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RESEARCH ARTICLE

In hot soup: sharks captured in Ecuador's waters

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Sharks never stop growing and neither does the Asian demand for sharkfin soup. Ecuador is one nation of many that feeds the demand for fins, and fishers there catch more than 40 different shark species. But shark catches have been considerably underreported worldwide. Until the 2005 update of fisheries data, the United Nations Food and Agriculture Organisation (FAO) did not report elasmobranches for Ecuador, indicating that the Ecuadorian government did not report on these species. This study reconstructs Ecuador's mainland shark landings from the bottom up from 1979 to 2004. Over this period, shark landings for the Ecuadorian mainland were an estimated 7000 tonnes per year, or nearly half a million sharks. Reconstructed shark landings were about 3.6 times greater than those retroactively reported by FAO from 1991 to 2004. The discrepancies in data require immediate implementation of the measures Ecuadorian law mandates: eliminating targeted shark captures, finning and transshipments, as well as adoption of measures to minimise incidental capture. Most of all, a serious shark landings monitoring system and effective chain of custody standards are needed.

Keywords: catch reconstructions; Ecuador; fisheries data; sharks; shark fin soup

1. Introduction

Sharks have survived the dangers of the world's seas for more than 400 million years. Today, over 250 species of sharks exist, ranging in size from tiny pygmy sharks (*Euprotomicrus bispinatus*) to 12 m plankton-feeding whale sharks (*Rhincodon typus*) (Compagno et al. 2005). However, over the last couple of decades, the wasteful practice of shark finning (the removal of dorsal, pelvic and pectoral fins; Figure 1) for shark fin soup has become a major threat to shark survival.

The consumption of shark fin soup is a Chinese tradition that dates back to the second century B.C. In the past, consumption of fins was confined to the privileged classes. But rapid economic growth in China has had impacts on shark populations. A relatively small class of people demanding shark fins has been replaced by hundreds of millions of mouths willing to commonly pay $400/kg for fins. Ecuador exports shark fins to Taiwan, Singapore, China and Hong Kong. Roughly half of all shark fins traded globally are

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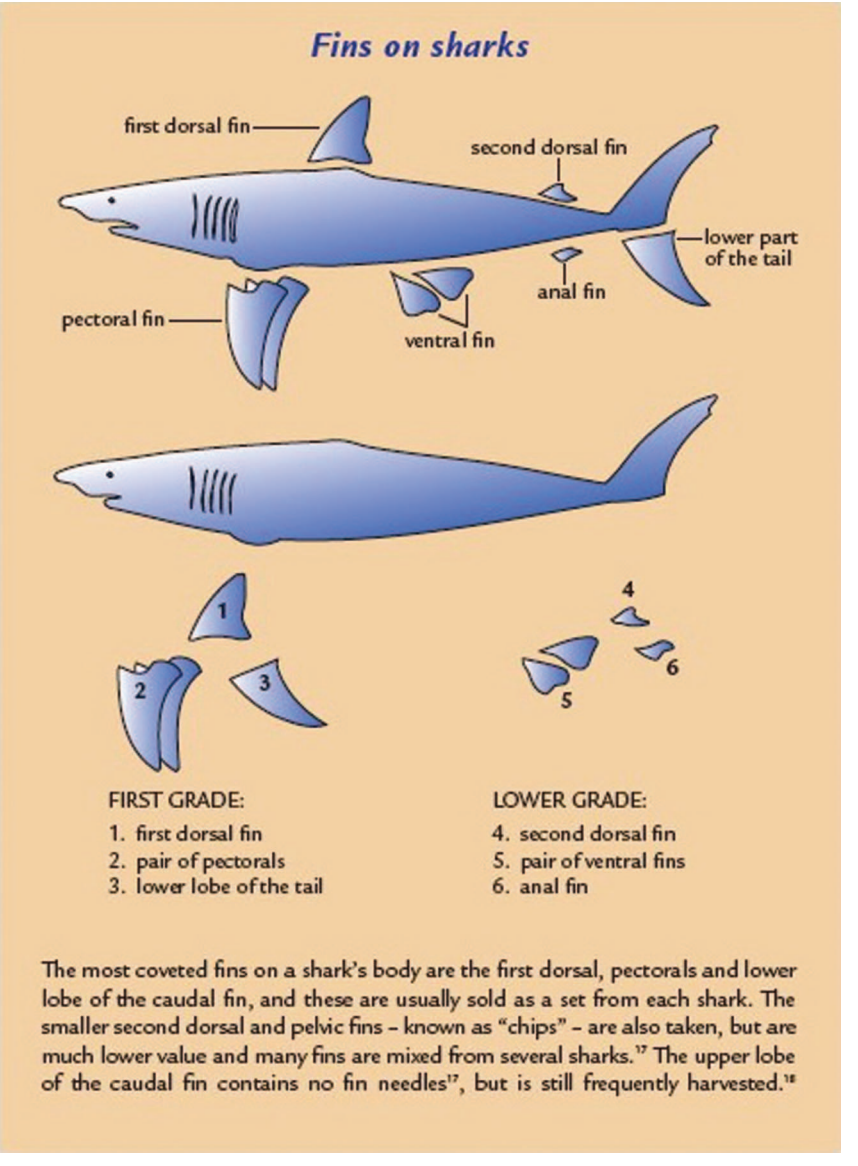

Figure 1. Fins on sharks (image credit: WildAid/Oceana).

imported to Hong Kong. Between 1991 and 2000, Hong Kong shark fin imports alone grew 6% per year (Clarke 2004). It is estimated that shark finning alone now claims between 26 million and 76 million sharks annually (Clarke et al. 2006).

Because of naturally slow population growth rates, many sharks are particularly vulnerable to overfishing, prompting the American Fisheries Society to recommend that sharks become high management priorities for fishing nations (Musick et al. 2000). Since the late 1980s, populations of almost all recorded shark species caught in the Northwest Atlantic decreased by more than 50%, with some species (e.g., hammerheads and thresher sharks) showing even greater declines (Baum et al. 2003). The IUCN Red List, a catalogue

of species that are at high risk of extinction worldwide, lists 39 species of elasmobranches (i.e., sharks and rays).

The management of shark fisheries is usually difficult because of a lack of data on shark captures, which results in underestimations of fishing pressure. The biomass of sharks caught globally is estimated to be three to four times larger than the shark catch estimates presented by the United Nations Food and Agriculture Organisation (FAO) on behalf of its member countries (Clarke et al. 2006). In Ecuador, we suspected underreporting of shark captures was also a problem.

1.1. On the equator

More than 40 shark species are found in Ecuadorian waters, most of which ($\sim$90%) are listed on the IUCN Red List. Many of these species are frequently caught (Table 1), some for meat and some for traditional use, such as angel shark eggs to treat asthma (Martinez et al. 1999). Most sharks, however, are caught and used only for their fins, which are sold primarily to Hong Kong traders but might also be exported to Taiwan, Singapore and China. The shark fin trade has existed in Ecuador since at least the early 1960s (INP 1964).

Sharks are often caught incidentally in various fishing gears, including pelagic and bottom longlines, drift and set gillnets, handlines and shrimp trawls (Watts and Wu 2005). According to Ecuadorian law, fishers are not allowed to target sharks specifically, though

Table 1. List and status of commonly caught shark species in Ecuadorian waters.

Common name	Scientific name	Listed on IUCN redlist
Scalloped hammerhead shark	*Sphyrna lewini*	Endangered
Pelagic thresher	*Alopias pelagicus*	Vulnerable
Bigeye thresher	*Alopias superciliosus*	Vulnerable
Oceanic whitetip shark	*Carcharhinus longimanus*	Vulnerable
Shortfin mako	*Isurus oxyrinchus*	Vulnerable
Longfin mako	*Isurus paucus*	Vulnerable
Galapagos shark	*Carcharhinus galapagensis*	Lower risk (near threatened)
Blue shark	*Prionace glauca*	Lower risk (near threatened)
Silky shark	*Carcharhinus falciforims*	Lower risk
Blacktip shark	*Carcharhinus limbatus*	Lower risk (near threatened)
Bull shark	*Carcharhinus leucas*	Lower risk (near threatened)
Dusky shark	*Carcharhinus obscurus*	Lower risk (near threatened)
Tiger shark	*Galeocerdo cuvier*	Lower risk (near threatened)
Lemon shark	*Negaprion brevirostris*	Lower risk (near threatened)
Crocodile shark	*Pseudocarcharias kamoharai*	Lower risk (near threatened)
Pacific angel shark	*Squatina californica*	Lower risk (near threatened)
Bonnethead shark	*Sphyrna tiburo*	Lower risk
Smooth hammerhead shark	*Sphyrna zygaena*	Lower risk (near threatened)
Smalltail shark	*Carcharhinus porosus*	Data deficient
Nurse shark	*Ginglymostoma cirratum*	Data deficient
Mexican hornshark	*Heterodontus mexicanus*	Data deficient
Sharptooth smoothhound	*Mustelus dorsalis*	Data deficient
Scoophead hammerhead shark	*Sphyrna media*	Data deficient
Brown smoothhound	*Mustelus henlei*	Not evaluated
Sicklefin smoothhound	*Mustelus lunulatus*	Not evaluated
Whitenose shark	*Nasolamia velox*	Not evaluated
Pacific sharpnose shark	*Rhizoprionodon longurio*	Not evaluated

Sources: Aguilar et al. 2007; IUCN 2007; Martinez-Ortiz 2007.

the high price to be gained from shark fins subverts this regulation. 'Incidental catch' can make up as much as 70% of total landings (Aguilar 2006). Sharks are finned and the carcasses are often discarded overboard as higher value fish species are used to stock the ship's hold (Bostock and Herdson 1985).

In the 1980s, there was concern in Ecuador about the high quantities of dead sharks being thrown back to sea without using the meat ($\sim$70%) (Wood et al. 1988). The government-led attempt in the mid-1980s to increase internal sales of shark failed due to high prices and poor quality (Helder 1994). There seems to be an aversion to shark meat in Ecuador, particularly on the coast – perhaps because shark meat spoils rapidly and the quality of meat is often poor (Franciso-Fabian 2001). Shark meat is sometimes used to make fishmeal and sometimes mislabelled and sold as 'marlin fillets', 'sea bass' or 'flounder' (Revelo and Guzman 1997).

Large quantities of 'incidental' sharks led the Ecuadorian government to limit the export of shark fins in 1989. In 1993, another law was passed to prohibit the extraction of fins without using the meat (i.e., all sharks had to be landed with fins intact) (Franciso-Fabian 2001). This law was prompted by growing concern that exported shark fins were actually originating from sharks caught within the protected Galapagos Marine Reserve (GMR), 1000 km from the Ecuadorian mainland.

1.2. In the islands

Historical accounts of early voyages to the Eastern Pacific point to the profusion of sharks there (Roberts 2007). On his crowning visit to the Galapagos in 1835, Charles Darwin was impressed by the abundance of marine life and wrote in the Beagle records, 'The Bay swarmed with animals; Fish, Shark & Turtles were popping their heads up in all parts'.

In the 1930s, at least one whale shark in the Galapagos Islands was, in the name of science, subjected to 'repeated harpooning and a number of shots with a heavy rifle' (Gudger 1933). Not long afterward, in the 1950s, shark finning in Galapagos became a commercial enterprise (INP 1964). In the late 1980s, tens of thousands of sharks were caught for the Asian market (Camhi 1995).

In 1998, industrial fishing (and shark finning) was prohibited in the GMR, which today encompasses a 40-mile radius around the archipelago. In 2000, the Inter-Institutional Management Authority of the GMR prohibited shark fishing, landing and trading of any type in the Galapagos Archipelago (the Ministry of the Environment officially enacted this legal resolution as an Ecuadorian Law in 2003). The Galapagos Islands and Marine Reserve are now a World Heritage Site and internationally recognised for their rich marine biodiversity. Galapagos waters are home to 30 species of sharks that come to the nutrient rich waters to visit symbiotic cleaning stations, where cleaner fish pick parasites from the sharks' bodies (Zarate 2002). The GMR also provides a unique opportunity to reliably scuba dive with sharks. In 2006, more than 145,000 tourists visited Galapagos – representing a total value of $418 million, an estimated $63 million of which remains in the local economy (Watkins and Cruz 2007).

Though capturing sharks is prohibited, illegal shark finning by local Galapagos fishers has been on the rise since the collapse of the sea cucumber fishery in the late 1990s (Watts and Wu 2005). Mainland Ecuadorian and foreign (e.g., Colombian, Costa Rican, Japanese, Taiwanese and Korean) industrial fishing vessels also illegally fin sharks within the Galapagos Marine Reserve. Over the last two decades, Ecuadorian authorities have apprehended a small fraction of local, national and international fishing vessels illegally shark finning within the Reserve's boundaries (Table 2). In 2001, one of the authors (JJ)

Table 2. Shark-related apprehensions in Ecuador, 1991–2007.

Date of incident	Flag	Illegal catch confiscated	Action taken	Source
Nov 1991	Japan	5000 shark fins	Vessel arrested by Ecuadorian Navy	Constant (1993)
Feb 1992	Ecuador	50 hammerhead sharks	Vessel arrested by Ecuadorian Navy	Constant (1993)
June 1996	–	32 shark fins	Seized by Galapagos National Park Services (GNPS)	El Universo (1996)
Mar 1997	–	Unknown number	Poachers fired on GNP personnel and fled; No arrest was made	CDF (1997)
1999	–	8000 shark fins	Boat seized	Watts (2001)
Jan 2001	Ecuador	5 blue sharks	Fishing vessel seized by Ecuador Navy	El Commercio (2001)
Mar 2001	–	350 shark bodies and 600 shark fins	Vessels released due to pressure from higher authorities	El Universo (2001)
Mar 2001	Costa Rica	1036 shark fins and 70 shark carcasses	Fishing vessel arrested while using long line fishing gear	GCT (2002)
July 2001	Costa Rica	600 Sharks	Vessel is arrested	SCT (2001)
July 2001	Ecuador	10 sharks	Fishermen arrested by GNPS	CDF (2001)
Mar 2003	–	46 shark fins	No arrests; catch found in a store in an illegal campsite	Watts and Wu (2005)
Mar 2003	–	514 shark fins	Seized from Isabella Island by Ecuador Navy	El Commercio (2003)
Mar 2003	–	211 shark fins	Cargo vessel detained by Ecuador Navy	SCT (2003a)
Mar 2003	–	4147 shark fins	Driver of the truck arrested and shark fins confiscated	SCT (2003b)
Mar 2003	Ecuador	Unknown number of sharks	Fishing vessel impounded	GCT (2003a)
Sept 2003	–	815 shark fins	Two fishermen and owner of the truck arrested	CDNN (2003)
Oct 2003	–	Unknown number of shark fins	Taken to Puerto Villamil, Isabela Island	GCT (2003b)
2003	–	Unknown number of sharks	Observed hauling long line by a tourist	Echeng (2003)
Jan 2004	–	409 shark fins	Shark fins seized from an illegal campsite on Isabela island	GCT (2004)

(*continued*)

Table 2. (*Continued*).

Date of incident	Flag	Illegal catch confiscated	Action taken	Source
Jan 2004	–	1349 shark fins	Seized from a light truck proceeding from wharf towards Airport	El Commercio (2004)
April 2004	Ecuador	22 dead sharks	5 boats arrested, the sixth one got away	GCT (2004b)
Feb 2005	–	2 sharks	Celebrity cruise vessel fined $80,000 and its operation suspended for two months	El Commercio (2005a)
Dec 2005	Ecuador	10 shark fins	Captain of the boat arrested	El Commercio (2005b)
Mar 2006	–	16 dead sharks	Cargo of the vehicle confiscated	Associated Press (2006)
April 2006	Spain	Unknown number of shark fins (one million worth shark fins and sea cucumber confiscated)	Seized in Manabita port	El Commercio (2006a)
Aug 2006	Ecuador	9320 kg of shark fins	Seized by Customs in Guayaquil, Ecuador	El Commercio (2006b)
April 2007	–	65 sharks	Vessel arrested by GNPS patrol for five infractions	GCT (2007a, 2007b)
April 2007	–	272.4 kg of shark fins	Judicial Police detained the 12 packages in Huaquillas prior to shipment to Aguas Verdas, Peru	Diario Hoy (2007)
Aug 2007	–	18,673 shark fins	Shark fins confiscated by Ecuadorian Environmental Police	Mercapesca (2007)
Aug 2007	Ecuador	2 tonnes of shark fins	15 people detained for illegal shark fishing	Ecuador-Rising (2007)

witnessed the incineration of 1044 shark fins and the at-sea disposal of 78 carcasses after the Galapagos National Park assisted by the Sea Shepherd Conservation Society detained the Costa-Rican long-lining vessel, *Canella II*, for fishing illegally in the GMR. Given roughly five fins per shark, the crew of *Canella II* likely killed at least 200 sharks but retained only 78, which supports accounts of high rates of discarding in shark fisheries.

1.3. Fin flop: export legal or illegal?

Partly over concern for the Galapagos, the President of Ecuador signed a decree in 2004 for a complete ban on the export of shark fins, even from the mainland (Watts and Wu 2005). But shark finning is very lucrative; fishers receive a minimum of $20/kg (Franciso-Fabian 2001). The only comparable activity in terms of profitability is drug trafficking. Thus, the export of mainland shark fins continued after the ban and, during this time, many shark fins were smuggled to Peru or simply labelled as 'plastic sheeting' or unspecified marine products. (Watts and Wu 2005). In July 2007, against the advice from conservation groups, the Ecuadorian President overturned the ban on shark fin exports.

Despite this long history of shark fishing and the problems of illegal shark finning, the FAO did not begin reporting shark data on behalf of Ecuador until the 2005 update of data (which retroactively included statistics from 1991 to 2005). However, knowing that shark finning has existed at least since the early 1960s, this study reconstructs historical shark catches for the Ecuadorian mainland using sporadic data on shark landings. We examined the period 1979–2004, from when the FAO database for trade in fisheries began until 2004, when shark fin exports were officially banned.

2. Methods

For the purpose of this study, we considered shark captures by Ecuadorian mainland fishers in the two categories used by government and grey literature reports: small-scale and industrial. For the small-scale sector, shark catches were available for 1982 and 1987–2004, though the 1988 data point was discarded because it was anomalous (more than three times higher than the average annual catch). However, of Ecuador's 138 small-scale fishing ports, these data were representative of only eight monitored ports: Esmeraldas, Manta, San Mateo, Santa Rosa, Anconcito, Engabao, Playas, Puerto Bolivar (Figure 2; Solís and Mendívez 1999). According to a 1999 survey of fishers, this represents only 21,005 of the nation's 56,068 fishers. Assuming fishers nationwide have comparable average per capita catch rates, this implies that reported catch reflects only 37.5% of Ecuador's total shark catch.

National reported shark landings were thus increased by 2.7 times to give countrywide estimates and account for the number of ports and 62.5% of fishers that went unmonitored. For the years 1979–1981, when small-scale shark landings were unavailable, we assumed the sharks to be 5% of total small-scale marine fisheries landings (the average ratio of sharks to total catch for the years 1982 and 1987). For years between 1982 and 1987, we interpolated the ratio of sharks to total catch (ranging from 4 to 6%) and multiplied this by the small-scale catch reconstructions to obtain annual shark landing estimates.

Estimates of sharks landed by industrial fishing boats were available for 1979–1982 and 1990–1995. Industrial landings between 1982 and 1990 were interpolated. For the years 1996–2004, we assumed an industrial catch equal to the average annual industrial

Figure 2. Map of Ecuador's 8 monitored fishing ports.

catch from 1990 to 1995 (608 t). We then aggregated the small-scale shark catch estimates and the industrial shark catch estimates to obtain total estimates for mainland shark landings.

FAO recently made shark captures available for Ecuador for the period 1991–2005 (www.fishstat.org). Ecuador's shark fin export data were obtained from several sources from 1979 to 2004, including the FAO commodities and trade fisheries database. Data were not available for the year 1996, which we interpolated. Dried shark fins conservatively represent 1–2% of the live weight of sharks (Bostock and Herdson 1985). Thus, we used an average of 1.5% to obtain estimates of live shark weight from dried shark fin weights (Table 3).

3. Results

We compared reconstructed catches with fin export data and FAO data (Figure 3). From the period of FAO reporting, 1991–2004, Ecuador's estimated shark landings are 3.6 times

Table 3. Reconstructed data and sources used to estimate total shark landings, FAO data and fin exports (t).

Year	Small-scale	Industrial	Mainland total	FAO[1]	Fin exports	Estimated live weight based on fin exports
1979	4,290	378[2]	4,668	–	128[3]	8,533
1980	4,046	77[2]	4,123	–	121[3]	8,067
1981	4,758	169[2]	4,927	–	142[3]	9,467
1982	4,741[4]	688[2]	5,429	–	142[3]	9,467
1983	3,994	620	4,614	–	89[3]	5,933
1984	4,889	553	5,443	–	95[5]	6,333
1985	4,958	486	5,445	–	76[5]	5,067
1986	4,494	419	4,913	–	63[5]	4,200
1987	9,219[6]	352	9,571	–	75[5]	5,000
1988	9,827[6]	285	10,112	–	83[5]	5,533
1989	10,435[7]	218	10,653	–	91[5]	6,067
1990	4,347[7]	151[7]	4,498	–	92[5]	6,133
1991	8,696[7]	230[7]	8,926	2,600	85[1]	5,667
1992	6,957[7]	168[7]	7,125	2,423	82[1]	5,467
1993	12,173[6]	614[7]	12,788	4,131	84[1]	5,600
1994	11,304[7]	936[7]	12,240	4,004	101[1]	6,733
1995	8,696[7]	1,548[7]	10,244	2,803	105[1]	7,000
1996	9,621[6]	608	10,229	1,805	–	6,167
1997	9,989[7]	608	10,597	1,874	80[8]	5,333
1998	4,247[9]	608	4,954	980	77[8]	5,133
1999	1,665[7]	608	2,272	625	124[8]	8,267
2000	2,608[10]	608	3,216	807	154[8]	10,267
2001	7,438[10]	608	8,046	2,790	145[8]	9,667
2002	5,653[10]	608	6,261	2,120	158[8]	10,533
2003	3,721[10]	608	4,329	1,400	127[8]	8,467
2004	2,338[10]	608	2,946	1,254	99[8]	6,600

[1]FAO 2007.
[2]Bostock and Herson 1985.
[3]Willman 1984.
[4]Herdson et al. 1985.
[5]Scott and Torres 1991.
[6]INP 1999.
[7]Arriaga and Martinez 2002.
[8]Watts and Wu 1995.
[9]Revelo 1999.
[10]INP 2005.

greater than FAO reports. Reconstructed shark landings for the Ecuadorian mainland averaged 6868 t per year from 1979 to 2004, with small-scale fisheries accounting for 93% of total landings. On average, shark fin exports from Ecuador were 109 tonnes per year over the 1979 to 2004 time period, or an equivalent of 6950 t in live weight per year. From 1998 to 2004, Ecuadorian shark fin exports exceed mainland catches by 44%, or an average of 3850 tonnes per year.

The FAO commodities and trade database only reports shark fin exports for the years 1981–1994, though national data sources (Table 3) clearly show that shark finning has occurred for at least 10 additional years.

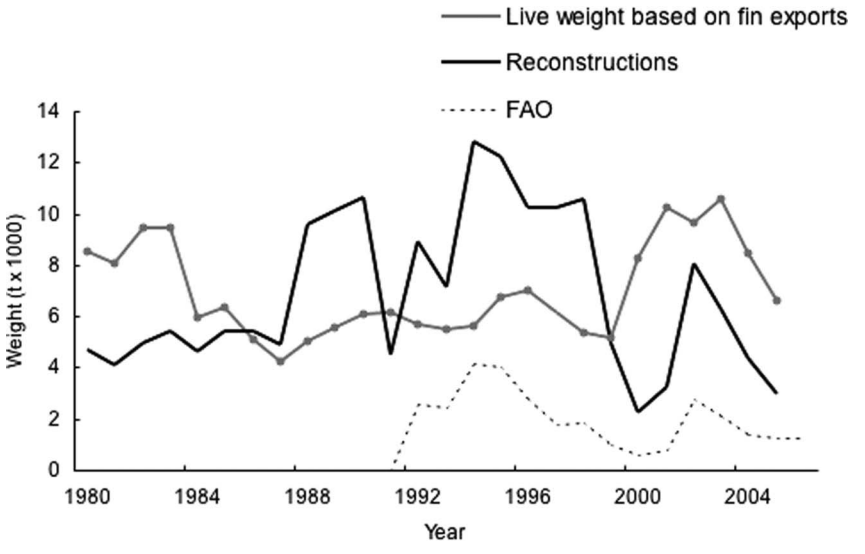

Figure 3. Sharks caught in Ecuador, 1979–2004.

4. Discussion

This research shows that shark landings by Ecuadorian mainland fishers are three to four times greater than those reported by FAO (1991–2004). These findings agree with broader research indicating that global shark catches globally exceed the values presented by FAO by a factor of three or four (Clarke et al. 2006). Our results further support the notion that the use of FAO figures to characterise trends in shark fin trade may lead to false conclusions (Clarke 2004).

Curiously, the fisheries data reported to the FAO by Ecuador did not include any shark catches until the 2005 update of data. Though reports indicate that 28 species of shark are commonly caught in Ecuador's waters (Table 1), only six categories of sharks are reported by FAO on behalf of Ecuador: thresher sharks, shortfin makos, miscellaneous sharks, requiem sharks, hammerhead sharks and houndsharks and smoothhounds. The absence of shark fin export data in the FAO database subsequent to 1994 is also problematic.

Great discrepancies not only exist between what FAO reports (and hence Ecuador) and what Ecuador catches on the mainland, but between what Ecuadorian mainland fishers capture and the amount of shark fins Ecuador exports. In the late 1990s, after the collapse of the sea cucumber fishery, many newly immigrated Galapagos fishers turned to fishing for sharks. There are anecdotes to suggest an estimated 80% of Ecuador's shark fin exports originated from Galapagos (WildAid 2007). Our results suggest that, since 1998, an average of 44% of Ecuadorian shark exports are unaccounted for, and it is possible that sharks from the Galapagos account for this gap.

We recognise the amount of uncertainty in these reconstructions, but believe they better represent reality. Furthermore, these estimates of shark landings are likely conservative minimums given reports of high rates of shark discards. Sharks caught as bycatch while fishing for pelagic species, particularly before the 1990s, were likely discarded at sea and this bycatch is large and unaccounted for. According to the reports from the Inter-America Tropical Tuna Commission (IATCC), Japanese long-liners also

finned sharks through the 1990s (Merlen 1995). Both of these sources of finning are not accounted for here.

Aside from reconstructing catches, anecdotes can be an important source of understanding for resource management (Pauly 1995). Fishers report that that catches of shark per fisher have declined (Watts and Wu 2005). Catch compositions of sharks might have also changed. In 1985, makos, tiger, bulls and Galapagos sharks were the most commonly caught sharks (Bostock and Herdson 1985). Today, in Manta, which some sources described as the epicenter of Ecuador's 'shark mafia', blue sharks (*Prionace glauca*) and pelagic thresher sharks (*Alopias pelagicus*) make up nearly 90% of all shark landings; the former is listed as 'near threatened' and the latter as 'vulnerable' and facing a high risk of extinction in the medium-term future on the IUCN Red List (see Table 1; Aguilar et al. 2007).

Worldwide, an estimated 1.7 million tonnes of sharks are killed annually for their fins alone (Clarke et al. 2006). As top predators, sharks exert important controls on food webs and ecosystem function (Worm et al. 2002). The disappearance of sharks could have major impacts on marine ecology. The removal of sharks in the northwest Atlantic caused a trophic cascade and an increase in their food source, cownose rays, which led to a subsequent decline in commercially valuable scallops (Myers et al. 2007). A trophic model of Galapagos fisheries indicates that the removal of sharks would cause an increase in toothed whales, sea lions and other reef predators, which would cause decreases in commercially valuable grouper (Okey et al. 2004). However, whether sharks are keystone predators is debatable, particularly in areas where tuna and billfishes are central to ecosystem function, such as the Central Pacific (Kitchell et al. 2002). But the goals of conserving biodiversity, the waste associated with finning, tourism and precautionary principle (particularly due to slow-growing shark populations) are also sound reasons to preserve sharks.

Given the worldwide distribution of sharks and their susceptibility to overfishing, a call for international collaboration in shark management was made two decades ago (Manire and Gruber 1990). In 1989, the Convention on International Trade in Endangered Species (CITES), which provides an international legal framework for preventing trade in endangered species, imposed an international ban on ivory. Comparing shark finning to killing elephants only for their tusks, several conservation groups are calling for a similar global ban for shark fins.

Though a global ban on shark finning has not yet been adopted, some nations have banned shark finning outright, including the U.S., Canada, Brazil and, for a short while, Ecuador. The Bahamas banned shark finning for the simple reason that revenues generated by live sharks exceed the revenues generated by dead ones (Watts 2001). In 2004, the International Commission for the Conservation of Atlantic Tuna (ICCAT) adopted an international ban on shark finning. The Inter-American Tropical Tuna Commission (IATTC) followed in 2005. In June 2007, CITES adopted a proposal to ban international trade in sawfishes, shark relatives considered to be critically endangered around the world.

In 2004, when Ecuador banned the export of shark fins, it had some of the most progressive shark legislation in the world, though its effect on the water was questionable. Today, a commercial export market for shark fins is again legal and in full effect. Researchers claim 'shark stocks can be harvested sustainably and, if carefully managed, can provide very stable fisheries' (Walker 1998). The question in Ecuador is not whether a shark fishery can be sustainable but whether it can be carefully managed.

The reconstructed shark captures presented here, which should be taken as minimum estimates, show that Ecuador's shark fisheries are more exploited than previously believed.

These findings support urgent implementation of the measures Ecuadorian law mandates: eliminating targeted shark captures, finning and transshipments, as well as adoption of measures to minimise incidental capture. Furthermore, the discrepancies in data show that monitoring of sharks is sporadic at best. Thus, a serious shark landings monitoring system and effective chain of custody standards are needed.

Better labelling is also needed for all fisheries products, including sharks (Jacquet and Pauly in press). In Ecuador, shark meat and fins are often mislabelled. In Hong Kong, customs data would be dramatically improved by establishing a Hong Kong-based customs inspection program for shark fins and other shark products. Furthermore, trade quantities often cannot be compared due to differences in commodities codes. Efforts should be made to more strictly teach and enforce these codes (Clarke 2004).

Other shark conservation efforts in Ecuador include the Eastern Tropical Pacific (ETP) Marine Corridor Initiative. In 2004, the United Nations Foundation and Global Conservation Fund granted $3.315 million to strengthen five marine reserves in the eastern Pacific and to promote regional cooperation on marine conservation issues in the eastern Pacific. This has allowed initial implementation of the ETP corridor that will provide much-needed and long overdue protection for migratory species, such as sharks, sea turtles, whales and seabirds. This large multiple-use area spans 521 million acres (211 million hectares) of ocean and constitutes the largest marine area explicitly managed for conservation and sustainable use under a voluntary cooperation agreement in the Western hemisphere. The tuna industry and some other fisheries have opposed the corridor, but the countries involved are all supportive. Overcoming this resistance and achieving active support of the industrial fishing sector is crucial to ensure that migratory species protected within national marine protected areas (MPAs) are not decimated in open waters. The recent placement of Galapagos on UNESCO's list of endangered World Heritage Sites further highlights the need for improved marine management even in relatively well-financed MPAs.

These top-down approaches are also complemented by bottom-up projects. The group WildAid is working to eliminate demand for shark fin soup and has also initiated many country campaigns in Ecuador. They are also helping in efforts to find substitute products for shark fin. The main culinary attraction of shark fins is their gelatinous texture. In proportion to its size, there is more gelatin in a shark's fin than any other living thing (Caldwell and Ellison 1978). The texture of shark fin is important in making the soup, but shark fins are essentially tasteless. The flavour of shark fins soup relies entirely on the broth, usually made from chicken (Watts 2001). Efforts to make shark fin analogues out of pork and melon rinds are underway. However, there is nothing that can substitute for sharks in the sea.

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