Shark hunting – an indiscriminate trade endangering elasmobranchs to extinction

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Shark finning – chopping-off the fins and discarding the rest – is increasing worldwide to satisfy the demand of shark-fin soup. This massive requirement for shark fins and other shark-related products has created an industry motivated by high returns. Reaching figures of up to US$ 116/kg, shark fins have become one of the world's most precious commodities. India has rich resources of elasmobranchs. Of this, annual shark production has been around 45,500 tonnes, obtained as a by-catch from a variety of gears. Shark-fin export in India reached its peak in 1995 with 303 tonnes, while a second peak was in 2001. Indian shark fins have been processed and marketed in many forms. Some of the shark-fin products have large market demand. Intricate techniques used for grading, processing and packaging of shark fin add to the product value. Overfishing due to increased demand has endangered many shark species. Mitigation measures are required to save the primitive species from becoming extinct. Identification of sharks based on fins, to track species being overfished has been a difficult task so far. However, recent developments on DNA-based forensic techniques have made the problem somewhat easy. This method of identifying sharks from the fins earmarked for export, could serve well to implement control measures to this unscrupulous trade and save the stocks under depletion.

Keywords: Elasmobranchs, finning, fin soup, overfishing, shark trade.

FOR more than 400 million years, sharks have dominated the oceans. As a species it is widely regarded as a predatory 'eating machine' that does not discriminate its prey from fish to humans. Right now, sharks are among the most valuable and vulnerable species in the sea. Massive consumer demand for shark-fins and other shark-related products has created an industry motivated by high returns. Shark fins have become one of the world's most precious commodities. It was recently reported by Forero[1] that shark fins sell for as much as US$ 700/kg in Asia, making big sharks worth thousands of dollars. It is barely surprising then that more than 125 countries around the world now trade in shark products, contributing to an uncontrollable surge in the number of sharks taken from the oceans. In a little over 50 years, the slaughter of sharks[2] has risen 400% to approximately 800,000 metric tonnes/year.

By 2017, it is anticipated that 20 species of sharks could become extinct due to indiscriminate fishing techniques to satisfy man's greed. Currently, more than 100 million sharks are taken from the sea each year – a rate at which they simply cannot survive. Unlike many other fish species, most large sharks do not reach sexual maturity until the age of seven years or later, and only give birth to a few pups each year. Right now, they are simply being caught and killed faster than they can reproduce.

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Indian shark fisheries

India is rich in natural resources, with a coastline of about 7516 km and 2.02 million sq. km of water in the exclusive economic zone (EEZ). The annual harvestable fishery potential of the country is estimated to be 3.48 million tonnes. The annual production of elasmobranchs in India is around 70,000 tonnes, over 4% of the total marine fish landings. Sharks account for around 60–70% of this. Tamil Nadu, Gujarat, Maharashtra, Kerala, Karnataka and Andhra Pradesh supply around 85% of the shark landings in India. Sixty-five species of sharks have been sighted in the Indian waters and over 20 of them belonging to the Carcharhinidae and Sphyrnidae families, contribute to the fishery[3].

The annual shark production has been around 45,500 tonnes, obtained as a by-catch from a variety of gears. Commercial importance of this valuable resource led to targetted exploitation of certain species, such as whale sharks (*Rhiniodon typus* Smith) along the Saurashtra coast since 1990, reaching a vulnerable level[4].

Several types of gears take sharks as incidental catch; among these the most important were the trawl net and gill net. Detailed information on shark landings by gear type is not available, but data on shark catch by mechanized boats at major fishing centres showed that trawl nets account for 60% of the shark landings and gill nets for 38%. Purse seine in Kochi and Mangalore, and hook-and-line in Kochi and Mumbai took a small fraction of the

catch. New Ferry Wharf and Sassoon Docks in Mumbai, Pudumanai Kuppam in Andhra Pradesh, Tuticorin in Tamil Nadu and Veraval in Gujarat were centres of good landing by trawl net and gill net. Shakthikulangara and Cochi in Kerala were centres for gill-net landings.

Sharks of the family Carcharhinidae are the most important group, dominating fishery all over the world, and this applies equally to India. Species commonly reported on the Indian coasts are *Carcharhinus limbatus*, *C. sorrah*, *C. dussumieri*, *C. melanopterus*, *C. macloti*, *Galeocerdo cuvier* (tiger shark), *Scoliodon laticaudus*, *Rhizoprionodon acutus* and *Sphyrna lewini* (hammerhead shark).

The other major species contributing to Indian fisheries are *Rhizoprionodon oligolinx*, *Isurus oxyrinchus*, *Sphyrna blochii*, *Sphyrna mokarran*, *Rhynchobatus djiddensis*, *Rhinobatos granulatus*, *Rhina ancyclostoma*, *Dasyatis sephen*, *D. uarnak*, *D. imbricatus*, *D. marginatus*, *Himantura alcockii*, *Aetobatus narinari*, *Aetomylaeus niehofii*, *Aetomylaeus maculatus*, *Rhinoptera javanica*, *Gymnura poecilura* and *Mobula diabola*. Whale shark and cat shark also appear occasionally.

Work on the biology of Indian sharks is insignificant and this is probably because of the difficulty in getting adequate samples. As there is no regular fishery for sharks, their availability is only incidental. Since whatever is obtained as by-catch is multi-species catch of sharks in a multi-gear fishery, no serious efforts have been made to assess the catch composition or estimates of landings by species on an all-India basis. Also, given inadequate information on the biology of the species, especially its growth characteristics, these factors explain the lack of attempts to study population dynamics.

Shark fin exports in India in relation to Asian countries

Annual shark fin export in India[5] from 1985 to 2003 (Figure 1) shows fluctuations reaching a peak growth of up to 303 tonnes in 1995. A second increase was also observed in 2001. However, in terms of cash value, the highest price received was Rs 259 million, in 2001. Data on capture production of elasmobranchs (sharks, rays, skates; Figure 2) remained almost steady from 1997 to 2000, varying from 71,991 to 76,802 tonnes and showed a decline from 2001 onwards. However, shark fin export during this period was higher, indicating increase in market demand.

As reported by FAO[6], China started to play a significant role in world shark-fin trade as a producer, importer, consumer, processing centre and re-exporter among Asian countries. Other producers and exporters are Taiwan Province of China, Indonesia, Singapore, India and Pakistan followed by other smaller producers.

Prices for shark fins are affected by their size, and larger fins are preferred. According to the study by Assistance to the Fishery Industry Marketing Information (INFOYU)[7], a part of the Ministry of Agriculture in China as referred to in Chen[8], shark fins are imported as raw material, but after cleaning these fins form the major product for export and/or re-export.

In India almost all shark fins were exported. Domestic demand for fins was chiefly in major hotels (for preparing soup). In India, shark fins were available in Gujarat, the Konkan coast, Orissa, Tamil Nadu and Andhra Pradesh. Fins were also sold in large quantities by the Lakshadweep Fisheries Department and in the Andaman Islands, where a good commercial shark fishery had been established. The major varieties exported were ranja, pison and khada, with ranja commanding the highest market price. According to Varma[3], the four species usually collected for export of shark fins have been hammerhead/round headed shark (*Sphyrna zygaena*), grey dog shark (*R. acutus*), sharp-nosed/yellow dog shark (*S. laticaudus*) and black-finned/blacktip shark (*C. melanopterus*). Most of the shark fin exports have been directed to Hong Kong and Singapore; the other products are in less demand and fetch little price (Tables 1 and 2). Recently, new markets have emerged such as the UK, USA, Malaysia, Germany and Taiwan Province of China. According to FAO statistics, in 1997 India produced 211 tonnes and exported 244 tonnes, worth US$ 2.5 million.

There was considerable scope for substantially increasing the volume of India's exports of shark products, but

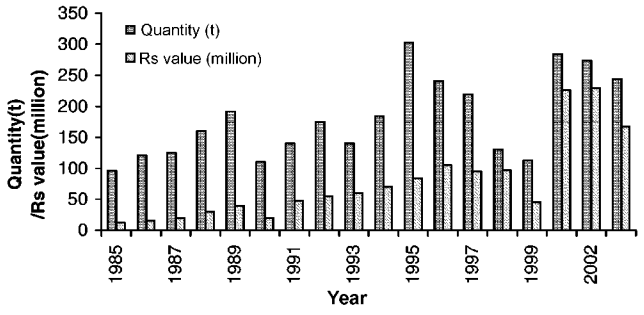

Figure 1. Export of shark fin in India during 1985–2003. Source: Pillai and Paraka[5] and FAO[6].

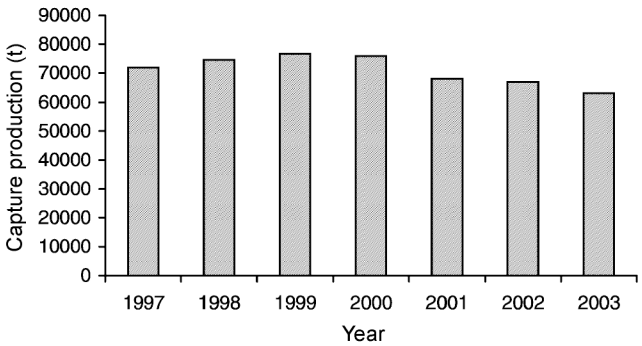

Figure 2. Capture production of shark, rays, skates 1997–2003. Source: FAO[6].

Table 1. Shark export: value and countries of destination[3]

Product	Country of destination	1995–96		1996–97	
		Quantity (tonne)	Value (million rupees)	Quantity (tonne)	Value (million rupee)
Frozen shark meat	Hong Kong, Singapore	584	18.3	142	4.9
Dried shark fins	Hong Kong, Singapore	369	119.3	244	90.0
Shark bones	Negligible				
Shark liver oil	Negligible				
Shark fin rays	Negligible				

Table 2. Price (Rs/kg) of shark products[3]

Product	Minimum	Maximum
Shark meat	25	30
Shark fins	280	340
Shark bone	70	75

worldwide awareness programmes have helped to suspend further expansion of this trade.

Shark products

Sharks are mainly caught for their fin export value. Along with fin, shark meat and other body parts also find a variety of uses.

Shark fins are processed and marketed in many forms. Some of the important products include: (i) wet fins (fresh, or chilled and unprocessed; Figure 3 *a*); (ii) raw fins in dried form only, complete with denticles and cartilaginous platelets (Figure 3 *b*); (iii) semi prepared fins without the skin but with fibres still intact as one dry mass (this is the most expensive form, as it is the cleanest and purest)[9]; (iv) fully prepared with individual strands of the cartilaginous platelets shown separately; (v) as fin nets, the cartilaginous fin needles are boiled, separated, redried and packaged in loose groupings, and (vi) prepared 'ready to eat' or cooked products such as soups and prepared dishes in cans/pouches, and instant soup powders. Among all these products, shark-fin soup is the most important, as it can be sold for hundreds of dollars a bowl (Figure 3 *c*).

Grading of shark fins

Shark fins are mainly graded by type, size, colour (black or white) and other factors such as moisture content, smell and the cut. Typical classification of white and black groups could be simply on the basis of: (a) colour (black, e.g. *Carcharhinus* species, mako and blue sharks, and white, e.g. sandbar and hammerheads), (b) their yield and taste, or (c) the fact that shark fins of the white group belong to those from shallow waters, while the black belong to deeper waters.

Not all fins of a shark are of the same commercial value. The most valuable are the first dorsal fin, the pair of pectoral fins and the lower part of the tail (Figure 4).

Finning of sharks (the practice of cutting-off only the fins and discarding the body) is taking place on a large scale due to increase in the demand of shark fin for making soup (an East Asian delicacy; Figure 5).

Species extinct and under threat in India

Brutality with which sharks are handled has received sufficient publicity through media reports. However, not much improvement has been achieved in the fishing and handling techniques around the globe. Overfishing is presently considered as the greatest threat to the existence of sharks. Many species of elasmobranchs have declined in the last decade and are now on the brink of extinction. Being aware of the expanding trade prospects and consequent threat to the shark fishery, Government of India by their Gazette Notification of 11 July 2001, prohibited fishing of all *Elasmobranchii*, which include shark and rays, thereby providing sufficient safety to this beautiful creature. Table 3 provides some of the shark species under the threat for extinction.

Adequate data (compiled from the 2000 IUCN Red List of Threatened Species and FishBase.org (http://filaman.ifm-geomar.de/)) have not yet been collected for some species of sharks (Table 4) to determine whether or not they are endangered.

Species-specific DNA test

While shark finning is increasing worldwide, tracking its trade is difficult. This is because isolated fins from different species generally look the same, and it is difficult to identify shark species from their fins. Shivji *et al.*[10] have developed an efficient method to achieve accurate and rapid identification of shark body parts, including dried fins. The method is based on species-specific, PCR primers in an eight-primer multiplex format to discriminate simultaneously between body parts from six shark species common in worldwide pelagic fisheries. Species-specific primers are based on DNA sequence difference

among species in the nuclear ribosomal internal transcribed spacer 2 locus. Six tests that tease out a species-specific stretch of shark DNA serve as a molecular ID tag. The new genetic tests are improved versions that allow testing for six species of shark 'all in one tube', i.e. blue, dusky, porbeagle, silky, and long- and short-fin mako. Although there are few drawbacks, this method is less time-consuming and preferred among others.

In India, efforts are being made to implement this method for detailed identification of shark fin, to detect the shark species involved in trade. This could also provide the position of stocks of shark species and its extinction level

Figure 3. *a*, Fresh cut shark fins. *b*, Shark fins being dried. *c*, A bowl of shark-fin soup. Courtesy: A. Pedder (adelepedder@amcs.org.au) and AMCS.

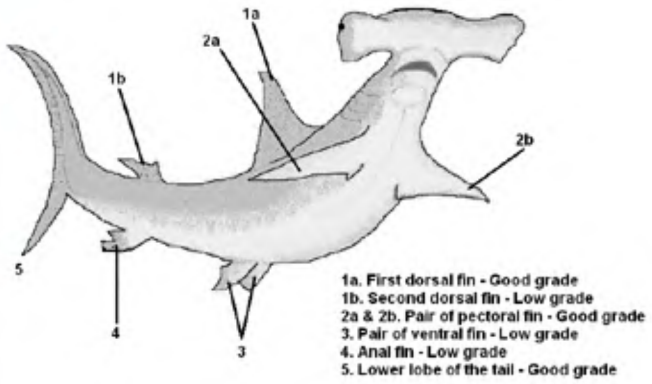

Figure 4. Relative commercial value of shark fins.

Figure 5. *a*, Shark finning. *b*, Shark with fins cut lying at the seafloor (Philippines). Courtesy: A Pedder (adelepedder@amcs.org.au) and AMCS.

Table 3. Endangered shark species

Ganges shark
Borneo shark
Basking shark – North Pacific and Northeast Atlantic sub-populations
Speartooth shark
Whitefin Topeshark
Angular Angel shark – Brazilian sub-population
Smoothback Angel shark
Spinner shark – Northwest Atlantic sub-population
Pondicherry shark
Smoothtooth blacktip
Blacktip shark – Northwest Atlantic sub-population
Dusky shark – Northwest Atlantic and Gulf of Mexico sub-populations
Grey Nurse shark (aka Sand Tiger)
Great White shark
Gulper shark
Basking shark
School shark (aka Tope shark)
Bluegray carpetshark
Porbeagle shark
Whale shark

Table 4. Shark species whose threat status is uncertain

Thresher shark (*Alopias vulpinus*)
Java shark (aka Pigeye) (*Carcharhinus amboinensis*)
Kitefin shark (*Dalatias licha*)
Salmon shark (*Lamna ditropis*)
Megamouth shark (*Megachasma pelagios*)
Broadnose Sevengill shark (*Notorynchus cepedianus*)
Bigeye Sand Tiger (*Odontaspis noronhai*)
Narrowmouth catshark (*Schroederichthys bivius*)
Great hammerhead (*Sphyrna mokarran*)
Argentine Angel shark (*Squatina argentina*)

in the Indian waters. The Ministry of Environment and Forests, Govt of India should encourage such proposals from researchers involved in developing cutting-edge DNA-based forensic techniques and markers to rapidly identify sharks from fin samples. These forensic approaches are important to establish a relationship between trade categories for fins and the shark species from which the fins were derived. This could serve useful to implement control measures of stocks under depletion, which are covered under convention on International Trade in Endangered Species of Wild Life Fauna and Flora/Wild Life (Protection) Act 1972.

Protection

The role of sharks in maintaining the ecological balance of the ocean is important. As top predators and scavengers, they serve an essential role of keeping our waters clean. Sharks, like whales and dolphins, must be recognized as important indicators of the health of the ocean. It is a matter of great concern that the elasmobranchs are on a decline due to overfishing and pollution. The only realistic way to save these creatures is to impose a worldwide moratorium on shark-fin trade and enforce it with penalties that serve as a deterrent to unscrupulous fishing companies. At an individual level we could take the following precautions: Never have shark-fin soup and refuse to patronize restaurants that serve this. Avoid medicines or supplements that profess to utilizing the healing power of shark cartilage or any other part of a shark. Do not buy shark teeth (unless fossilized), shark jaws, or any items made with shark skin. In this way we may ensure that we are not part of the problem and thereby save these important creatures from becoming extinct.

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