CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

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Fourteenth meeting of the Conference of the Parties
The Hague (Netherlands), 3-15 June 2007

CONSIDERATION OF PROPOSALS FOR AMENDMENT OF APPENDICES I AND II

A. Proposal

Inclusion of all species of the family Pristidae in Appendix I of CITES.

All species of family Pristidae qualify for listing in Appendix I in accordance with Article II, paragraph 1 of the Convention, and satisfy Criterion A.i), A.v), B.i), B.iii), B.iv), and C.ii) in Annex 1 of Resolution Conf. 9.24 (Rev. CoP13).

B. Proponents

Kenya and the United States of America

C. Supporting statement

1. Taxonomy

1.1 Class: Chondrichthyes

Subclass: Elasmobranchii

1.2 Order: Rajiformes

1.3 Family: Pristidae

1.4 Genus, species or subspecies, including author and year: see the Annex, section A.

1.5 Scientific synonyms: see the Annex, section A.

1.6 Common names: see the Annex, section A.

1.7 Code numbers: None

2. Overview

The family Pristidae includes seven species of elasmobranchs that were historically widespread in tropical to temperate, nearshore marine habitats, estuaries, large rivers, and some lakes. Their distribution is relatively close to shore; thus, introduction from the sea (outside the Exclusive Economic Zone) is not an issue for this family. Their distribution was presumably once continuous in suitable habitats, but it is now severely fragmented with many populations extirpated from large parts of their former ranges and remaining populations seriously depleted. Species in the family Pristidae are among those marine fishes with the lowest productivities, which makes them particularly vulnerable to excessive mortalities and rapid population declines, and susceptible to intrinsic and extrinsic factors. Their estimated natural mortality rate is between 0.07 and 0.15 per

year (Section 3). All known populations of species in the family Pristidae have severely declined based on publication and museum records, negative scientific survey records, anecdotal fishermens' observations, and limited catch-per-unit-effort. Many populations have been extirpated or nearly extirpated from large areas of their former ranges, with no or only very few observations recorded since the 1960s. The global populations of all species in the family Pristidae have experienced historic extents of decline greater than 90% (Section 4). All species in the family Pristidae are listed on the IUCN Red List of Threatened Species as Critically Endangered globally (IUCN, 2006). The principal threats to the family Pristidae are fishing (formerly target, now mostly utilized incidental capture) in broad-spectrum fisheries and habitat loss (Section 5). Species in the family Pristidae are utilized for their meat, fins, rostral saws and other products. They are targeted or utilized as bycatch to supply international trade demand for rostral saws and teeth, fins, other body parts utilized in traditional medicines, and live animals for aquaria. An Appendix-I listing would have beneficial effects for wild populations of these animals by preventing the international trade in their two most valuable products; the rostra and fins, and preventing trade in live animals other than as permitted under Article III. A few populations of species in the family Pristidae are legally protected in a small number of range countries, and some are establishing recovery plans for these endangered species. Some habitat is incidentally protected (Section 7). There are no national fisheries management plans for species in the family Pristidae. The United Nations Food and Agriculture Organization (FAO) and Regional Fisheries Bodies do not manage Pristidae fisheries or bycatch (Section 8).

3. Species characteristics

3.1 Distribution[1]

Species of Pristidae are generally tropical marine and estuarine elasmobranchs that have a circumtropical distribution. Their distribution was presumably once continuous in suitable habitat, but is now severely fragmented with many populations extirpated from large parts of their former ranges and with remaining populations seriously depleted (see the Annex, Section B). *Anoxypristis cuspidata* occurs in the Indo-West Pacific Ocean, ranging from east Africa to Australia and China (Compagno and Cook, 1995). *Pristis clavata* primarily occurs in northern nearshore waters of Australia, whereas *Pristis microdon* is found from Sri Lanka to Australia, including islands in the Indonesian archipelago (Last and Stevens, 1994; Compagno and Cook, 1995). *Pristis microdon* is also found in freshwater bodies in countries in southern Africa, India, and southeast Asia (Taniuchi et al., 1992). *Pristis pectinata* is the most wide-ranging species, but its range is highly disjunct. It ranges in the western Atlantic Ocean, Gulf of Mexico and Brazil (Bigelow and Schroeder, 1953). In the eastern Atlantic Ocean, *Pristis pectinata* once occurred in the Mediterranean Sea (now extirpated), but still may be found (although it is extremely rare if not extirpated) in some west African countries, South Africa, east Africa to southeast Asia and Australia (Last and Stevens, 1994; Simpfendorfer, 2000). *Pristis perotteti* occurs in the western Atlantic Ocean, from the United States of America to Brazil, including numerous freshwater drainages (e.g., Amazon River, Rio San Juan), and also in the eastern Pacific Ocean from Mexico to Ecuador (Bigelow and Schroeder, 1953; Thorson, 1974, 1976). *Pristis pristis* is found in the eastern Atlantic Ocean from Portugal to Angola (Compagno and Cook, 1995). *Pristis zijsron* occurs in the Indian and western Pacific Oceans from east Africa to Australia, including some areas of southeast Asia and in the Indonesian Archipelago (Bigelow and Schroeder, 1953; Cook and Compagno, 1995; Last and Stevens, 1994).

3.2 Habitat

Specific data on habitats of species in the family Pristidae are limited. In general, species in the family Pristidae are coastal species found in waters less than 10 m deep, but occasionally adults have been recorded at depths of over 100 m (Poulakis and Seitz, 2004; Peverell, 2005; Simpfendorfer and Wiley, 2005). Species in the family Pristidae are generally found in a variety of habitats in marine, euryhaline or brackish waters. In addition, some are found in freshwater

[1] *The taxonomy of this group is currently under scientific review, and the distribution of individual species may also change to align with taxonomic changes (Colin Simpfendorfer, Mote Marine Laboratory, personal communication to John Carlson, NOAA Fisheries Service).*

habitats [e.g., *Pristis perotteti* in the Amazon River and Lake Nicaragua (Thorson, 1974; 1976) and *Pristis microdon* in Australia (Peverell, 2005)]. Data have indicated that *Pristis pectinata* is associated with mangroves, seagrasses, and the shoreline (Simpfendorfer and Wiley 2005). In addition, *Pristis pectinata* occurs in shallower water, and *Pristis perotteti* occurs regularly at depths greater than 10 m (Simpfendorfer and Wiley, 2005).

3.3 Biological characteristics

Studies on the biological characteristics of Pristidae are rare, but those studies that have examined age, growth, and reproduction suggest that this taxon has very low productivity. Growth rates from three captive fish in Colombia averaged 19.6 cm per year (Bohoroquez, 2001). Clark et al., (2004) reported an average growth rate for 16 captive *Pristis pectinata* of 13.9 cm per year for animals ranging in size from 80 cm to 412 cm. Tanaka (1994) estimated growth of *Pristis microdon* of 18 cm per year for juveniles. He estimated a maximum age of 44 years for this species. Age at maturity has been estimated between 10 and 33 years depending on sex (Simpfendorfer, 2000; Clarke et al., 2004).

Like all elasmobranchs, fertilization in species of the family Pristidae is internal. Development in these species is believed to be ovoviviparous. The embryos, while still bearing the large yolk sac, already resemble adults relative to the position of their fins. During embryonic development, the rostral blade is soft and flexible. The rostral teeth are also encapsulated or enclosed in a sheath until birth. Shortly after birth, the teeth become exposed and attain their full size proportionate to the size of the rostrum. The size at birth for *Pristis pectinata* is approximately 80 cm, with the smallest free-living specimens reported during field studies in Florida being 77-84 cm (Simpfendorfer, unpublished data). Bigelow and Schroeder (1953) reported gravid females of *Pristis pectinata* carry15-20 embryos. Studies of *Pristis perotteti* in Lake Nicaragua (Thorson, 1976) report litter sizes of 1-13 individuals, with a mean of 7.3 individuals. The gestation period for *Pristis perotteti* is approximately 5 months, and females likely produce litters every second year.

Natural mortality estimates range from 0.07-0.14 per year for *Pristis pectinata* and *Pristis perotteti* (Simpfendorfer, 2000). Using age-based demographic models, Simpfendorfer (2000) estimated an intrinsic rate of increase of 0.08-0.13 per year, and a population doubling time for *Pristis pectinata* of between 5.4 and 8.5 years under ideal conditions (no fisheries mortality, no population fragmentation, no habitat modification, and no inbreeding depression arising from the genetic consequences of a small population size). Intrinsic rates of increase for *Pristis perotteti* under the same circumstances were from 0.05 to 0.07 per year and population doubling times were 10.3-13.6 years. These low intrinsic rates of population increase are associated with the life-history strategy known as “K-selection.” K-selected animals are usually successful at maintaining relatively small, persistent population sizes in relatively constant environments. Consequently, species in the family Pristidae are not able to respond effectively to additional and new sources of mortality. Musick (1999) and Musick *et al*. (2000) noted that intrinsic rates of increase below 10 percent (0.1) were low, and make a species particularly vulnerable to excessive mortalities and rapid population declines, after which recovery may take decades.

Bigelow and Schroeder (1953) reported that species in the family Pristidae, in general, subsist chiefly on small schooling fish, such as species in the families Mugilidae and Clupeidae. They also reported some feeding on crustaceans and other bottom-dwelling inhabitants. Breder (1952), summarizing the literature on observations of feeding behavior of species in the family Pristidae, noted that they attack fish by slashing sideways through schools, and often impale the fish on their rostral teeth. Prey are subsequently scraped off the teeth by rubbing them on the bottom and are then ingested whole. The oral teeth of species in the family Pristidae have flattened cusps that are better suited to crushing or gripping.

3.4 Morphological characteristics

All modern species in the family Pristidae appear in some respects to be more like saw sharks (family Pristiophoridae) than the skates and rays within the superorder Rajomorphii that includes family Pristidae; only the trunk and especially the head are ventrally flattened. The presence of a

rostrum having laterally protruding teeth separates the family Pristidae from all other skates and rays (orders Torpediniformes, Rajiformes, and Myliobatiformes). Snouts of all species in the family Pristidae are extended as a long, narrow, flattened rostral blade with a series of transverse teeth along either edge. The rostrum has a saw-like appearance; hence, in English the common name of "sawfish".

Pristis pectinata has 20 to 34 rostral teeth on each side of the rostrum (versus 14-23 in *Pristis perotteti*) (Bigelow and Schroeder, 1953; Thorson, 1973; McEachran and Fechhelm, 1998; Compagno and Last, 1999). *Pristis zijsron,* has perhaps the longest rostrum of any living species in the family Pristidae, ranging to at least 1.7 m rostral length. The rostral tooth count for *Pristis zijsron* varies between 23 and 37 (typically 25-34) per side. *Pristis zijsron* is distinguished from *Anoxypristis cuspidata* by its sharply pointed rostral teeth (versus blade-like), greater number of rostral teeth per side (23-37 versus 18-25), presence of dermal denticles over the entire body, and the lack of a developed lower caudal fin lobe (Last and Stevens, 1994). *Pristis zijsron* is distinguished from *Pristis clavata* by its narrow-based and moderately tapering rostrum (*versus* wide-based and strongly tapering), greater number of rostral teeth per side (23-37 *versus* 18-23), and the lack of a developed lower caudal fin lobe. In addition, *Pristis zijsron* reaches a larger maximum size (7.3 m or larger versus 3.1 m total length) than does *Pristis clavata*.

Species in the genus *Pristis* are also separable into two groups, depending on whether the caudal fin has a distinct lower lobe or not. *Pristis pectinata* is the sole known representative on the western side of the Atlantic Ocean of the group lacking a defined lower caudal lobe. Other species in this group include *Pristis clavata* and *Pristis zijsron*. The group in which the caudal fin has a lower lobe is similarly represented by *Pristis perotteti* (alternatively referred to as *Pristis zephyreus*) and *Pristis microdon*.

3.5 Role of the species in its ecosystem

Like most elasmobranchs, species in the family Pristidae likely occupy mid to upper trophic levels within ecosystems.

4. Status and trends

4.1 Habitat trends

The habitat of species in the family Pristidae has been degraded or modified throughout their ranges by agriculture, urban development, commercial activities, channel dredging, boating activities, and the diversion of freshwater run-off. Degradation and modification of habitat is likely one of the primary reasons for the decline in abundances of species in the family Pristidae and their contracted distribution worldwide. Although migration patterns are generally unknown, the construction of dams and weirs and serious pollution can make transits through rivers and estuaries impossible. The shallow coastal, brackish and freshwater habitats of species in the family Pristidae are often associated with high levels of human activity, which may result in degradation or loss of habitat through pollution and coastal or riverine developments, including mangrove clearance, canal development and construction of seawalls (Simpfendorfer, 2002). Populations in fresh water and estuaries are particularly affected by constraints on availability of suitable habitat because of deteriorating water quality. Examples include the effects of mining operations, such as the cyanide spill in the Fly River (Papua New Guinea), several South American river catchments, and dam construction on the Chao Phraya River, Thailand (Compagno *et al*., 2006 a;b;c).

4.2 Population size

Data are not available to determine the actual number or size of most remaining population of species in the family Pristidae, but all known populations of these species have severely declined based on publication and museum records, negative scientific survey records, anecdotal fishermens' observations, and limited catch per unit effort information. Many populations have been extirpated or nearly extirpated from large areas of their former ranges, with no or only very few observations since the 1960s. Interviews with fishermen (structured and unstructured) have been undertaken in several countries in recent years to obtain

information on recent and historic catches (e.g., Doumbouya, 2004; Saine, 2004). In most range countries, these species are now only sporadically recorded.

The acute rarity of fishes in the family Pristidae today contrasts with reports of these species being common in inshore waters at the end of the 19th century and in the early 20th century (Henshall, 1895; Jordan and Evermann, 1896; Bigelow and Schroeder, 1953). In some cases, population size was large enough to support fisheries. For example, T. Thorson noted large catches of *Pristis perotteti* during preliminary visits to Lake Nicaragua in 1963 (T.B. Thorson personal communication referenced in Cook *et al*., 2006). However, target fisheries removed an estimated 60,000–100,000 fishes in the family Pristidae between 1970 and 1975 (Thorson, 1976), and these species are now extremely rare in freshwater lakes of Nicaragua. Taniuchi (1992) reported no Pristidae during a survey of freshwater elasmobranchs in Central America. Stanford University field collection expeditions in the Gulf of Thailand for the George Vanderbilt Foundation from 1959 to 1962 commonly reported *Anoxypristis cuspidata* in commercial catches. Recent visits to Thailand in 1993 and 1996, Borneo in 1996, and Singapore in 1996 found no reports of any Pristidae in 25 visits to commercial fish markets (Compagno *et al*., 2006 a,b,c). In the United States, *Pristis pectinata* were once prevalent throughout Florida and were commonly encountered from Texas to North Carolina. In the late 19th century, Evermann and Bean (1898) reported a fisherman catching 300 fish of the family Pristidae in his nets in the Indian River Lagoon, Florida, United States. Currently, the U.S. population of this species is estimated to be approximately only about 2,000 animals (Colin Simpfendorfer, Mote Marine Laboratory, personal communication to J. Carlson, NOAA Fisheries Service).

4.3 Population structure

Data are not available on population structure.

4.4 Population trends

All populations of species in the family Pristidae have undergone serious declines, as demonstrated by a significant reduction in captures or complete disappearance from their original range (also see Section 4.2 and the Annex, Section C). Although few quantitative population trends can be determined for most species because of lack of accurate records, evidence from surveys, field collections, and landing data suggest large declines. Worldwide landings of Pristidae were recorded by FAO between 1962 and 2004, with a worldwide peak of 1,759 metric tonnes (mt) in 1978 (FAO Fishery Information, 2004). Most landings were reported from South America. A strong decline in reported landings took place between 1984 and 1995, partly masked by estimates of landings by FAO (it is unclear how these estimates were reached), despite some landings declared by Pakistan between 1987 and 1995, reaching 84 mt in 1990. In West Africa, Liberia declared some landings between 1997 and 2000, ranging from 41 to 48 mt. Landings are now only recorded sporadically and in very small quantities in world fisheries (Figure 1).

Based on field surveys and commercial catches throughout southeast Asia, Compagno *et al*. (2006b) estimated that *Anoxypristis cuspidata* may have declined well below 80% of levels in the 1950s, with worldwide declines at least greater than 50%. Similar observations have been made for *Pristis zijsron,* and the species has not been observed in 30-40 years in the Gulf of Thailand (Compagno *et al*., 2006a).

Pristis perotteti populations have declined in the past 35 years, especially with the decimation of populations in Lake Nicaragua due to pressure from directed fisheries. From 1970 to 1975, an estimated 60,000-100,000 fishes of Pristidae were harvested (Thorson 1976), whereas in 1998, a preliminary survey of shark and Pristidae populations captured no individuals of species in the family Pristidae (McDavitt, 2002). Further, conversations with local fishermen who reported catching only 4-6 fish of the family Pristidae per year, confirmed that populations of species in the family Pristidae have not recovered from the over-harvest that occurred two decades earlier. In Lago Bayano, Panama, and Lake Yzabal and the Rio Dulce, Guatemala, physical alteration of the environment through the introduction of dams that barred free transit to the sea is thought to

have eliminated populations of species in the family Pristidae (Thorson *et al*., 1966; Thorson, 1976; Vasquez-Montoya and Thorson, 1982; Taniuchi, 1992; Tanaka, 1994).

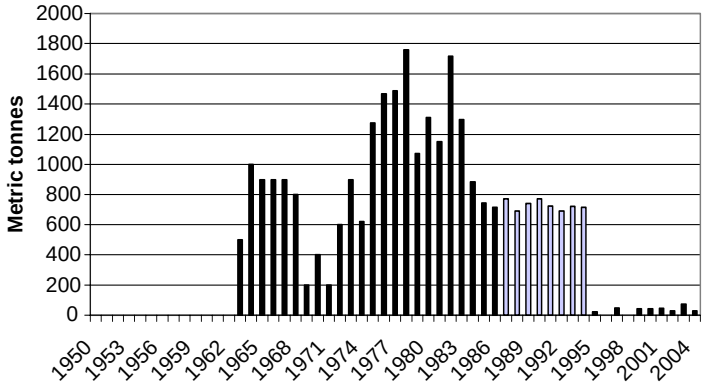

Figure 1. World landings (metric tonnes) of Pristidae, 1950-2004. Records from 1988 to 1994 (the grey bars) are FAO estimates, not reports from fishing countries.

In the United States, Simpfendorfer (2000) examined the reduction in populations of *Pristis pectinata* and concluded that both population size and range have been severely reduced. The portion of the population that once dispersed north along the eastern coast of the United States as far as New York may have been completely extirpated. Bycatch rates in Louisiana shrimp trawlers declined steeply during the late 1950s and early 1960s. The Gulf of Mexico population has also been severely reduced, with isolated and very small populations remaining in Florida, compared with estimates of hundreds of thousands in the late 1800s (Figure 2; Simfendorfer, 2002). Simpfendorfer (2002) estimated that the U.S. population is currently less than 5% of its size at the time of European settlement.

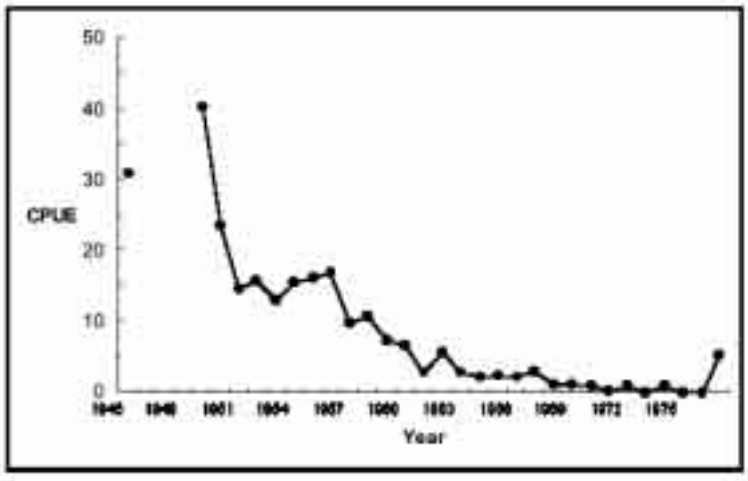

Figure 2. Mean annual landing of individuals in the family Pristidae per trawler in Louisiana waters (from Simpfendorfer, 2002).

Pristis pectinata and P. perotteti were once extremely abundant in West African countries, but the last known records of species in the family Pristidae from West African countries are from 1970 in Gambia, 1984 in Senegal, 1993 in Guinea, and 2000 in Guinea-Bissau (3rd meeting of the Sub-Regional Fisheries Commission, Banjul, Gambia, March 2004). Recent visits to Mauritania and Senegal in 2004 found no reports of any species in the family Pristidae in multiple visits to commercial fish markets (G. Burgess, Florida Program for Shark Research, University of Florida, personal communication to J. Carlson, NOAA Fisheries Service, United States). Current reports from artisanal fisheries in West African countries also lack records of

fish in the family Pristidae being caught (Mika Diop, Sub Regional Fisheries Commission of West Africa, presentation at Technical Workshop on the Conservation and Management of Sharks, Intersessional Shark Working Group of the CITES Animals Committee, Slimbridge, United Kingdom of Great Britain and Northern Ireland, 2006).

4.5 Geographic trends

As with population trends, quantitative data are not available to determine the precise historical geographic ranges of species in the family Pristidae. However, data from museum records, scientific surveys, and fishing catch records indicate evidence for a serious constriction in the range of the entire family Pristidae. For example, it is believed that *Pristis pristis* has been extirpated from the Mediterranean Sea and eastern Atlantic Ocean (Cook and Compagno, 2000). *Anoxypristis cuspidata, Pristis microdon* and *Pristis zijsron* have all but disappeared from the Gulf of Thailand (Compago *et al*., 2006 a,b,c). *Pristis pectinata's* range in the United States has contracted to areas of south Florida (Simpfendorfer 2002) and has been extirpated from areas of the eastern Atlantic Ocean and Mediterranean Sea (Adams *et al*., 2006). *Pristis perotteti* has been drastically reduced from areas in Central and South America and has disappeared from the United States (Shark Specialist Group, 2000). Interviews with older fishermen in Brazil have revealed that, regionally, catches of Pristidae have been greatly reduced over the last 10-15 years (Charvet-Almeida, 2002).

5. Threats

The principal threats to these species are from fishing (formerly targeted, but now mostly incidental capture) in broad-spectrum fisheries. Their long tooth-studded saw makes species in the family Pristidae extraordinarily vulnerable to entanglement in any sort of net gear. There have been some large-scale fisheries targeting species in the family Pristidae: in Lake Nicaragua in the 1970s, in the southeastern United States in the 19th and early 20th centuries, and possibly in Brazil from the 1960s to 1980s (bycatch is still landed in this range country). Populations are now so depleted that commercial targeting of most stocks of species in the family Pristidae is no longer cost-effective, although they are still targeted opportunistically in some regions if located. Despite being primarily a bycatch, fish in the family Pristidae are usually retained, just as they were in former target fisheries, because of the very high value of their products (see Section 6).

Although bycatch mortality is now the primary threat to species in the family Pristidae, in some regions directed fisheries remain, primarily for the public and private aquarium fish trade, and there are indications that species in the family Pristidae are at times targeted opportunistically for the shark fin trade. There is also evidence that demand for *Pristidae rostra* in Chinese Taipei may be driving some directed fishing for species in the family Pristidae. It is estimated that 23,000 spirit mediums in Chinese Taipei require Pristidae snouts as part of their ceremonial equipment, despite the emergence of metal replicas (McDavitt and Charvet-Almeida, 2004). In the north of Brazil, Charvet-Almeida (2002) reported a limited market for meat, rostra and rostral teeth of fish in the family Pristidae (see Section 6).

Habitat degradation and loss also threaten species in the family Pristidae. These species, because of their reliance upon specific habitat types (e.g., mangroves, estuaries) for at least part of their life cycle, are affected by human development. The continued development of coastal zones has resulted in substantial loss or modification of these habitats through agricultural and urban development, commercial activities, dredge-and-fill operations, boating, erosion, and diversions of freshwater run-off. Loss and/or degradation of habitat has contributed to the decline of many marine and freshwater species, and is unknown, but fully expected, to have affected species in the family Pristidae.

6. Utilization and trade

6.1 National utilization

Species in the family Pristidae are utilized for a wide variety of products, the most important of which are the toothed rostra, fins and meat. Among the most common products is the rostrum. Rostra have long been a favorite marine curio (Migdalski, 1981), with large rostra commanding impressive prices (McDavitt, 1996). Rostra are sometimes decorated with elaborate designs or

grotesque faces. These folk art rostra are sometimes fashioned into elaborate sheaths for knives. Rostra of these species are also utilized as ceremonial weapons in the folk religion of Chinese Taipei. McDavitt (1996) reported that rostra of species in the family Pristidae are also used in traditional medicine in Asia and in Mexico City. Rostra are dried and powdered, and then infused into a medicinal tea, which is used to treat "whooping cough, bronchitis, laryngitis, and diseases of the respiratory tract in general" (Charvet-Almeida, 2002; Watson, 2004).

Asian shark fin soup is one of the most expensive food items in the world (Vannuccini, 1999). Because of their large fins with high fin needle content, fins of species in the family Pristidae are highly valued for shark fin soup. Although few fin dealers advertise the type of fins they trade, one Hong Kong vendor designates two trade names used for Pristidae fins: *huang jiao* (described in English as "saw shark") and *mian qun* (labeled as "yellow shovel nose") in English. Fins of species in the family Pristidae also have appeal for traditional Asian medicine. Foods made from certain wild species like those in the family Pristidae are deemed strengthening (Anderson, 1988). Pristidae fins, in particular, are listed in one major Chinese materia medica guide as a food that can combat *xulao*, a chronic disease marked by diminished vital energy, lethargy, and weakened body resistance (Anonymous, 1983).

Rostral teeth of species in the family Pristidae have been the preferred material used to manufacture artificial spurs on Peruvian fighting cocks (Cogorno Ventura, 2001). The rostral teeth are mostly obtained from Brazil, Ecuador, Panama and various Caribbean countries. Charvet-Almeida (2002) and McDavitt and Charvet-Almeida (2004) determined that rostra find their way into the international cockfighting market from Brazil. Rostral teeth of species in the family Pristidae have been favored over other natural spur materials (such as deer antler, sea turtle shell, sea-lion teeth, mammal bones, and stingray spines), because systematic testing revealed that teeth of species in the family Pristidae were more durable and have a sufficiently porous surface to cause greater body damage to the opponent (McDavitt and Charvet-Almeida, 2004).

Products of species in the family Pristidae are also utilized for medicinal purposes. Three products of species in the family Pristidae are listed as *materia medica* in traditional Chinese medicine: liver, ova and bile (Han and Xu, 1992), as well as the rostra (McDavitt, 1996). The bile of species in the family Pristidae is thought to remove phlegm and diminish inflammation from such conditions as fall injuries, rheumatoid arthritis, and cholecystitis (inflammation of the gall bladder) (Anonymous, 1983). Shark flesh is utilized as a general tonic, shark skin for blood and heart problems, and shark bile to heal sore throats (Read, 1939).

Species in the family Pristidae are highly prized as exhibit animals in public aquaria because of their charismatic nature (McDavitt, 1996).

6.2 Legal trade

With the exception of a very few countries where some species in the family Pristidae are protected (see Section 7), all international trade is legal. Records of trade in species of the family Pristidae are difficult to verify because many times the products are not recorded at the species level. Nevertheless, international trade in many Pristidae products has been documented (see Section 6.3).

6.3 Parts and derivatives in trade

Opportunistic trade in parts of species in the family Pristidae has been observed in southeast Asia (Musick and McMillan, 2002), Hong Kong SAR (Parry-Jones, 1996), the United Republic of Tanzania (Barnett, 1997), Brazil (Charvet-Almeida, 2002), and Madagascar (Cooke, 1997). Ongoing daily trade in rostra of species in the family Pristidae occurs on eBay and other online auction houses (McDavitt and Charvet-Almeida, 2004). Overall, the annual trade in rostra of species in the family Pristidae through eBay alone was estimated at over 200 rostra sold per year, with a value of more than USD 25,000, with approximately 37% of the eBay sales representing international trade (McDavitt and Charvet-Almeida, 2004). Organized curio trade in rostra of species in the family Pristidae has recently been reported in Brazil (Charvet-Almeida, 2002; McDavitt and Charvet-Almeida, 2004). According to the US Fish and Wildlife Service's

import/export trade data, 163 Pristidae rostra were imported in the last five years. It is estimated that 90–180 large rostra are purchased annually by Asian buyers from the main fish market in northern Brazil, presumably for the curio trade (McDavitt and Charvet-Almeida, 2004). Local artisans in Brazil sometimes decorate medium-sized Pristidae rostra (usually *Pristis perotteti*) for sale to tourists. Overall, an estimated 1,000–1,500 small- to medium-sized rostra are sold per year from this same market for a variety of purposes (McDavitt and Charvet-Almeida, 2004).

Several published sources verify that fins of species in the family Pristidae are indeed regarded as high quality in the shark fin trade (e.g., Anon. 1983; Bentley 1996; Cooke 1997; SOA, 2002). Historically, Day (1878) observed Pristidae fins being exported from India to China, and Day (1889) lists species of Pristidae among seven species found in Malaysian shark fin markets. Species of Pristidae in the United States were commonly caught in the Big Pine Key shark fishery of the 1920s; a worker at this shark camp stated that Pristidae fins attained the highest value in the Asian trade (Young & Mazet, 1933). The lucrative market for meat and fins was the primary driving force for the *Pristis perotteti* fishery in Lake Nicaragua, which virtually extirpated species in the family Pristidae from this area (Davies 1976; Thorson 1982). More recently, Cooke (1997) has found fins of species in the family Pristidae among the four commonly exported species from Madagascar. Currently, both *huang jiao* and *mian qun* are common names for Pristidae in the fin trade, and both appear in a published list of the approximately 40 fin types recognized by Hong Kong traders (Vannuccini, 1999). Given their quality and increasing scarcity, large fins can command spectacular prices. For example, Fowler (1998) reported that in 1997 observers in Sandakan, Malaysia, discovered *Pristis zijsron* fins for sale in a Chinese shop, the largest of which was offered for approximately USD 3,000.

International trade is also known to occur in Peruvian cockfighting spurs. From the mid-1970s until today, rostral teeth of species in the family Pristidae have been the preferred material used to manufacture artificial spurs for Peruvian cockfighting (Cogorno Ventura, 2001). The rostral teeth are mostly obtained from Brazil, Ecuador, Panama, and various Caribbean countries. Depending on the species used, and assuming all rostral teeth in the rostral saw are used, one rostrum could now have a retail value of between USD 2,000 and USD 7,000. Currently, a Peruvian website offers both finished spurs and raw rostral teeth of species in the family Pristidae for the international market. In Brazil, small or damaged Pristidae rostra obtained as local bycatch are sold in markets as a treatment for asthma (Charvet-Almeida, 2002; McDavitt and Charvet-Almeida, 2004).

Species in the family Pristidae have historically commanded high prices in the aquarium trade, and they continue to be very valuable. A Pristidae specimen in the Vancouver Aquarium in 1986 was valued at USD 10,000 (Harper, 1986). Juvenile *Pristis microdon* imported from "freshwater Indonesia" by one Canadian dealer in the late 1990s were priced at USD 5,000 per animal (Biotope Imports, pers. comm. to M. McDavitt, 1999). In 2000, fish in the family Pristidae were given an estimated worth of approximately USD 1,000 per foot (NMFS, 2000). An Australian exporter regularly sells fish in the family Pristidae to public aquaria worldwide. In 2005, *Pristis zijsron* and *Pristis microdon* sold for USD 1,650 per foot, and *Pristis clavata* sold for USD 1,750 per foot (Lyle Squire, Jr., pers. comm. to M. McDavitt, 2005). According to the US Fish and Wildlife Service's import/export trade data, 26 live fish in the family Pristidae were imported into the United States over the last five years.

6.4 Illegal trade

Illegal trade in Pristidae fins and rostra could only occur from those few countries where these species are legally protected. However, this trade would not be identified because importing countries are unlikely to be aware of the species protected status in the countries of origin.

6.5 Actual or potential trade impacts

There is evidence from some countries that demand for rostra and fins, which are the most valuable parts and derivatives of Pristidae that enter international trade, continues to drive Pristidae fisheries. Demand for fish in the family Pristidae for the aquarium trade also drives

some fisheries, particularly in northern Australia. Even when incidentally caught in other fisheries, the high price and demand for Pristidae parts precludes any interest in releasing the animals unharmed. Since species in the family Pristidae are now so seriously threatened with extinction, any reduction in demand for these products leading to a decrease in mortality rates will benefit these species. It is difficult to imagine any conditions under which commercial trade in these Critically Endangered species or their products might lead to an improvement in their status in the wild. An Appendix-I listing would have beneficial effects upon the wild populations of these animals by preventing the international trade in their two most valuable products: the rostra and fins, and preventing trade in live animals other than as permitted under Article III. Increased international awareness of the Critically Endangered nature of species in the family Pristidae arising from an Appendix-I listing may also stimulate range countries to take national conservation measures for these species, which are currently largely lacking.

7. Legal instruments

7.1 National

Very few range countries have enacted legislation specifically to protect species in the family Pristidae or manage their fisheries. The Nicaraguan Government imposed a temporary moratorium on targeted fishing for fish in the family Pristidae in Lake Nicaragua in the early 1980s (Thorson, 1982), only after the population collapsed following intensive fishing in the 1970s. The aim was to allow the population to recover, but no such recovery has occurred (McDavitt, 2002). Indonesia enacted legislation to protect species in the family Pristidae (and five other freshwater fish species) in Lake Sentani, West Papua, following severe depletion of populations in a gill-net fishery (Compagno *et al*., 2006b). All Australian populations of species in the family Pristidae are listed as Vulnerable or Endangered, either under Australia's Commonwealth Environment Protection and Biodiversity Conservation Act (EPBC) or by the Australian Society for Fish Biology (ASFB). The EPBC lists *Pristis microdon* as a Protected species and Vulnerable in Queensland. The other three Australian species may be nominated for protection as 'at Conservation-risk'. *Pristis clavata* and *Pristis zijsron* are assessed as Endangered by the ASFB and *Anoxypristis cuspidata* as Vulnerable (Daley *et al*., 2002, Pognoski *et al*., 2002). Environment Australia was petitioned to list all species in the family Pristidae on the Endangered Species List. India's Ministry of Environment and Forests has protected species in the family Pristidae under the Wildlife Protection Act (WPA) since 2001. The United States listed *Pristis pectinata* under the U.S. Endangered Species Act in 2003 (50 CFR 224). The US National Marine Fisheries Service recently released a draft Recovery Plan for the U.S. population of this species (http://www.nmfs.noaa.gov/pr/recovery/plans.htm).

7.2 International

Because these species are not commercially fished, they do not typically fall under the remit of regional fisheries management organizations nor are they addressed by efforts of the UN Food and Agriculture Organization. No international instruments have been identified relating to the conservation and/or management of species in the family Pristidae, or to trade in these species.

8. Species management

8.1 Management measures

Besides the aforementioned protected status (see Sections 7.1 and 7.2), there are no management measures in place for species in the family Pristidae.

8.2 Population monitoring

As part of the U.S. recovery plan for *Pristis pectinata*, monitoring programs have been established in some areas of their former range (NMFS, 2006). Elsewhere, no other monitoring programs for species in the family Pristidae have been identified, although the West African countries of the CSRP are collecting all regional records.

8.3 Control measures

Pristis pectinata is protected under the U.S. Endangered Species Act (ESA). The prohibitions of section 9 of the ESA, in part, make it illegal for any person subject to the jurisdiction of the United States to take (i.e., to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect or to attempt to engage in any such conduct) any endangered wildlife.

8.3.1 International

Pristis pectinata is protected under the United States Endangered Species Act (ESA). The prohibitions of section 9 of the ESA, in part, make it illegal for any person subject to the jurisdiction of the U.S.: to import into, or export from, the United States; to ship in interstate or foreign commerce in the course of commercial activity; or to sell or offer for sale in interstate or foreign commerce any endangered wildlife. To possess, sell, deliver, carry, transport, or ship, endangered wildlife that has been taken illegally is also prohibited. No other international control measures have been identified

8.3.2 Domestic

See Section 7.1.

8.4 Captive breeding

None.

8.5 Habitat conservation

The remnant population of *Pristis pectinata* in the southeast United States is protected by the benefits of the establishment of the Everglades National Park in 1947 (Simpfendorfer, 2002). Although this national park was not established specifically for *Pristis pectinata*, this large protected area has been identified as vital to the survival of this species in the United States (Simpfendorfer, 2002). Elsewhere, no habitat protection measures have been identified specifically for species in the family Pristidae.

8.6 Safeguards

None.

9. Information on similar species

The main products entering international trade are the fins and the rostral saws and teeth. Fin merchants can identify the fins, but an identification guide or genetic tools would be needed to enable non-experts to distinguish between these and other shark fins.

Sawsharks, order Pristiophoriformes, are superficially similar deepwater sharks that also have a long, flat saw-like snout. Sawshark's rostra differ from those of Pristidae species in having a pair of long, string-like ventral barbels in front of the nostrils and close-set rows of ventral as well as lateral sawteeth.

10. Consultations

The U.S. Fish and Wildlife Service mailed letters requesting additional information on populations of species in the family Pristidae and comments on the possible listing of all species in the family Pristidae in Appendix I to all range countries. Below are the responses received to date.

Aruba (the Netherlands): The Aruba Management Authority and Scientific Authority support the listing of Pristidae in Appendix I.

China: China is unable to support a proposal for listing Pristidae in Appendix I of CITES unless issues regarding Introduction from the Sea and making of non-detriment findings are resolved.

Colombia: *Pristis pectinata* and *Pristis perotteti* are encountered in Colombian waters and are listed in their "Red Book of marine fishes and invertebrates," which follows the methodology used by IUCN, as Critically Endangered. Colombia expressed their support and collaboration for the proposal.

Côte d'Ivoire: *Pristis microdon, Pristis pectinata, and Pristis pristis* occur in coastal and freshwater environments of Côte d'Ivoire. Approximately 4 tons of these species are harvested annually and delivered to domestic markets. Species in the family Pristidae are not imported or exported from Côte d'Ivoire. Although detailed fisheries statistics are not available, declining harvests from various bodies of waters is an indicator of the threatened natured of these species. Current Ivorian legislation does not specifically cover these species. Côte d'Ivoire believes that strengthening the conservation status of Pristidae should be based on study and evaluation of populations and threats.

Egypt: Fishes in the family Pristidae, while once widespread in Egyptian waters, are now very rare. Fishing, handling and trade of all cartilaginous and ornamental fishes in the Red Sea have been banned. Egypt supports listing fishes in CITES.

Guatemala: In Guatemala, no species in this family is found in the endangered species listing due to lack of information. It was suggested by the Consejo Nacional de Areas Protedigas to consult with the Fisheries and Aquaculture Unit but overall Guatemala supports listing of Pristidae for Appendix I.

India: *Anoxypristis cuspidate*, *Pristis microdon*, *Pristis zijsron*, and *Pristis pectinata* occur in Indian waters. *P. microdon* and *P. zijsron* have been included since 2001 in Schedule I of the Indian Wildlife (protection) Act, 1972. As populations of all species of Pristidae are very low, there is no targeted fishery for any of these species. Because catch of fish in the family Pristidae is not recorded separately, India is not able to assess impacts of harvest on wild populations. Considering the low abundance and vulnerability of species of Pristidae, India suggests that Pristidae may merit CITES listing.

Jamaica: In Jamaica, there is no commercial fishery or international trade of species in the family Pristidae. The Scientific Authority of Jamaica has considered the Family Pristidae as being rare in Jamaica's territorial waters.

Japan: Japan is not able to scientifically verify and assess the Pristidae listing proposal without additional background documentation to the listing proposal. They encourage collection of sufficient data about catch of species in the family Pristidae, bycatch, trade, and stock status via expert consultations under the frameworks of fisheries management bodies such as FAO and RFMOs before considering listing of Pristidae in CITES Appendices.

Madagascar: The Ministry of the Environment, Waters, and Forestry is unable to establish a conservation status for species in the family Pristidae based on the current data on trade and local consumption. Their fisheries experts expressed concern that the data on species in the family Pristidae might not be substantial enough to support a proposal for Appendix-I listing; however, they support the U.S. efforts to safeguard species in the family Pristidae.

Morocco: Fish in the family Pristidae are very rare in Moroccan waters. Morocco does not collect data specific to species in the family Pristidae and thus cannot contribute information regarding populations and trends. Based on consultations with their fisheries experts, Morocco does not object to the proposal to list Pristidae in Appendix I.

Myanmar: Two species in the family Pristidae, *Pristis microdon* and *Pristis zijsron* have been recorded from Myanmar waters (as by-catch). In the last decade, fish trawlers have made no reports of by-catch. In addition, they were not found in the local markets and are considered locally endangered.

Nicaragua: Nicaragua supports the proposal.

Sierra Leone: Sierra Leone was not able to access scientific data on species in the family Pristidae from their Marine and Fisheries Ministry because they received the range country consultation letter at a late date. However, they assured their support for the proposal, providing that it demonstrate reduced and fragmented distribution; over-exploitation and slow recovery; over-fishing and habitat loss; and low reproductive rate.

Singapore: *Pristis microdon* and *Pristis zijsron* are found in inshore and intertidal waters in the Indo-West Pacific. Species in the family Pristidae, while caught as by-catch on rare occasions, are not commercially targeted in any fisheries and have not been commercially imported or exported in the last 5 years. Very limited imports (2 specimens) occurred in 2005 for display purposes. Singapore would support conservation of Pristidae if scientific information shows they are critically endangered. They believe that enforcement of national legislation regulating trawl fishing and harvesting might be more effective for the long-term protection of species in the family Pristidae than a CITES Appendix-I listing.

Syrian Arab Republic: International trade between Syria and other countries in species of Pristidae is very low. Additional comments on the proposal are expected from Syria.

Chinese Taipei: There are very few reports of catch of species in the family Pristidae in Chinese Taipei. Because there are no specific CCC [Customs] code for species of Pristidae, Chinese Taipei is not able to provide specific import/export data.

Thailand: Species in the family Pristidae are threatened by habitat loss and bycatch in Thailand. The Thailand Department of Fisheries and the CITES Management Authority for aquatic animals relies on protected areas to maintain habitat and control fishing effort for species in the family Pristidae and other protected species. Thailand suggests Pristidae should be included in CITES Appendix II rather than Appendix I.

Togo: Togo will not ignore its obligation to support this proposal.

United Republic of Tanzania: Tanzania will provide comments after consulting with stakeholders in the country. As of 27 November, the United States Scientific Authority had not received comments.

11. Additional remarks

The cultural and economic significance of species in the family Pristidae in the Americas has been studied by McDavitt (1996; 2002), who identified an extensive mythology regarding these species in tribal societies in Central America, West Africa, Papua New Guinea and Australia. Some tribes associate fish in the family Pristidae with warfare and have used the teeth and rostra as weapons. To the Akan people of West Africa, fish in the family Pristidae symbolized the indisputable authority of the king and the prosperity of the kingdom. A symbol of a fish in the family Pristidae still appears on the common currency of the seven West African Monetary Union nations. The species is associated with manhood ceremonies of the inhabitants of the Bijagos Archipelago in West Africa and spirits of fish in the family Pristidae are summoned during healing ceremonies by the Embera and Wounaan peoples of the Darien rainforest on the Pacific side of the Panamanian-Columbian border, Central America. Fish in the family Pristidae also appear in cosmological and narrative paintings in Thai Buddhist temples, in figurative Islamic art from Indonesia, and are among the most abundant large animal remains present in the archaeological record from Aztec temples in Mexico.

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A. Species, scientific synonyms, and common names of Pristidae

1.4 Species*	1.5 Scientific Synonyms	1.6 Common Names
Anoxypristis cuspidata (Latham, 1794)	-	Knifetooth, pointed, or narrow sawfish
Pristis clavata (Garman, 1906)	-	Dwarf or Queensland sawfish
Pristis microdon (Latham, 1794)	*Pristis leichhardti*	Freshwater, Leichhardt's, great-tooth, largetooth sawfish (smalltooth sawfish in Australia)
Pristis pectinata (Latham, 1794)	*Pristis woermanni*	Smalltooth sawfish
Pristis perotteti (Valenciennes in Müller and Henle, 1841)	*Pristis zephyreus*	Largetooth sawfish
Pristis pristis (Linnaeus, 1758)	-	Common sawfish
Pristis zijsron (Bleeker, 1851)	-	Green sawfish

* The taxonomy of this group is currently under scientific review and may require changing in the future (Colin Simpfendorfer, Mote Marine Laboratory, personal communication).

B. Range countries and territories for family Pristidae

	Anoxypristis cuspidata	***Pristis clavata***	***Pristis microdon***	***Pristis pectinata***	***Pristis perotteti***	***Pristis pristis***	***Pristis zijsron***
Andaman Islands	X						
Angola			X	X		X	
Aruba			X	X			
Australia	X	X	X	X		X	X
Bangladesh	X			X			
Belize				X			
Benin			X	X		X	
Bermuda				X			
Brazil			X	X	X		
Cambodia			X				X
Cameroon			X	X		X	
Canary Islands				X		Extinct?	
Cape Verde			X	X		X	
China	X						X
Colombia			X	X	X	X	
Congo			X	X		X	
Costa Rica						X	
Côte d'Ivoire			X	X		X	
Cuba				X			
Curaçao Island			X	X			
Democratic Republic of the Congo			X	X		X	
Ecuador			X	X	X	X	
El Salvador						X	
Equatorial Guinea			X	X		X	
French Guiana			X	X	X		
Gabon			X	X		X	
Gambia			X	X		X	
Ghana			X	X		X	
Gibraltar				X		Extinct	
Guatemala						X	
Guinea				X		X	
Guinea Bissau			X	X		X	
Guyana			X	X	X		
Honduras						X	
India	X		X	X		?	X
Indonesia	X		X	X			X
Islamic Republic of Iran							X
Israel				X			
Jamaica				X			
Japan	X						
Kenya			X	X			

	Anoxypristis cuspidata	*Pristis clavata*	*Pristis microdon*	*Pristis pectinata*	*Pristis perotteti*	*Pristis pristis*	*Pristis zijsron*
Lao People's Democratic Republic			X				
Lebanon				X			
Liberia			X	X		X	
Madagascar			X	Extinct?			
Madeira Islands						Extinct?	
Malawi			X				
Malaysia	X		X				X
Malta						Extinct	
Mauritania				X		X	
Mauritius			X	X			X
Mexico				X	X	X	
Morocco				X		X	
Mozambique			X	?			X
Myanmar	X		X	X			X
Namibia				X			
Nicaragua			?	X	X	X	
Nigeria			X	X		X	
Oman	X			X			X
Pakistan	X			X			X
Panama						X	
Papua New Guinea	X		X			X	X
Peru				X			
Philippines	X		X	X			
Portugal						Extinct	
Republic of Korea	X						
Reunion			X	X			
Sao Tome and Principe			X	X		X	
Senegal			X	X		X	
Sierra Leone			X	X			
Singapore	X						
Somalia	X			X			X
South Africa			X	?			X
Spain						Extinct	
Sri Lanka	X			X			X
Suriname			X	X			
Syrian Arab Republic				X			
Chinese Taipei	X						
Thailand	X		X	?			X
Togo			X	X		X	
Trinidad and Tobago			X	X			
United Republic of Tanzania			X	X			

	Anoxypristis cuspidata	***Pristis clavata***	***Pristis microdon***	***Pristis pectinata***	***Pristis perotteti***	***Pristis pristis***	***Pristis zijsron***
United States of America			X	X	X		
Venezuela			X	X	X		
Viet Nam	X		X				X
Western Sahara				X		X	
Zimbabwe			X				

C. Available estimates of population declines by species of Pristidae and region.

Species	Geographic region	Estimated initial population size	Estimated current population size	Estimated reported decline (%)	Source
Pristis microdon	Southeast Asia	Common in fisheries in 1960s	Few reported; Extirpated from Fly River System, New Guinea	n/a	Compagno *et al*., (2006c)
Anoxypristis cuspidate ***Pristis zijsron***	Southeast Asia	Captured regularly by trawlers off the Sabah (East Malaysia) coast in the 1950s	One record in Sandakan, Sabah, in the early 1990s. One juvenile recorded on the Kinabatangan River, Sabah, during a survey in 1976-1977	80%	Compagno *et al*., (2006a,b)
Pristis pectinata	United States	n/a	2,000	95%	Simpfendorfer (2000)
Pristis perotteti	Central America, Lake Nicaragua	60,000 - 100,000 sawfish caught between 1970-1975	4-6 sawfish caught per year since 1998	n/a	Thorson (1976); McDavitt (2002)
Pristis perotteti	South America	Common in historical fisheries	Number of catches has reduced significantly over the last 10-15 year	n/a	Charvet-Almeida (2002)
Pristis pectinata ***Pristis perotteti*** ***Pristis zijsron***	Southern Africa	Commonly caught in shark beach netting program in the 1960s	Annual catch range between 0-5 in 1978-2002. Only two specimens have been caught in the last decade	n/a	Geremy Cliff, Natal Sharks Board, (2004 unpublished data).
Pristis pectinata ***Pristis perotteti***	West Africa	Populations formerly said to be common	Few reports since 1980s (see section 4.4)	n/a	West African Sub-Regional Fisheries Commision