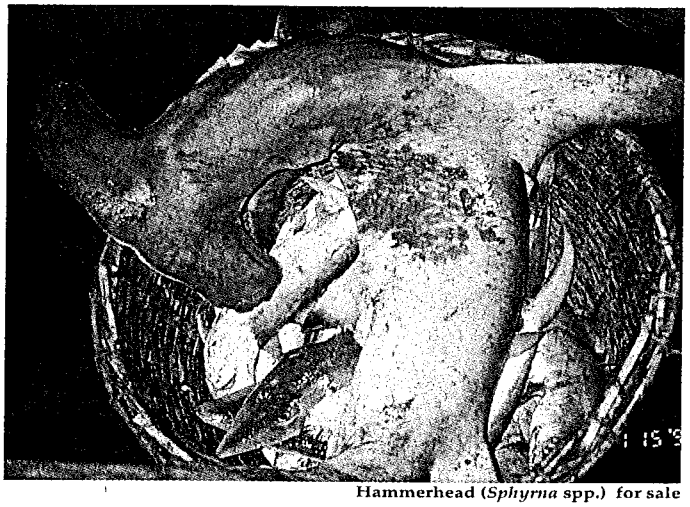
Our survey clearly brought out two distinct schools of thought :

1. The seas are full of sharks: on the basis of a preliminary survey, this view was expressed by 30 per cent of fishermen, 60 per cent of dealers and 50 per cent of the scientists interviewed.

2. There are really not as many sharks as there appear to be: this view was expressed by 70 per cent of fishermen, 40 per cent of dealers and 50 per cent of scientists.

These views, on one hand give an impression of an abundant resource and on the other, fears of over-exploitation. A majority of the fishermen said that they actually fish at a depth of about 30-40 meters. Most of the shark landings came as a bycatch or were incidental catch. The survey showed that with every passing year there is a decrease in the length (size) of the sharks being caught.

Blacktip Shark, which grows up to 2.5 meters in length, is the most commonly caught species. Hammerhead sharks *Sphyrna* spp. are also commonly netted. Smaller sharks, including Spot-tail Shark, Whitecheek Shark *Carcharhinus dussumieri*, Scalloped Hammerhead and other hammerheads are commonly caught on the west-coast.



Hammerhead (*Sphyrna* spp.) for sale

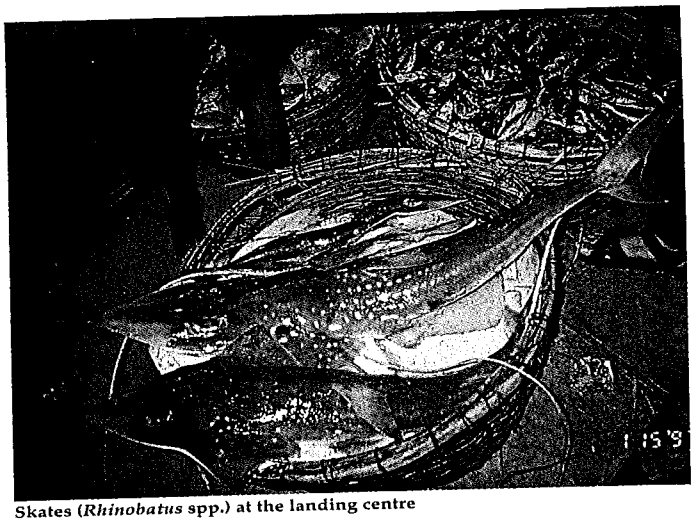
Among the rays, stingrays *Dasyatis* spp. dominate. Other groups of rays fished occasionally are the spotedged rays *Aetobatus* spp. and cow rays *Rhinoptera* spp.

Dolphin is the most preferred bait. It is however another matter that the most commonly used bait comprises different kinds of eel, which usually are again a bycatch from trawlers. Dolphin meat is not easily available, moreover it is more expensive than eel. For drift longlining, cut pieces of mullet, tuna and dolphin are used. Depending on the availability, whole Indian Mackerel may also be used (Dahlgren, 1992).

On the East Coast (subsistence and commercial exploitation)

West Bengal has more than 300 fishing villages. This state is located in the northern part of Bay of Bengal, between the state of Orissa in the south and Bangladesh in the east. The selected sites in this state were in and around Calcutta and Digha. In Calcutta, the sharks come from the surrounding fishing villages mainly Kakdeep, Namkhana, Canning, Raidighi, Diamond Harbour and Frazerganj. They are mostly transported by train and sometimes by road. Fish are unloaded at Sealdah market from where whole sharks are distributed to other markets like New Market, Patipokur and Howrah. In these markets they are cut into pieces and distributed to sub-dealers and agents. Fishermen in Diamond Harbour and Kakdeep go for target shark fishing. Both the places together have more than 400 trawlers and they use gillnets but in Kakdeep, Raidighi and Namkhana hooks are also being used. The normal cruise is for 10-15 days.

The shark dealers have godowns and they go for salt curing. The major exporters directly purchase the products from these dealers. Fins are collected from surrounding villages and sent to Calcutta and Madras for further export. Shark meat is sent to Kerala and Tamil Nadu for local consumption.

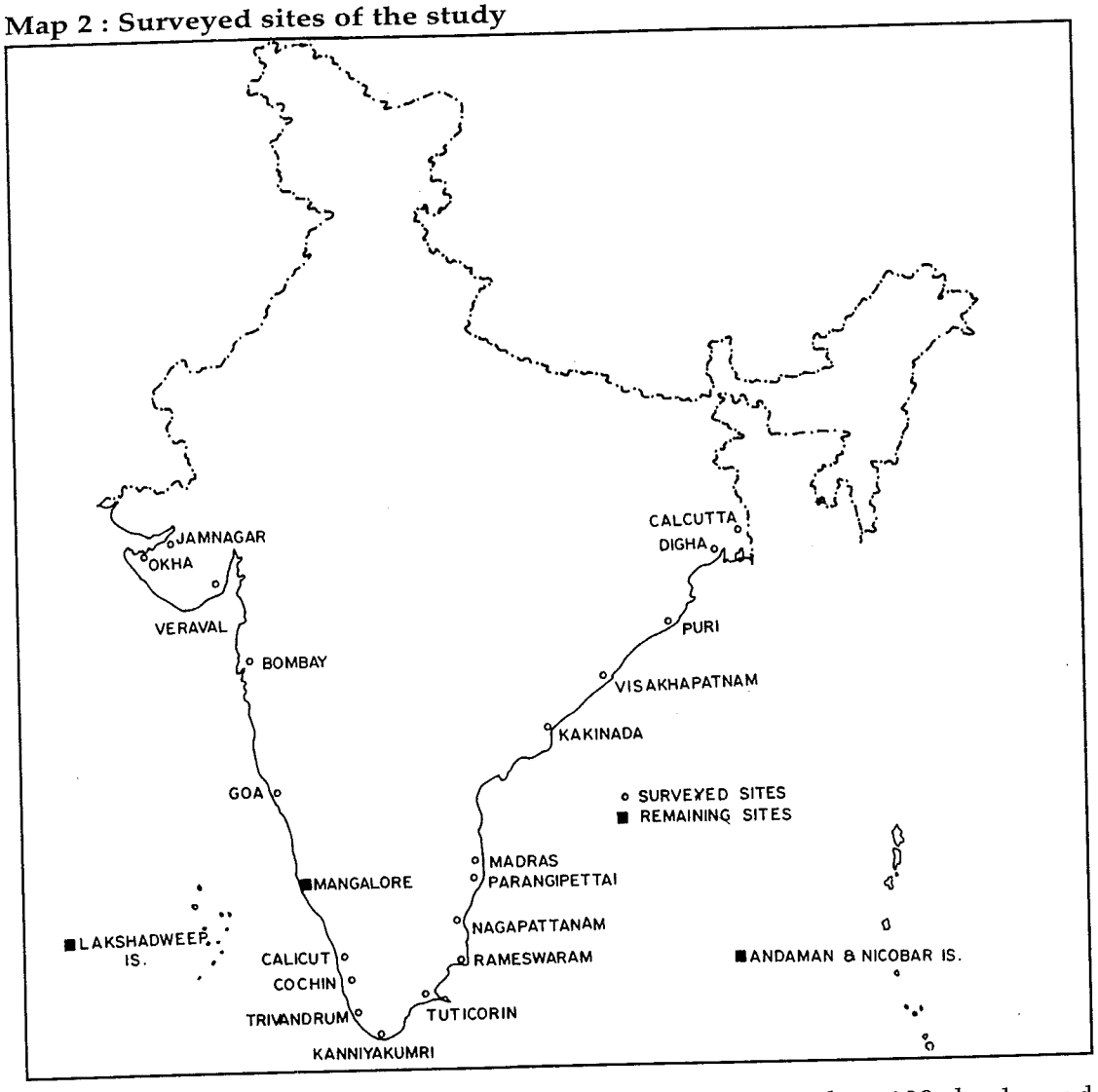


Skates (*Rhinobatus* spp.) at the landing centre

Prices

Dried fins: Rs. 4000 - 5000 per kg. (below 9")
Rs. 10,000 per kg. (above 9")
Wet fins: Rs. 50/- per kg. (small size)
Dried scoliodons and skates: Rs. 40/- per kg.

Map 2 : Surveyed sites of the study



Rays and skates are frequently caught in Canning. More than 100 sharks and skates of 3-4 feet length were observed at one godown in Kakdeep and at the same place approximately 20 large specimen, varying between 5 to 6 feet, were also recovered. Sometimes, shark skins are collected by poor people as edible stuff (free of cost) or for medicinal purposes.

Kakdeep provides a natural advantage. There is a riverine canal which comes straight till the landing centers enabling the trawlers to sail closer to the land. This makes it easier for fishermen to carry big sharks and unload them from ship to land. Perhaps this may be the reason why fishermen in this area go specifically for sharks.

Some 300 km. from Calcutta is a place called Digha. It has got two main harbours viz. Sankarpur and Mohana. Foreign trawlers from Thailand, Malaysia,

Indonesia and Burma are reported to be moving in this region. They come mainly for sharks and move around in groups of 15 to 20, staying for about one to two months in the sea.

Dry fins in this area are priced at about Rs. 4,000 per kg. and the meat sells for Rs. 40 per kg. While the fins are sent to Madras, the meat goes to Kerala. Average length of the catch is around 5 feet, and this generally comes as a bycatch. At Sankarpur Harbour, a few Hammer head sharks (the biggest was of wt 32 kgs & Length 5 feet), several skatea (the maximum of wt 100 kgs. & Length 6 feet) and hundreds of other shark species of average length 2-3 feet were recorded.

Sometimes whole fish of about 6 ft length is sold for Rs. 10,000. The demand for whole fish has been on an upswing since 1991.

Bordered by West Bengal in the north-east, Bihar in the north, Andhra Pradesh in the south and Bay of Bengal in the east is the state of Orissa, forming 8 per cent of the coastline of India. Orissa has approximately 250 fishing villages all along the coast. According to CMFRI reports, the maximum landings of elasmobranchs are in Balasore, followed by Puri. Although in the present survey only Puri was covered, Paradeep is also known for all kinds of fisheries and is considered to be a major landing center.

In Orissa, shark is not known to be consumed locally. Moreover there is no specific fishery for Sharks. Like in other parts of the country, it comes as a by-catch in most areas of this state. Near Puri, other center for fishing are Chandipore, Konark and Gopalpur. Very few people deal in sharks meat and fins. They usually get very small sized sharks. Whole shark do not fetch a price higher than Rs. 40-50 / kg. Trade in fins is low because of the poor demand for small size sharks. Its meat is, however, cured and salted and then sent to Kerala. Andhra Pradesh and West Bengal.

Connecting the coastline in the southern part of Orissa is the state of Andhra Pradesh. With approximately 450 marine fishing villages, the state has two major fishery harbours at Kakinada and Vishakapatnam, handling bulk of the mechanised fleet.

Both the harbours, have target fishery for sharks. They mostly use hooks and lines and sometimes gillnets. The cruise is often 4-5 days and each trawler catch is around 10-12 sharks. Average catch is 1 ton per day and average size of the shark caught is 5-7 feet in length. Price for fins is Rs. 3000-4000 per kg. (dried) and Rs. 300-400 per set (wet). Meat is sent to Kerala afresh in ice-trolleys @ Rs. 17 per kg.

In Kakinada, there is an oil factory which is the only one running presently in India. Shark liver at Rs. 4-7 per kg. comes mainly from Kakinada port. From Vishakapatnam and nearby places (Pudimaddakka, Gangavaram and Chipurupalle), crude oil comes to the factory @ Rs. 30 per kg. Crude oil from liver (average wt. of liver is 5 kg.) is also extracted. And after further processing and refined, it is sent to Mumbai. The refined oil is sold @ Rs. 70-75 per kg.

Fishermen in small villages in Madras, the capital of Tamil Nadu, have catamarans. The local made boats are fitted with engines. They do not target sharks but when caught incidentally they auction it for Rs. 500-600 per shark, depending on the size. The smaller sharks (*Scoliodon* spp., hammerhead sharks), of about 0.3-0.6 meters are sold for Rs. 70-75 per shark. Fishermen using trawlers and gillnets bring their catches to the main harbour. Big rays are also caught incidentally and the meat is sold for Rs. 35-40 per kg in the fish market.

Approximately 200 km from the city of Madras is the small village of Parangipettai (famous as Porto Novo), where the fishermen mainly use trawlers. They go specifically for sharks during the month of March, which is the main season for shark hunting. They use special thick gillnets for shark fishing. The average size of the sharks caught is around 1.55 meters in length. During the season they sometimes catch 20-25 sharks in a day. They also catch 10-15 rays of an average size of 1.25 to 1.55 meters in width, every day. Blacktip Shark, hammerhead sharks and Devil Rays were seen during the survey.

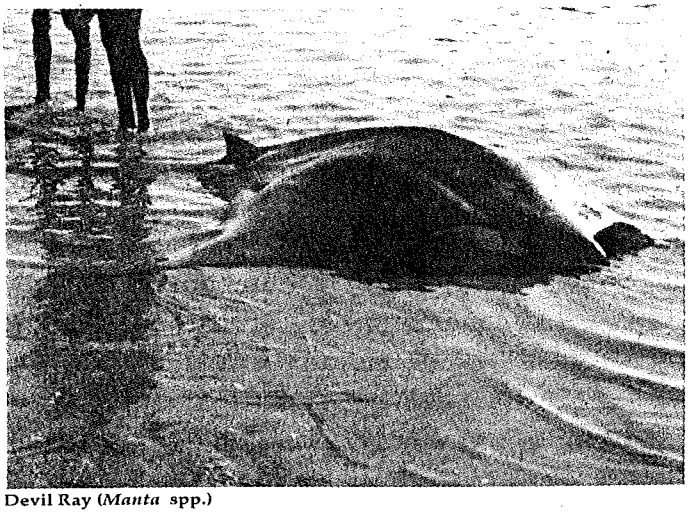
The fishermen sometimes cut the fins from sharks and sell the meat. Dry fins for approximately Rs. 1000 per kg are sent to Madras for export. Meat sent to Kerala where it is much in demand and is locally consumed fetches a price of Rs. 30-40 per kg. Often whole sharks are auctioned to middlemen for approximately Rs. 1000-1500 per shark of length 5ft.

About 80 kms from Parangipettai is another major fishing center, Nagapattinam. Fishing gear used here is longline. Dahlgren, 1992 reports, sometimes the same longline may be used for drift longlining and bottomset longlining by removing the floats and attaching stones. Sharks are not very popular here, but sometimes they are caught incidentally in the nets. Normally, small sharks not exceeding one metre in length are caught. Small sharks of grey colour (not identified), hammerhead sharks and rays were seen during the survey. When a big shark is caught incidentally, the fishermen sell the whole shark to the dealer who takes out the fins to be sent to Madras and the meat to Kerala. The market value for dried salted shark meat is Rs. 50-70 per kg and small rays are sold for Rs. 20 per ray.

Rameswaram, approximately 320 kms from Nagapattinam, is a major fishing center for rays. Trawls and gillnets are used for fishing. At some places they use deep-set gillnets. The price for Stingray meat was Rs. 50-70 per kg in the local fish market. The dealers cost price for rays was Rs.10-12/kg and their selling price Rs.15-17 per kg. Some of the species recorded were Whitetail Stingray *Dasyatis bleekeri*, Bluespotted Stingray *D. Kuhlii*, Giantdevil Ray *Manta birostris*, Spotted Electric Ray *Narcine timlei*, Shovelnose ray *Rhinobatos* spp., saw fish *Pristis* spp., spotedged ray, and cow ray.

Mandapam, very close to Rameswaram, is also an important fishing harbour. Fishing here takes place all the year round. In the Palk Bay, when the sea becomes rough during monsoons fishermen shift to the Gulf of Mannar and vice versa. The gear used by the fishermen are mainly gillnets and hooks. Trawling is mainly for prawns. Occasionally rays and sharks are caught. Sometimes in the Palk Bay side of the sea they use bottom set gillnets specifically for rays.

Between Rameswaram and Kanyakumari is located another famous city called Tuticorin, known better as the 'city of pearls'. Here three types of gear are used for shark fishing: drift gillnet, trawlnet and longline. This is another harbour where fishing vessels have started using bottom set long line (BSLL) for shark. BSLL is also used by large Kattumarams*, both motorised and sail-powered ones operating from several villages on the coast (Dahlgren, 1992). The trawlers exploit smaller hammerhead sharks *Sphyrna* spp. and *Rhizoprionodon* spp.). Large incidental catches are occasionally reported. In season, they catch about 300-400 sharks of various sizes every day. In off-season too sharks are occasionally caught. Sometimes they have bumper catches, i.e. more than 500-600 sharks in a day. The good season for shark fishing is from May to June. One set of fins fetches them Rs. 7000-8000 per set. During the survey, fishermen said that people from Singapore come directly to buy fins. Fins of Tiger Shark fetch Rs. 8000-10,000 per set. A fin set consists of four fins, usually a pair of pectoral fins, one first dorsal fin and one caudal fin.



Devil Ray (*Manta* spp.)

Kanyakumari is the tip of the Indian peninsula and is approximately 680 kms from

* Local made boats. Probably the origin of "Catamaran".

Madras. In this port, rays are more commonly caught. More than five to seven rays per day are caught on an average. Smaller sharks of 1 meter or less are occasionally caught. In a season, the average catch is of 20-25 sharks per day. During the survey 25 Blacktip Sharks of about 1 meter and some rays were recorded. The fins are cut and dried and sent to Japan and Singapore and the meat is dried, salted and sent to Kerala.

Scoliodon spp. being skinned at Okha, Gujrat

On the West coast (subsistence and commercial exploitation)

On the west coast, Gujarat has the longest coastline adjoining to Maharashtra on its south. With nearly 180 fishing villages, the state has the lowest local consumption of fishery products. To get a good cross-section analysis of this area, three major areas — Jamnagar, Veraval and Okha were surveyed.

In Jamnagar, shark fishing is not very popular. The catches are purely accidental. Veraval and Okha have an edge since it has good facilities and many processing centers are located near the landing centers thereby utilising the catches to its maximum. Unlike Jamnagar, both the places are known for shark products. Fresh meat of Whale shark *Rhiniodon typus* is exported to Taiwan from these areas. The meat of the rest of shark species is dried, salted and sent to Kerala and Tamil Nadu. Dried fins are also sent to Chennai and Mumbai for further export.

Okha (Dwaraka) has emerged recently in whale shark fishing. It targets fish and huge whale sharks (4 m - 12 m) are hooked mainly for fins and livers and sometimes for meat as and when the demand arises. The fins are sold for Rs. 200-300 per kg., meat for Rs. 2-5 per kg., and liver for Rs. 14-15 per kg. The crude oil is sold for Rs. 7000 per tin (1 tin = 15 litres approx.). The whale shark meat is exported (fresh and frozen) to countries like Taiwan, Korea and Singapore @ US$ 1 per kg.

Gujarat coast is a major landing center for *Scoliodon* spp. These species with dried rays and skates are sent to Mangalore, parts of Kerala, Tamil Nadu and Karnataka. Some of the companies remove the skin, dry the Scoliodon and export it.

Trivandrum is the capital of Kerala, situated approximately 87 kms from Kanyakumari. In Trivandrum (Vizhinjam) trawlers, gillnets and hooks are used for fishing. Fishing vessels from Kanyakumari, Visakapattinam and Thoothoor also come to this region. The best season for shark fishing is March-April. Blacktip Shark is commonly caught, and grey sharks are caught rarely although they are very valuable. The average weight of sharks caught ranges from 40-50 kgs and are normally 1.55-1.85 meters in length. The fins are cut and dried and sent to Madras for export at a price of US$ 114/kg. The tail fin is more expensive. The meat is sold at a price of Rs. 35-40 per kg and is sent to the local markets of different towns and cities of Kerala.

Approximately 200 kms from Trivandrum lies Cochin, the biggest harbour. The main gear used for fishing is gillnets and hooks. They have directed fisheries for sharks. There are about 30 vessels operating. They take a week to complete one trip. In a trip they catch 4-5 sharks on an average. According to a fishermen the shark weight varies between 25-500 kgs. Sometimes they catch sharks of 2.44-2.75 meters in length. However, during the shark fishing season, i.e. May, they catch 25-30 sharks per trip. Whole shark is generally auctioned. Sometimes they sell it piece by piece or per kg. The companies which buy whole sharks remove the fins, cut the meat into fillets and sell it part by part. The fins go to Madras for export. People living near the harbour buy the livers for crude oil extraction.

In Calicut (approximately 190 kms from Cochin), there is a shark fishing village, Elathur. Usually the fishermen here catch sharks for six months during the monsoon. But for the past few years, they are finding it difficult to catch sharks. These fishermen have been adversely affected by the sophisticated high-tech boats coming for fishing from surrounding areas. Sometimes, foreign vessels also come, and sharks are occasionally caught. On an average, they catch three to four sharks in a day. Sharks of approximately 75-80 kgs and 1.55-1.85 meters in length are caught. In the month of June and July, they target sharks and in other seasons, mackerels and other fish.

The fishermen at Elathur have been using mechanised boats for the last 10 years. They have around 55 fibre glass boats fitted with engines. Usually 25 boats operate together. They go in the morning and come back the next evening. Each boat is manned by five to six people. Mainly hooks are used. Earlier they used to cut the fins and throw away the rest of the body. But these days they have an infra-structure with freezing plants etc., so they auction the whole shark without going into the trouble of cutting fins and meat.

The fins are sent to Madras at a price of Rs. 2000 per set for smaller sharks and Rs. 4000 per set for bigger sharks up to 1.85 meters. The meat (dried and salted) is sold in local markets of Calicut for Rs. 35-40 per kg. Small sharks (whole) dried and salted are sold for Rs. 35 per shark.

Following are the price for the fins as obtained from various merchants in 1996:

White		Black	
40 cm up / set	US$ 132-136	30 cm up / set	US$ 84-86
30 cm up / set	US$ 100-104	20 / 30 cm up / set	US$ 62-65
20 cm up / set	US$ 72-74	15 / 20 cm up / set	US$ 35-39
15 cm up / set	US$ 42-46	10 / 15 cm up / set	US$ 20-22
		5 / 10 cm up / set	US$ 10-14

Thoothoor is a fishing village on the western coast of the Kanyakumari district of Tamil Nadu. The fishermen of Thoothoor are famous for their bravery and are known to venture into deep waters. These fishermen are said to be experts in shark fishing. They operate from Kanyakumari to Veraval in Gujarat. The main fishing method is long lining from mechanised boats. The peak shark fishing season is from September to December. Other major areas which they cover are Pallikal (Kerala), Malpe and Karwar (Karnataka), Goa, Ratnagiri (Maharashtra) and Veraval (Gujarat). They fish in these areas mainly between September to April.

The number of boats varies according to seasons. In peak season, more than 200 boats operate, using large sized hooks exclusively for sharks. Usually six to eight fishermen go per boat. They leave at dawn, first collect the bait and then go to the seas for fishing. The fishing ground for sharks is about 50-70 kms from the main shore and sharks are fished at a depth of about 80-150 meters, and sometimes as deep as 500 meters, as also reported by Dahlgren, 1992. Night-time is ideal for hooking sharks. The next morning the gear is hauled and they return if the catch is satisfactory, otherwise they stay longer.

The fishermen claim that of the total shark landings, 50per cent is of *Carcharhinus* spp. and *Isurus* spp. Rays and skates landed include *Aetobatus* spp., *Dasyatis* spp., *Himantura* spp., *Rhinobatus* spp. and *Rhyncobatus* spp.

Mumbai (Bombay) and Goa were also surveyed. The distance between Mumbai and Goa is approximately 580 kms. Bombay is one of the major outlets and commercial centers for dried fin exports on the west coast like Madras is on the east coast. In Mumbai, the fins are cut on the harbour itself and dried and sold for Rs. 3000-4000 per kg. The fins are exported to Hong Kong and Singapore.

Small Scoliodon spp. are sold in the Mumbai fish market for approximately Rs. 35 per piece. Rays (size 12 inches in length and 3 inches in width) are also sold on per piece basis for Rs. 35-40. Different gears are used by the fishermen : trawl net, dol net, gillnet, purse seine and sometimes hooks and lines. Sharks are taken as bycatch when the fishermen fish for prawns. In Malim jetty and Old Goa jetty (Goa), fishermen usually use hooks but sometimes the small sharks are also caught in nets. Hooks are specially used for shark fishing in season, i.e. September to May.

Some of the fishermen cut and dry the fins themselves and then sell them at a price of Rs. 2500 per kg to middlemen who take the fins to Bombay and export them to Singapore. Others sell the whole shark (1.25-1.55 meters) to middlemen for approximately Rs. 5000-7000 per shark (prices vary depending on the size of the shark). Some sharks of about 1.25 meters, without the fins, were seen on the Malim jetty. After cutting and drying, middlemen sell the fins in Bombay for approximately Rs. 4000 per set (6 fins of smaller sharks, i.e. less than 1.25 meters, make a kg). They collect about 50-60 fins per week which fetches them about Rs 1,00,000. The collection is on weekly basis.

Liver oil is also extracted by the same middlemen who along with fins or sharks buy liver from the fishermen. The oil is used for painting boats as a local preservative. Rarely people come to buy it for medicinal purposes at a price of Rs. 35-40 per litre. *Scoliodon* spp. are sold in local markets at a price of Rs. 35 per pair.

In Margao (Goa), fishermen use rampani and sometimes hooks. The sharks from other harbours of Goa and also from Bombay are sold in the local markets for flesh. Sharks is a popular food in Goa. From Bombay the sharks are kept in ice and are transported to Goa. Thirty boxes of small sharks were kept for sale in the new market at a price of Rs. 350-400 per box. One box carries about 60-65 sharks of 0.3 meters length.

Prices of sharks sold in the Margao fish market (1996) :

Size	Nos.	Price
<0.3 meters	50-60	US$ 1-2 for 3
0.6 meters	8-10	US$ 3-4 each
0.3 meter piece	Dry shark meat	US$ 1-2

The dry fish market hawkers sell the fins to the middlemen at a price of Rs. 400 per kg (small) and Rs. 750 per kg (big). The fins are sold to the agents from Bombay who collect the fins per week. In a month they sell approximately 1 quintal dry fins.

TRADE IN SHARKS PRODUCTS

Fins: Dried shark fin is a valuable export product of export from India. A major portion of export takes place from Bombay and Madras (Table 5). Geographically, Madras is centrally located on the shark landing belt of the Indian east coast. On the other hand, inland transportation is good and allows fins from the west coast to easily reach Madras. Moreover, Madras has a large commercial port and a well connected international airport.

According to the Marine Products Export Development Authority the fins are exported mainly to Singapore, Hong Kong, Malaysia, UK and Australia, (Table 6). Fins from several varieties of sharks are exported. The fin rays prices vary from Rs. 5000-15,000 per kg. Figure 3 shows a bar chart indicating the quantity which shows significant increase in 1995-1996 and parallel to which the value has also shows increase. This can be due to fluctuations in exchange rates and also due to increase in demand over the years as mentioned earlier.

As there is a good internal demand for shark fins rays, especially in major hotels, CIFT has successfully evoloved a suitable method for extraction of the fin ray. One bowl of shark fin soup costs Rs. 75-80/-, in Chinese restaurants of metro cities. Usually the first dorsal, pectoral and the lower lobe of the caudal fin are highly valuable in the foreign market. In the case of skates, the two dorsals and the whole caudal fin are preferred. Fins of certain varieties of skates are considered to be of superior quality fetching more value than the fins of sharks. The fins of certain sharks like *Alopias* spp., *Centrophorus* spp. and *Echinorhinus* spp. have no economic value, but it's flesh or liver oil, and in some cases both are made use of. Fins of Whale shark are also of not much value but still it is traded mainly from Gujarat.

India, Sri Lanka, Bangladesh and Maldives are the main producers of fins. The main consumer countries - Thailand, Malaysia and Singapore - also re-export un-processed and processed fins in various forms to Western markets as well as trade extensively with Hong Kong further to the east.

Meat: Shark meat is consumed locally, mainly in dried (salt-cured) form. It is very popular on the west coast, especially in Kerala and Goa. In Tamil Nadu, shark meat is less popular. It is therefore transported to Kerala where the demand is growing. For the poor people in Kerala, shark meat with Tapioca is part of the staple diet.

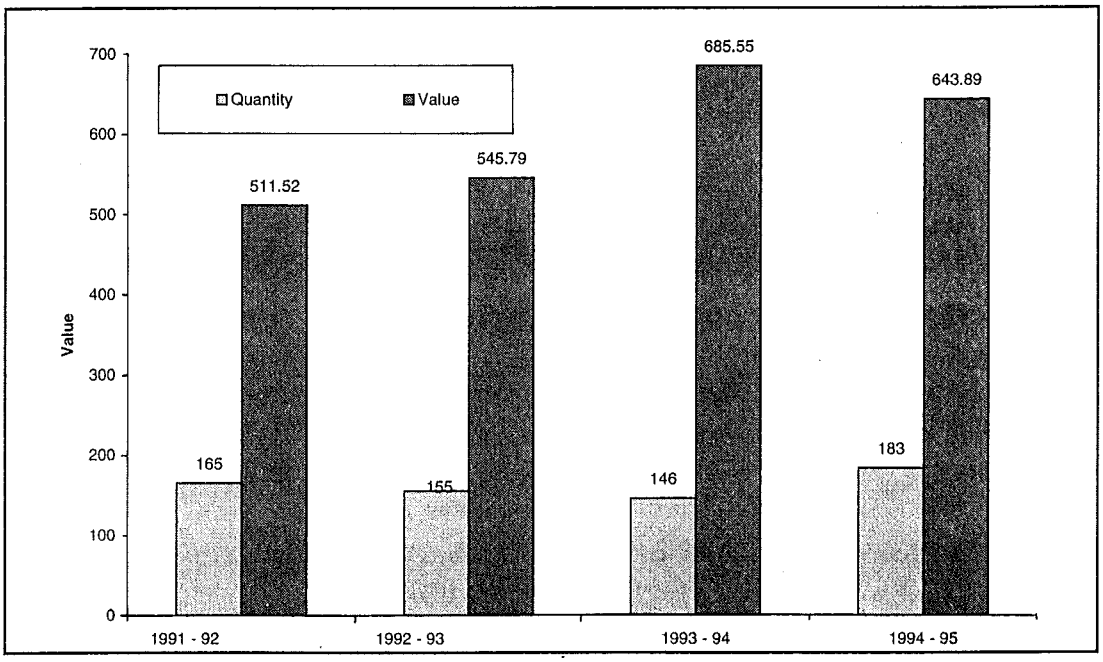
Among the Edavar (a tribe from North Malabar) and Muslims particularly of Calicut region, shark meat is preferred in wedding parties.

Table 5: Export of shark fins by port (Q = tonnes; V = US$)

Port		1989	1990	1991	1992	1993
Bombay	Q:	-	1.55	32.05	33.23	19.27
	V:	-	38.05	337.2	290.1	117.9
Calcutta	Q:	-	-	-	0.87	-
	V:	-	-	-	5.34	-
Cochin	Q:	2.43	23.14	0.60	10.00	-
	V:	47.08	108.9	7.94	8.91	-
Madras	Q:	150.09	62.62	93.93	109.40	101.92
	V:	2 112.9	775.1	1 412.6	613.1	1 662.5
Nagapattinam	Q:	0.75	-	-	-	-
	V:	13.5	-	-	-	-
Tuticorin	Q:	25.76	23.72	17.37	17.64	17.72
	V:	169.3	131.5	173.5	126.9	95.6
Visakhapatnam	Q:	0.77	-	-	-	-
	V:	0.5532	-	-	-	-
Mangalore	Q:	13.00	-	-	-	0.13
	V:	121.6	-	-	-	11.4
Jawaharlal	Q:	-	-	-	3.28	-
Port	V:	-	-	-	35.3	-

Source: The Marine Products Export Development Authority (1994).

Figure 3. Export of dried shark fins



Source: Based on data obtained from MPEDA (1996).

Table 6 : Export of shark fins by reported country of destination (Q: Quantity in kgs. V: Value in US$)

Country or Territory		1989	1990	1991	1992	1993
USA	Q:	-	-	-	100	-
	V:	-	-	-	4 300	-
SRI LANKA	Q:	-	11 871	-	10 000	-
	V:	-	46 526	-	8 915	-
TAIWAN	Q:	-	-	-	874	25
	V:	-	-	-	5 247	2 310
HONG KONG	Q:	21 972	3 204	34 541	46 619	40 516
	V:	343 527	45 359	466 184	743 838	462 358
JAPAN	Q:	773	800	-	-	-
	V:	569	18 265	-	-	-
KOREA, REPUBLIC	Q:	-	-	-	900	-
	V:	-	-	-	2 002	-
SINGAPORE	Q:	156 993	75 385	109 410	110 595	98 486
	V:	2 064 762	890 472	1 465 091	1 424 422	1 422 896
BAHRAIN ISLANDS	Q:	60	-	-	-	-
	V:	164	-	-	-	-
REPUBLIC OF GERMANY	Q:	-	-	-	224	-
	V:	-	-	-	1 472	-
IRELAND	Q:	13 000	-	-	-	-
	V:	125 085	-	-	-	-
UNITED KINGDOM	Q:	-	1 907	-	5 100	-
	V:	-	4 248	-	29 529	-
SPAIN	Q:	-	17 860	-	-	-
	V:	-	43 760	-	-	-
Total	Q:	192 798	111 027	143 951	174 412	139 027
	V:	2 534 108	1 053 633	1 931 275	2 219 729	1 887 565

Source: The Marine Products Export Development Authority (1994)

Difficulty is encountered in commercial utilisation of the shark flesh, in fresh form or processed products, due to the imability to remove the relatively high urea content from its flesh. CIFT has developed a successful method for removal of urea from shark, rays and skates flesh and they are also promoting processing of good quality fillets.

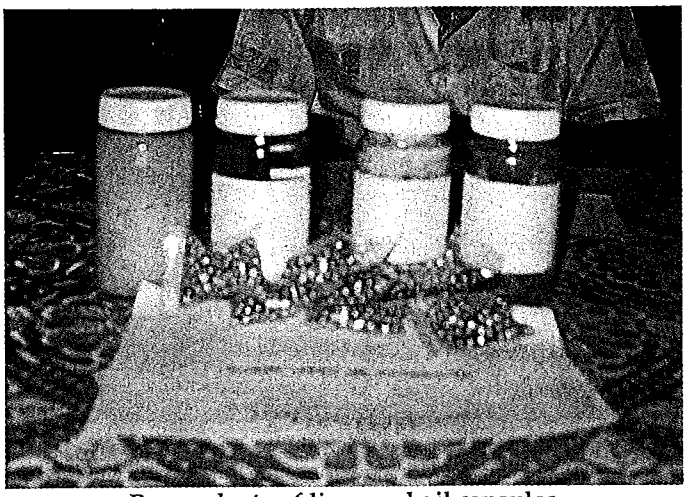
Gujarat is the only state exporting meat at present. Its export depends upon the demand. The whale shark meat is exported afresh in frozen form to mainly Taiwan and also Korea and Singapore. The meat of other species of sharks as well as whale sharks is also occassionally exported to Sri Lanka in dried form.

Oil: Of more than 37 species of sharks available in Indian waters, only certain are commercially important (Tiger sharks, hammerhead sharks, saw fish, Black Fin Sharks) and yield liver oil with high vitamin content.

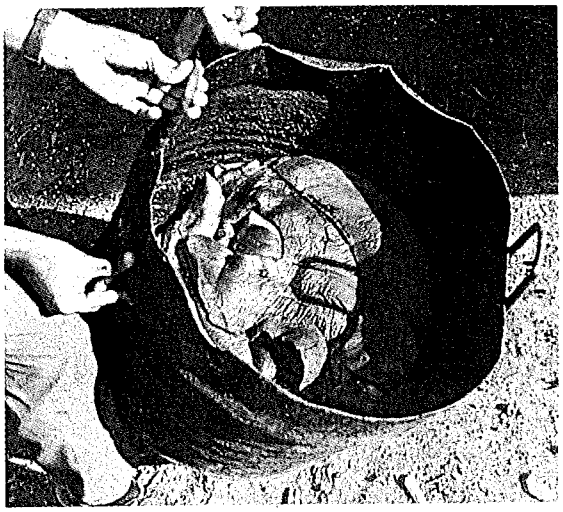
In India, a shark liver oil factory did existed at Calicut in 1854, which closed down due to the import of cheap cod liver oil. With the establishment of a shark liver oil extraction unit at Calicut in 1940, the industry was revived. The industry was again faced with problems with the introduction of synthetic vitamin A. It again pulled down its shutters some ten years back due to non-availability of raw material.

These days, oil is extracted crudely at some places in the unorganised sector. Crude oil (the liver oil that does not meet pharmaceutical standards) is used as a preservative for boats. It is smeared on the country craft to repel marine foulers. Sometimes it is sent to the refineries and sometimes to Bombay for capsulation as medicines. The value of liver oil differs from species to species depending on its quality. In 1992, prices were reported by ranging between Rs. 150-200 per 15 kg.

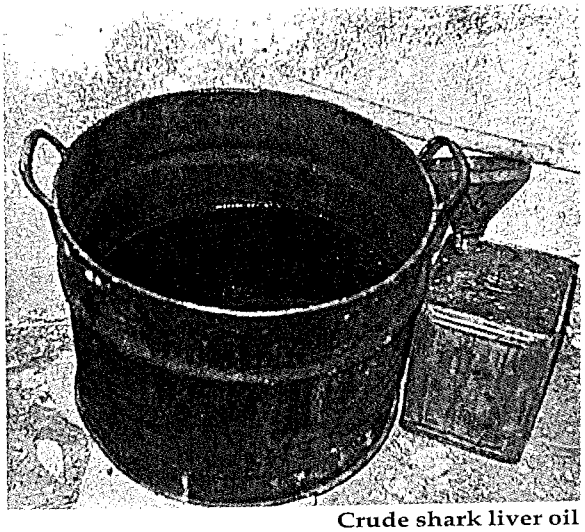
Dahlgren (1992) reported that The Andhra Pradesh Fisheries Corporation offered Rs.5 per kg for shark liver delivered to their oil refinery plant at Kakinada. The well equipped factory, had at that time a daily capacity to handle about 200 kg of liver. In 1991, 21 tonnes of liver were purchased for over Rs. 100,000 per tonne. This factory works in collaboration with a company in Bombay and converts refined oil into capsules of Vitamin A and D. The natural vitamin content of the purchased liver is considered to be low and surprisingly some synthetic vitamin A and D are added. The end products are small droplet like capsules. One kg of refined oil produces 10 000 capsules, which sell at a retail price of Rs. 50-70 per pouch (1 pouch=1000 capsules). This activity is a revival of a decade old practice which slowed down due to the non-availability of raw material. With shrimps being overfished, the fishermen again turned their attention to shark and their livers. The shark liver oil factory at Kakinada is the only one working at present in India.



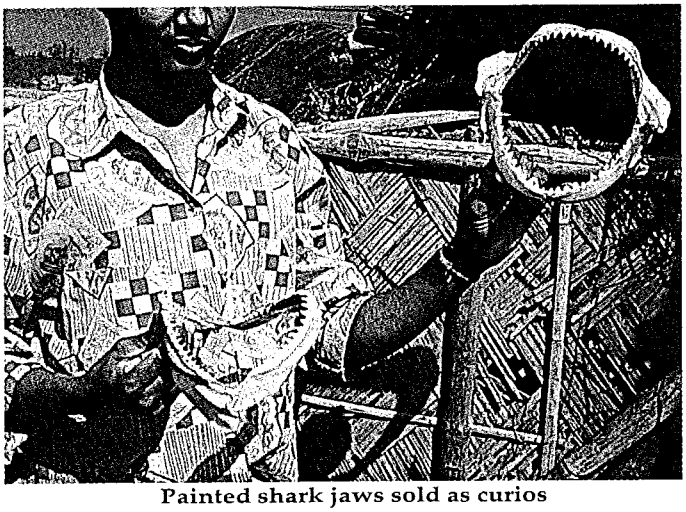
By-products of liver and oil capsules



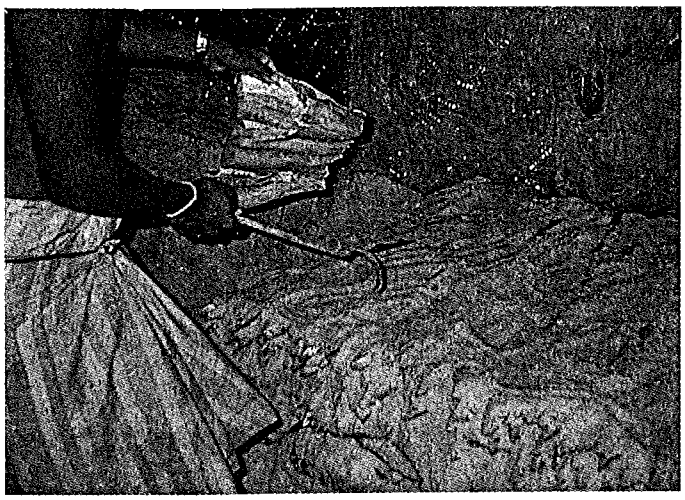
Shark liver collected for oil extraction



Crude shark liver oil

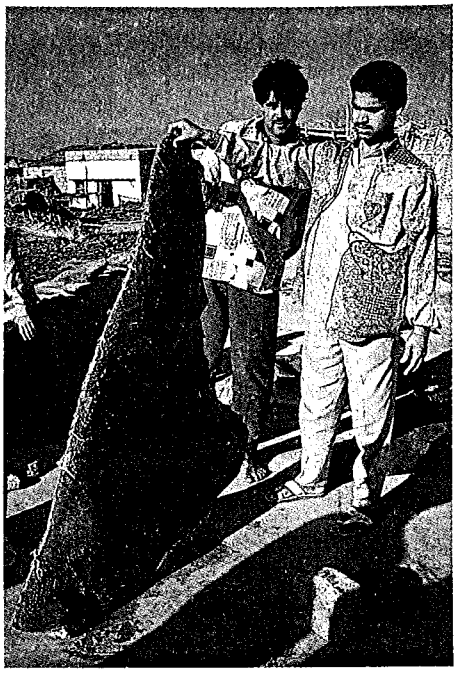


Painted shark jaws sold as curios

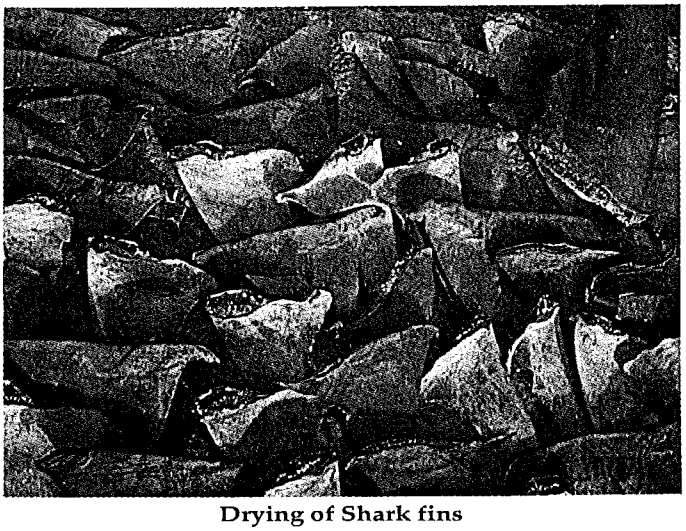


Salt curing: Shark meat store house

Salt curing: Ray meat



Dried Whale shark fin



Drying of Shark fins

The biggest market for deep-sea shark liver oil is Japan, where it is used by the cosmetic industry. Its demand in the US and Europe is small except for Germany, where shark liver oil is used in the textile and leather industry, for paints, varnishes and cosmetics (MPEDA Product Profile). Recently, one Indian scientist is experimenting to popularise shark liver oil as an alternative to the dolphin oil used as bait for Neria fish *Clupisoma garua* in Brahmaputra region.

By-products of liver oil

Stearin : It is preserved in crude liver oil as a fatty matter. It is separated by chilling the crude liver oil in a cooler before centrifuging. Crude liver oil contains about 20-30 per cent stearin, which is used in the manufacture of candles, soaps and paints. It is also used as an anti-fouling agent for fishing craft.

Liver meal : Fresh livers are minced and vigorously boiled for two hours. After boiling, water and liver settle at the bottom and the oil floats on the surface. The oil is carefully separated using a filter cloth and the liver meal is dried and powdered for mixing in poultry feed.

Cartilage: According to CIFT scientists, there is an occasional demand for 'shark-bone', which is powdered and made into tablets. These tablets are used by heart patients in the European countries. The price for the bone is US$ 15-20/ kg. It is also reported to have anti-cancer properties and sometimes the vertebra are used for ornamental purposes. There are some recent reports on cartilage extracts being used specifically against carcinoma / tumours with positive results.

Skin: Shark skin can be processed into good quality leather. Not very popular in India, shark skin products like, handbags, sandals, water-proof watch straps, scooter and cycle handle cover grip, wallets etc., are seen. Also when the ray meat is cut into fillets, the middle portion is usually a waste. Sometimes, as reported by a dealer at Rameswaram, the skin from this portion is sold to Nepalese customers for Rs.4-5 per piece.

Teeth: Shark teeth also have commercial utility. In the absence of any internal demand, trade is highly un- organised. Reports from Veraval (Gujarat) indicate that agents collect jaws from Mumbai and Chennai for export. The jaws are very rarely sold as curios and the teeth are sometimes used as beads in artificial jewellery.

Industrial uses (e.g. fish meal): The residue from liver oil is used in fish meal production, and as feed for pigs and poultry.

CONCLUSIONS AND RECOMMENDATIONS

From the survey, basically two diametrically opposite assumptions emerged. While most of the fishermen feel that there are not as many sharks as it appears to be, some of the scientists feel that the export of fins is not a threat to the shark population. From the available data and the short term survey conducted, it is not possible to determine whether trade in shark fins and other parts has been negatively impacting sharks.

Considering India's precarious economic status, it is important for the country to earn foreign exchange through shark fin trade. But this needs to be done very carefully, especially in a country like India, where the licenses for the vessels are issued by the Ministry of Food and Processing Industry, which has little to do with species conservation or protection.

In general, sharks grow slowly, mature late, have small numbers of young and live for many years. As a result, there is a direct relationship between stock size and recruitment, with population replacement rates being very low. All these factors indicate that shark stocks are vulnerable to over-fishing. These factors also establish that shark stocks once over-fished, take years, even decades, to recover. The present situation in shark fisheries, therefore, require particularly careful monitoring and species management.

There appears to be a high level of catches of elasmobranchs in India (peak of 73 500 tonnes in 1988) and it is important that such large yields are monitored over a long period to determine the impact on shark populations. The collapse of the neighbouring Pakistan's elasmobranch fisheries in 1983 as also reported by Bonfil, 1994 is a pointer to future catch reductions for the Indian elasmobranch fisheries

It is difficult to verify the impact of fishing on sharks as little information exists on the levels of bycatch, survival of discards, and deep sea shark populations themselves. Moreover, there is no legislation in India for the shark fishing and generally under-sized fish. If no management measures are taken, there can be problems in sustaining shark harvests thereby creating an imbalance of the marine ecosystem.

This preliminary survey does not provide ample scope for conclusions but does provide an indication of the emerging crisis. We are therefore pleased to make the following recommendations:

- Sufficient information is required about the size and state of India's shark stocks, their basic biology and the magnitude of their exploitation.

- The assessment of the impact of these fisheries is problematic because of the difficulty in estimating their abundance, therefore research is needed to assess the real bycatch levels in each fishery and their impacts on different shark populations.

- A specific survey programme for shark population statistics could be entrusted to :

  a) Fishery Survey of India, Mumbai (Under Ministry of Food Processing and Industry)

  b) Central Marine Fisheries Research Institute, Cochin

  c) National Institute of Oceanography, Goa.

- Extensive study has to be undertaken in major landing sites to collect more in-depth information on the composition of catches and their size (probably by CMFRI).

- As fisheries is a priority area, it needs immediate attention for an effective management policy. Protection of elasmobranchs should begin with education and awareness.

- The Central Marine Fisheries Research Institute, Central Institute of Fisheries Technology and other fisheries institutes, while promoting export of shark products, should also become more involved in its conservation, particularly in the case of sharks.

- All commercial fishing boats should maintain log book reporting details of shark catches to the designated authorities.

- An illustrated catalogue, information brochures, posters in local languages, of sharks from Indian waters may be compiled with basic information for wide distribution as a means of creating awareness.

- The Indian Fisheries Act, 1897, the WPA, 1972 and the Deep Sea Fishing Policy, 1991 are silent on the issue of fishing of species in danger. It is very essential that the existing laws may be reviewed and effective legal mechanisms and management may be planned keeping view the conservation value of fisheries in our country.

REGULATORY AND MANAGEMENT FRAMEWORKS

Domestic Measures

In the fisheries sector India's objectives consist of promoting production and export, generating employment, ensuring the welfare of fishermen's communities and sustainability.

Restrictions and regulations

There are no clear restrictions / regulations on the shark fishery, but there are several acts which cover a few aspects. For example, in The Environment Protection Act, 1986 it is obligatory on the part of Central Government to improve and protect the environment, which also includes fisheries. Under the same Act, the Central Government issued a notification in 1991 declaring coastal stretches as Coastal Regulation Zone (CRZ) and regulating activities in the CRZ. In the CRZ there are restrictions on the setting up and expansion of industry, operations or processes. (Appendix I).

The Indian Fisheries Act is an outdated legislation which was originally enacted in 1897 to regulate "certain matters of fishing".
Section 5 prohibits destruction of fish by poisoning and Section 6 ensures protection of fish in certain areas. Several States have adopted the Act with modifications.

The Deep Sea Fishing policy set up by "The Murari Committee" (ref: Controls on activities of foreign fleets), unfortunately with respect to which no action has been taken up by the Government. Some of the recommendations of this committee are given below:

a) The committee suggested that all types of marine fisheries should come under one Central ministry and the Government should consider setting up a fishery authority of India for formulation of policy for the industry as well as to ensure its implementation;

b) In order to conserve fishery resources in Indian waters, protect fishermen and reduce conflicts at sea, all deep-sea regulations should be enacted by the parliament after consulting the fishing community;

c) Upgrade of technological skills and equipment used by traditional fishermen, including mechanised boats, so that they can effectively exploit the areas reserved for them. Traditional and small mechanised sector should be helped by providing fuel subsidy given to deep-sea fishing;

d) The Government should give priority to the creation of infrastructure needed for preventing wastage of fishery resources by providing cold storage, ice factories and fish processing facilities for value addition to the product by fishermen and their cooperatives; and

e) The Coast Guard has to be strengthened, expanded and upgraded technically with adequate navigational and surveillance equipment and weaponry to prevent poaching by foreign vessels.

Registration of and reporting of dealers

All the exporters of marine products are issued registration cum membership certificates from MPEDA, which is a government body and undertakes all promotional works relating to exports of seafood from India.

Controls on activities of foreign fleets

The licenses for vessels are issued by the Ministry of Food Processing Industry under 'The Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act, 1981. The relevant legislation and the provisions of this law directly applicable in this context are reproduced in Appendix II.

There were representations from all the coastal states that indiscriminate fishing by foreign vessels was depleting fish stocks in the seas around the country and posing a threat to the livelihood of the fishermen. As a result a committee was set up in early 1984, headed by Mr P. Murari, former secretary to the Government of India. This was appointed to review the Deep-Sea Fishing policy.The committee recommended the immediate cancellation of all permits for deep-sea fishing by chartered, leased and joint venture fishing vessels. Some of the recommendations made by the committee are:

a) No renewal of licences should be issued in future to such joint ventures, leased or test fishing vessels;

b) Foreign vessels which are more than 20 meters in size, should not be permitted to exploit areas where fishermen in traditional crafts or small mechanised vessels ply their trade; and

c) The fleet size for different fishing grounds may be fixed taking into account the maximum sustainable yield and the need for conservation of resources.

Habitat and species protection

Some of the areas come under the Wildlife Protection Act (1972), as these have been declared as National Parks and Sanctuaries under chapter -IV of this Act. These include the Marine National Park, Pulicat Bird Sanctuary, Mahatma Gandhi Marine Park (Andaman & Nicobar Islands), and Nalbund-Chilka sanctuary.

In exercise of the powers conferred by section 25 of the Maritime Zones of India (Regulation of Fishing by Foreign vessels) Act, 1981 (42 of 1981), the Central Government made some rules.

The relevant rule is given below:-

Rule 5.1h (i) and (ii)

i) The crew of the vessel shall fish only for the stocks described in the licence:

ii) the crew of the vessel shall not catch any fish by a species, size or age set out in the licence as prohibited catches, that are covered under the Wildlife (Protection) Act, 1972 (53 of 1972) and where such fish are caught they shall be retained and preserved on board the vessel, accounted for in Form 'C' (Appendix III) and shall be surrendered at such places as may be directed by the authorised officer.

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APPENDIX I

Coastal area classification and development regulations

Classification of Coastal Regulation Zone:

1. For regulating development activities, the coastal stretches within 500 meters. of the High Tide Line of the landward side are classified into 4 categories, namely:

   Category I (CRZ-I):

   (i) Areas that are ecologically sensitive and important, such as national parks / marine parks, sanctuaries, reserve forests, wildlife habitats, mangroves, corals / coral reefs, areas close to breeding and spawning grounds of fish and other marine life, areas of outstanding natural beauty / historical / heritage areas, areas rich in genetic diversity, areas likely to be inundated due to rising sea level consequent upon global warming and such other areas as may be declared by the Central Government or the concerned authorities at the State / Union Territory level from time to time.

   (ii) Area between Low Tide Line and High Tide Line

   Category II (CRZ-II):

   The areas that have already been developed up to or close to the shoreline. For this purpose, "developed area" is referred to as that area within the municipal limits or in other legally designated urban areas which is already substantially built up and which has been provided with drainage and approach roads and other infrastructural facilities such as water supply and sewerage mains.

   Category III (CRZ-III):

   Areas that are relatively undisturbed and those which do not belong to either Category I or II. These include coastal zones in the rural areas (developed and undeveloped) and also areas within municipal limits or in other legally designated urban areas which are not substantially built up.

Category IV (CRZ-IV):

Coastal stretches in the Andamans & Nicobar, Lakshadweep and small islands except those designated as CRZ-I,CRZ-II or CRZ-III.

Norms for Regulation of Activities:

The development or construction activities in different categories of CRZ areas shall be regulated by the concerned authorities at the State / Union Territory level in accordance with the norms described in the Coastal Regulation Zone Notification, 1991.

APPENDIX II

CHAPTER II (Maritime Zones of India, Act, 1981)

Regulation of fishing by foreign vessels

3. Subject to the provisions of this Act, no foreign vessel shall, except under and in accordance with-

   a) a license granted under section 4 or

   b) a permit granted under section 5
   by the Central Government, be used for fishing within any maritime zone of India.Prohibition of fishing in maritime zones of India by foreign vessels

Prohibition of fishing in maritime zones of India by foreign vessels.

4.

   1) The owner of a foreign vessel or any other person (not being in either case any person to whom any of the descriptions specified in sub-items [1] to [3] of item [I] of sub-clause [II] of clause [e] of section 2 applies) who intends to use such vessel for fishing within any maritime zone of India, may make an application to the Central Govt. for the grant of license.

   2) Every application under sub-section (1) shall be iN subH forlOÿnd shall be accompanied by such fees as may be prescribed.

   3) No license shall be granted unless the Central Government having regard to such matters as may be prescribed in the public interesting this behalf and after making such inquiry in respect of such other matters as may be relevant, is satisfied that the license may be granted.

   4) Every order granting or rejecting an application for the issue of a license shall be in writing.

   5) A license granted under this section -

      a) shall be in such form as may be prescribed;

      b) shall be valid for such areas, for such period, for such method of fishing and for such purposes as may be specified therein;

c) may be renewed from time to time; and

d) shall be subject to such conditions and restrictions as may be prescribed and to such additional conditions and restrictions as may be specified therein

6) A person holding a license under this section shall ensure that every person employed by him complies in the course of such employment with the provisions of this Act, or any rule or order made thereunder and the conditions of such licence.

Grant of Licence

5.

1) Every Indian citizen and every person to whom any of the description specified in sub-item (2) or (3) of item (I) of subclause (ii) of clause (e) of section 2 applies, who intends to use any foreign vessel for fishing within any maritime zone of India, may make an application to the Central Government for a permit to use such vessel for such purpose.

Prohibition of fishing by Indian citizens, etc. using foreign vessels.

2) Every application under sub-section (1) shall be made in such form and shall be accompanied by such fees as may be prescribed.

3) No permit shall be granted unless the Central Government, having regard to such matters as may be prescribed in the public interest in this behalf and after making such inquiry in respect of such other matters as may be relevant, is satisfied that the permit may be granted.

4) Every order granting or rejecting an application for the grant of such permit shall be in writing.

5) A permit granted under this section

a) Shall may be in such form as may be prescribed

b) shall be valid for such areas, for such method of fishing and for such purposes as may be specified therein.

c) may be renewed from time; and

d) shall be subject to such conditions and restrictions as may be prescribed and to such additional conditions and restrictions as may be specified therein.

6) A person holding a permit under this section shall ensure that every person employed by him complies in the course of such employment with the provisions of this Act, or any rule or order made thereunder and the conditions of such permit.

7) Notwithstanding anything contained in the foregoing provisions of this section, or in section 3, any permission granted to an Indian citizen to use or employ foreign fishing vessels in any maritime zone of India and in force immediately before the commencement of this Act shall, if the terms and conditions of such permission are not inconsistent with the provisions of this Act, be deemed to be a permit granted under this section and such permission shall continue to be in force after such commencement on the same terms and conditions, including the conditions as to the area of operation and the period of its validity, and the provisions of this Act shall, so far as may be, apply to such permission.

6.

1) The central Government may, if there is any reasonable cause to believe that the holder of any licence or permit has made any statement in, or in relation to, any application for the grant or renewal of such licence or permit which is incorrect or false in material particulars or has contravened any of the provisions of this Act or any rule or order made thereunder or of the provisions of any licence or permit or any conditions or restrictions specified therein, suspend such licence or permit, as the case may be, pending the completion of any inquiry against such holder for making such incorrect or false statement or for such contraventions, as the case may be.

2) where Central Government is satisfied, after making such inquiry as is necessary, that the holder of any licence or permit has made such incorrect or false statement as is referred to in sub-section (1) or has contravened the provisions of this Act, rule or order made thereunder of the provisions of any licence or permit or any conditions or restrictions specified therein, it may, without prejudice to any other penalty to which such holder may be liable under the provision of this Act, cancel such licence or permit, as the case may be.

Cancellation or suspension of licence or permit.

3) Every person whose licence or permit has been suspended under sub-section (1) shall, immediately after such suspension, stop using the foreign fishing vessel in respect of which such license or permit is given and shall not resume such fishing until the order of suspension has been revoked.

4) Every holder of a license or permit which is suspended or cancelled shall, immediately after such suspension or cancellation, surrender such licence or permit, as the case may be, to the central Government.

7. Where any foreign vessel enters any maritime zone of India without a valid licence or permit, granted under this Act, the fishing gear, if any, of such vessel shall, at all times while it is in such zone, be kept stowed in the prescribed manner.

Foreign vessel entering maritime zones of India without licence or permit to stowgear.

8. Notwithstanding anything contained in section 3, the Central government may, in writing, permit a foreign vessel to be used for fishing within any maritime zone of India for the purpose of carrying out any scientific research or investigation or for any experimental fishing in accordance with such terms and conditions as may be prescribed.

Fishing for scientific research, investigations, etc.

APPENDIX III

FORM C

Data on catch of prohibited fish species:

1. Name and address of fishing company:

2. Particulars of fishing vessels:

   Name:
   Size:
   Horse power of Main Engine:
   Base of operation:

3. Licence number and period of validity:

4. Description of fishing operations authorised in the licence:

5. Details of fishing gear used:-
   (a) Length of headline
   (b) Greatest depth
   (c) Mesh size

6. Description of the catch:

SL. No	Location of the Vessel		Date and Time	Gear in operation	Fishing zone	Depth (meter)	Species (prohibited)	Average Length (cm)	Average Weight (kg)	Number
	Latitude	Longtitude								
1	2	3	4	5	6	7	8	9	10	11

7. Place of surrendering the catch:

8. Conditions of the catch at the time of surrendering:

9. Comments of the master / skipper

Signature of owner / owners representatives.

APPENDIX - IV

List of species occuring on the Indian coast
(Based on previous reports and current survey)

S.no	Scientific name	Synonym	Common Name
	SHARKS		
1	*Alopias pelagicus*		Thresher shark
2	*Alopias superciliousus*		-do-
3	*Alopias vulpinus*	*Squalus vulpinus*	Fox shark
4	*Apristurus investigatoris*		Cat shark
5	*Atelomycterus marmoratus*	*Scyllium marmoratum*	Marbled cat shark
6	*Carcharhinus altimus*		Big-nosed shark
7	*Carcharhinus amblyrhyncoides*		Longnosed Black shark
8	*Carcharhinus amboinensis*		Pig-eye shark
9	*Carcharhinus brevipinna*	*Carcharias (Aprion) brevipinna*	Spinner shark
10	*Carcharhinus dussumieri*	*Carcharias dussumieri /Eulamia*	White-cheeked shark
11	*Carcharhinus gangeticus*	*Carcharias gangeticus*	Ground shark / Gangetic river shark
12	*Carcharhinus falciformes*		
13	*Carcharhinus hemiodon*	*Carcharias (Hypoprion) hemiodon*	
14	*Carcharhinus leucas*		Bul shark
15	*Carcharhinus limbatus*	*Carcharias limbatus*	Grey shark
16	*Carcharhinus longimanus*	*Squalus longimanus*	Oceanic white-tip shark
17	*Carcharhinus macloti*	*Carcharias (Hypoprion) macloti*	Hard-nose / pointed snout shark
18	*Carcharhinus melanopterus*	*Carcharias / Eulamia melanoptera*	Blackfin shark
19	*Carcharhinus sealei*		
20	*Carcharhinus sorrah*	*Carcharias sorrah*	Spot-tailed shark
21	*Carcharhinus albimarginatus*		Silver tip sharl
22	*Centrophorus moluccensis*		Spiny shark
23	*Centrophorus scalpratus*		
24	*Centroscyllium ornatum*		
25	*Centroscymnus crepidater*		
26	*Centroscymnus rossi*		
27	*Cephaloscyllium silasi*		Cat shark
28	*Chaenogaleus macrostoma*	*Hemigalcusmacrostoma*	Hooktooth shark
29	*Chiloscyllium plagiosum*		
30	*Chiloscyllium indicus*		Ridge-back catshark
31	*Chiloscyllium griseum*		Cat shark
32	*Echinorhinus brucus*		Bramble shark
33	*Ericdacnis radcliffei*		Requiem shark
34	*Eugomphodus taurus*	*Carcharias taurus*	

(Continued from overleaf...)

S.no	Scientific name	Synonym	Common Name
35	*Eugomphodus tricuspidatus*		Sand tiger shark
36	*Eusphyra blochii*		
37	*Galeocerdo cuvieri*	*Galeocerda tigrinus* / *Squalus cuvier*	Tiger shark
38	*Ginglymostoma ferrugineum*	*Scyllium ferrugineum*	Rusty shark
39	*Halaelurus hispidum*		Cat shark
40	*Halaelurus guagga*		Cat shark
41	*Hemigaleus microstoma*	*Hemigaleus balfouri*	
42	*Hemipristis elongatus*	*Carcharias elloti*	Devil shark
43	*Heptranchias perlo*		
44	*Iago omanensis*		Requiem shark
45	*Isurus oxyrhincus*	*Lamna spallanzanii*	Short-fin Mako shark
46	*Lamiopsis temmincki*	*Carcharias temmincki*	Broad-fin shark
47	*Loxodon macrorhinus*	*Scoliodon ceylonensis*	Sliteye shark
48	*Mustelus mosis*	*Mustelus manazo*	Gummy shark
49	*Nebrius ferrugineus*	*Nebrius concolor* / *Nebrodes concolor* / *Ginglymostoma concolor*	Tawny shark
50	*Negaprion acutidens*	*Carcharias acutidens*	Sharptoothed shark
51	*Negaprion odontaspis*		
52	*Paragaleus sp.*		
53	*Prionace glauca*		Blue shark
54	*Rhiniodon typus*	*Rhincodon typus*	Whale shark
55	*Rhizoprionodon oligolinx*	*Scoliodon palasorrah*	Grey dogshark
56	*Rhizoprionodon acutus*	*Carcharias acutus*	Milk dog-shark
57	*Scoliodon laticaudus*	*Scoliodon sorrakowah*/ *Carcharias sorrakowah*	Spade-nose shark / Yellow dogshark
58			
59			
60	*Scoliodon walbeehmi*	*Carcharias walbeehmi*	Sharp-nosed shark
61	*Scyliorhinus capense*		
62	*Sphyrna lewini*		
63	*Sphyrna mokarran*		
64	*Sphyrna zygaena*		Round-headed Hammerhead
65	*Sphyrna blochii*	*Zygaena blochii/malleus*	Arrow-headed Hammerhead
66	*Sphyrna tudes*	*Zugaena tudes*	Squathheaded Hammerhead
67	*Squalus blainvillei*		
68	*Stegostoma varium*		
69	*Stegostoma obesus*	*Triaenodon obesus* / *Carcharias obesus*	Reef whitetip shark
70	*Stegostoma fasciatum*	*Stegostoma tigrinum*	Zebra shark
	SKATES		
71	*Pristis microdon*		Small toothed sawfish
72	*Pristis pectinata*		Green sawfish
73	*Pristis cuspidatus*		
74	*Rhinobatus granulatus*		Granulated shovel nose ray

(Continued from overleaf...)

S.no	Scientific name	Synonym	Common Name
75	*Rhinobatus djiddensis*		White-spotted shiovel nose ray
76	*Rhinobatus obtusus*		
77	*Rhinobatus ancylostomus*		
78	*Rhinobatus armatus*		
79	*Rhina ancylostoma*		
80	*Raja mamillidens*		Prickly skate
	RAYS		
81	*Dasyatis bleekeri*		White-tail sting ray
82	*Dasyatis kuhlii*		Blue-spotted sting ray
83	*Dasyatis microps*		Sting ray
84	*Dasyatis zugei*		Pale-edged sting ray
85	*Dasyatis uarnak*		
86	*Dasyatis sephen*		
87	*Dasyatis imbricata*		
88	*Aetobatus flagellum*		
89	*Aetobatus narinari*		Spot-edged ray
90	*Rhinoptera adspersa*		Rough cow ray
91	*Rhinoptera javanica*		Javanese cow ray
92	*Manta birostris*		Giant devil ray
93	*Narcine timlei*		Spotted electric ray
94	*Narcine brunnea*		
95	*Narcine indica*		
96	*Tygon walga*		
97	*Trygon zuge*		
98	*Gymnura poecilura*		

Source : TRAFFIC-India / NBFGR

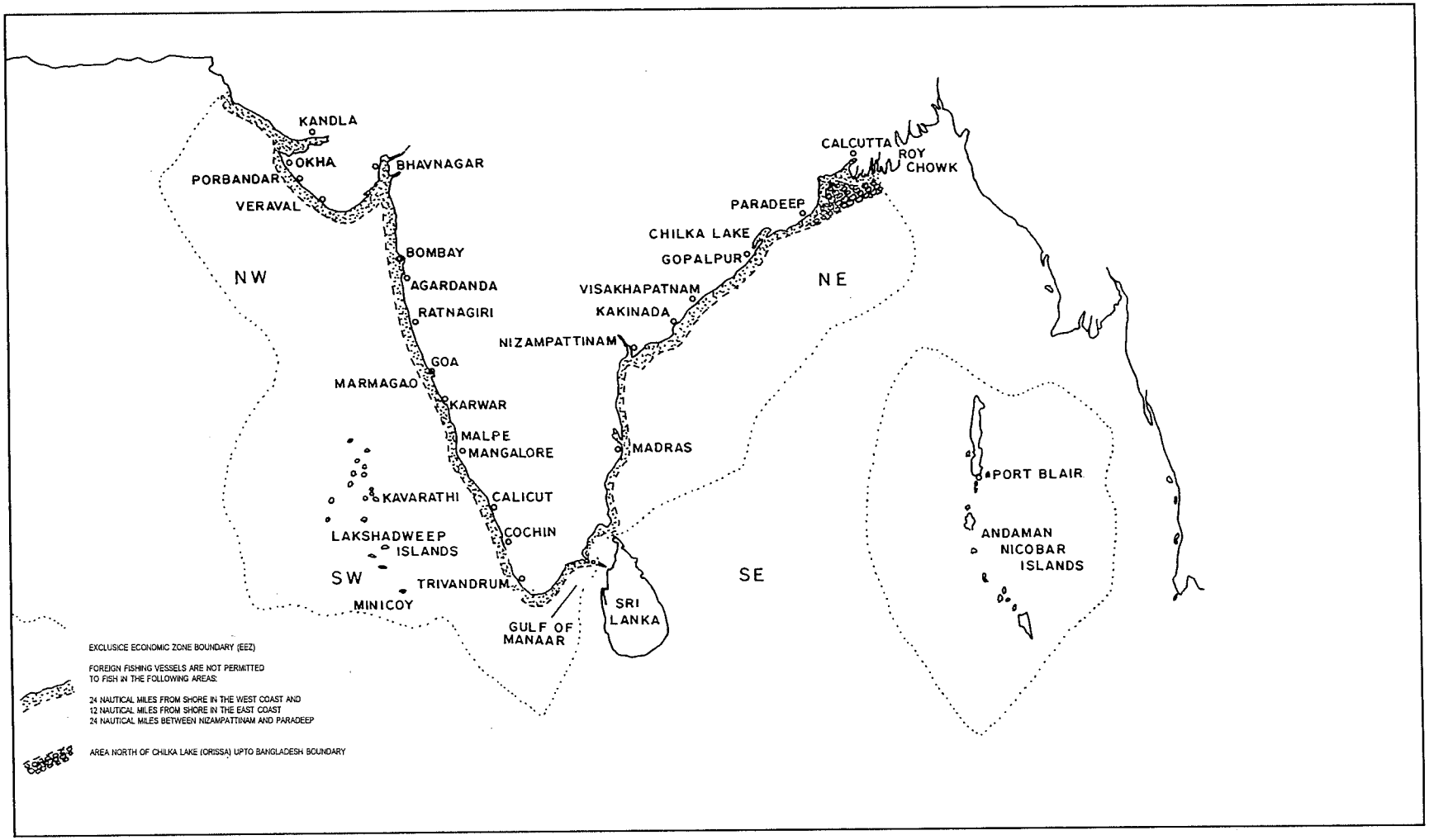
APPENDIX V

List of local names :

Language	Shark	Ray	Whale Shark
Tamil	*Sura*	*Thirukkai*	*Amini uluvai*
Malayalam	*Srava*	*Therandi*	*Thimingalam*
Telugu	*Sorrah*	*Tekkali*	-
Bengali	*Hangur*	*Sankar machch*	-
Oriya	*Magar machch*	*Miththi mach*	-
Gujrati	*Magra*	*Patro*	*Barrel*

APPENDIX-VI

Exclusive economic zone of India



Source : MPEDA(1991)

GLOSSARY

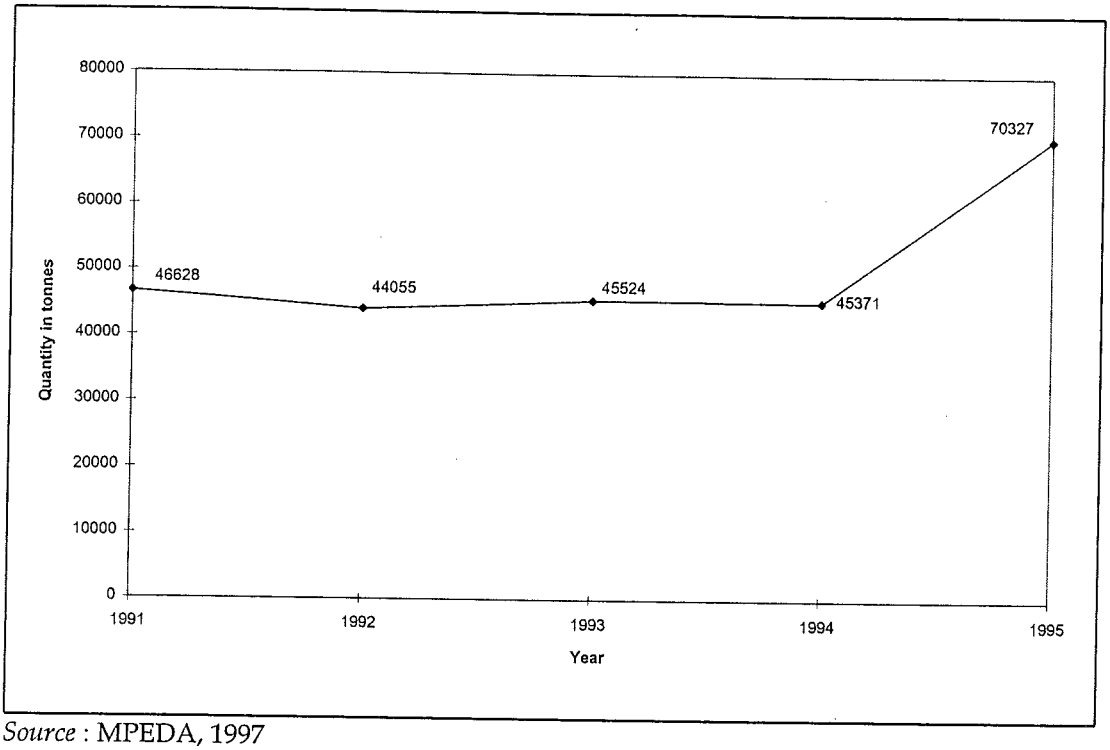
Anal fin	:	the vertical fin immediately behind the vent (anus).
Benthic	:	animals living on or in the sea bottom.
Caudal fin	:	tail fin
Cartilage	:	a skeletal material consisting largely of a matrix of white translucent *chondrin* sometimes containing white collagen fibres or yellow elastic fibres. In cartilaginous fishes and many lower chordates the whole skeleton is composed of cartilage.
Chondrichthyes	:	Cartilaginous fish : those whose skeletons are entirely of cartilage. The group includes sharks, skates and rays.
Demersal	:	living near (or) deposited on (or) sinking to the bottom of the sea .
Dorsal	:	on the back.
Dorsal fin(s)	:	one or more vertical fins situated on the midline on the back of a fish.
Elasmobranch	:	an alternative name for cartilaginous fish or Chondrichthyes. The name refers to the fact that the gill-slits are exposed and are not covered by an operculum.
Fin	:	a flat plate-like structure used by the fish for swimming and steering.
Fin ray	:	branched or forked, stiff structures supporting and strengthening the fin membrane. In primitively evolved fish, only fin-rays are present, there being no fin spines.
Gill slits	:	narrow openings-usually five pairs-in sharks and rays, from which water is expelled while breathing.
Pectoral fins	:	pair of fins situated on the side of the body just behind the gill covers.
Pelagic	:	animals living at or near the surface of water.
Pelvic fins	:	pair of fins situated on the ventral part of the body. Also called ventral fins.

Abbreviations

CMFRI	:	Central Marine Fisheries Research Institute
CIFT	:	Central Institute of Fisheries Technology
NBFGR	:	National Bureau of Fish Genetic Resources
MPEDA	:	Marine Products Export Development Authority
BOBP	:	Bay of Bengal Program
GOI	:	Government of India
WII	:	Wildlife Institute of India
SACON	:	Salim Ali Centre for Ornithology & Natural History
CWLO	:	Centre for Wildlife and Ornithology
ZSI	:	Zoological Survey of India
NIO	:	National Institute of Oceanography
WPA	:	Wildlife Protection Act

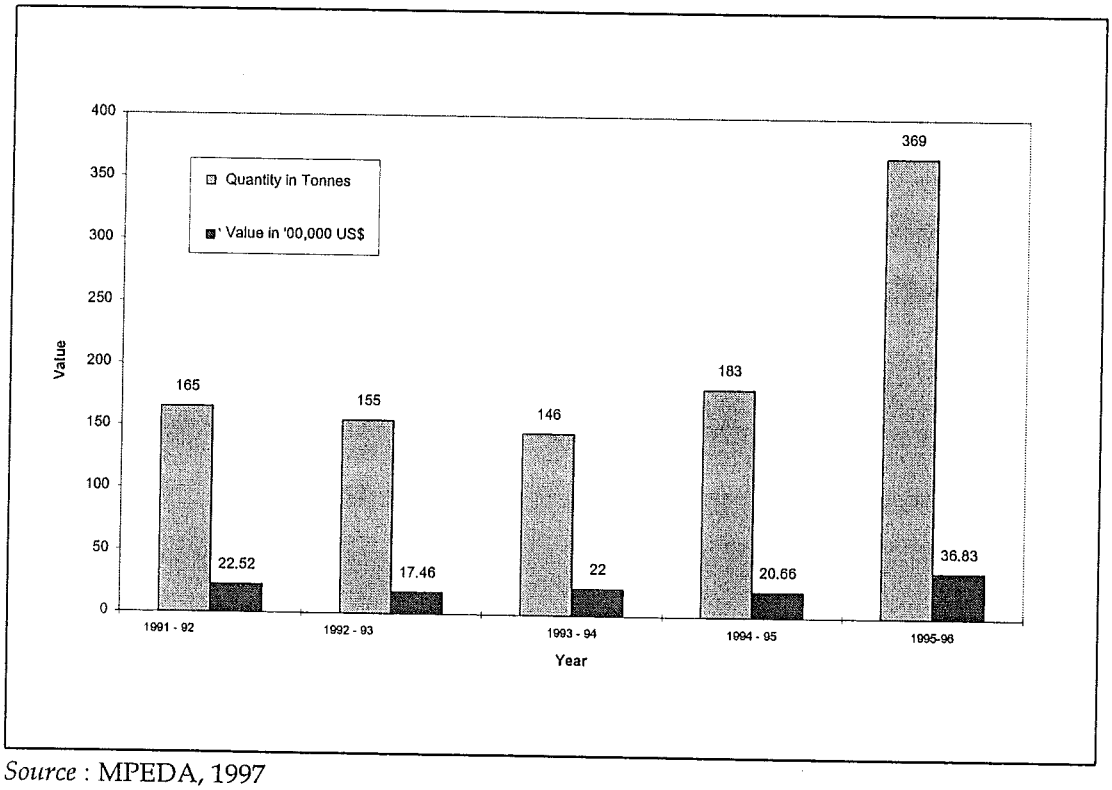
DATA UPDATE : Figure 1 on page 3 and Figure 3 on page 24 should be read as shown below :-

Figure 1 : Annual Shark Landings in India



Source : MPEDA, 1997

Figure 3 : Export of dried shark fins



Source : MPEDA, 1997