SHARK NEWS

SHARK NEWS 5 NEWSLETTER OF THE IUCN SHARK SPECIALIST GROUP **OCTOBER 1995**

What future for manta rays?

Giuseppe Notarbartolo-di-Sciara, Tethys Research Institute

Rays belonging to the family Mobulidae, the devil rays, are considered by many, scientists and lay-persons alike, among the most fascinating and mysterious of marine animals. Yet, because of their present vulnerability to man's activities, we may no longer have the opportunity of finding out the details of their biology, ecology and behaviour.

Entire populations, if not species, may disappear without anybody even noticing it. Back in the early 1980s, I approached a community of fishermen near the southern tip of Baja California to collect data on mobulids for my doctoral thesis. According to the existing literature, there should have been two species of *Mobula* in that area, however the fishermen insisted that there were four. Of course they were right, and one of those species turned out to be new to science. Unfortunately, I also found out that my friends were mostly catching immature rays. Seventy-two per cent of bentfin devilray *M. thurstoni* – the most frequent species in their catch – had not had the chance of reproducing. I can hardly think of a better example for an unsustainable fishery.

A fisherman fillets a spinetail devilray *Mobula japanica* in Baja California. Photo: G. Notarbartolo-di-Sciara.

I had stumbled on such conclusions by pure serendipity. However, how many situations such as this one exist, or have existed, scattered around the world's tropics? How many mobulid populations have been studied, what data are being or have been collected and published concerning the presence of mobulid rays in any of the world's fisheries' catch or by-catch? I regularly monitor *Current Contents*, and obtained a clean zero during the past ten years. Yet, we know from anecdotal sources that mantas and mobulas are often involved in fishing activities, be it in organised direct catches, by opportunistic harpooning, or in the by-catch of large-scale industrial fishing, such as pelagic driftnets or tuna purse seines.

Mobulids are extremely vulnerable animals. First of all, their reproductive rate is among the lowest of all Elasmobranchs, with a single huge pup being produced by each female presumably every 2 to 3 years, or longer. Secondly, although there are no data on population sizes, one can presume that these large-bodied rays are rare and live in very low densities. Finally, mantas and mobulas are very easy to harpoon or to entangle in a gillnet, and for most fishermen living in precarious conditions these rays provide a very tempting source of extra proteins for their table.

One can think of several reasons why all possible action should be undertaken to prevent the disappearance of mobulid populations and species from the world's oceans. Obviously, to begin with, there is the catch-all but deservedly sacrosanct concept of preserving biodiversity. Secondly, mobulids are evolutionarily extraordinary batoids in many ways, having left the bottom for the surface, having attained the largest body size, having adopted a filter-feeding habit, and having developed the largest elasmobranch brain. It would be nice to be able to make some sense of all this before eating them out of existence.

In addition, mobulids (and particularly manta rays) are becoming a major attraction for many diving locations, and can thus be considered assets of economic importance for the tourism industry. Finally, I think mantas and mobulas have an important symbolic value, because they could be excellent indicators for the plight of the forgotten species – those which are disappearing without anyone knowing it. As such symbols, they could serve to greatly increase public awareness of the need for preserving marine biodiversity. In the Mediterranean Sea, for example, a war has been raging for almost a decade between fishermen and environmental groups over the use of driftnets. This was mainly due to the environmentalists' awareness of the tremendously large cetacean by-catch in this fishery. I feel personally very sympathetic with the plight of cetaceans in the Mediterranean, and spend a great deal of my energies in this field, realising that dolphins and whales are taking a very severe beating from human activities in this region. But at least we all know about this. By contrast, how many hundreds, or how many thousands of the giant devil ray *Mobula mobular* were obliterated from the Mediterranean by the very same driftnets? We will never know. Most environmentalists are not even aware of the existence of mobulid rays in the Mediterranean.

Mantas should have now the spotlights turned on them, to remind us of all those marine species, large and small, that are disappearing daily under our unseeing eyes.

Chairman's farewell message

It was with great reluctance that on 15 July 1995 I resigned as chairman of the IUCN Shark Specialist Group (SSG). Looking back on my tenure, I see a mixed record. From the very beginning when Species Survival Commission Chairman George Rabb nominated me as SSG Chairman, I questioned whether I was the right choice for the job in as much as I had no formal training or practical experience in conservation biology nor did I know the players or understand the rules of the international conservation scene. Still I forged ahead, in some ways re-inventing the wheel, and under George's authority established the IUCN SSG at the 1991 *Sharks Down Under* meeting.

Over the past five years the all-volunteer SSG has been instrumental in changing the public's perception of sharks from a hellish, nightmare fish to a sophisticated creature that must be allowed to exist to complete the delicate balance of life in the sea. The proof of this is the unprecedented priority given to sharks at the last CITES Convention.

Over this period the Group has also been reasonably productive. The highlights have been: the meetings at Sydney, New York and Bangkok; the production of a slide series and pamphlet on shark conservation; consultation on two CD-ROMs about sharks, one of which led to funding the Bangkok meeting; establishment of a quarterly newsletter *Shark News*; funding of a shark project under the Darwin Initiative; funding of the SSG Action Plan by the Peter Scott Foundation; outlawing of long-line fishing gear in the waters of the Commonwealth of the Bahamas; the unprecedented resolution passed at the 1994 meeting of Parties to CITES; and, most importantly, the writing of the conservation action reports by our volunteer Vice Chairpersons. I think it is a record that we can be reasonably proud of.

On the other hand, because of my personality and style of leadership, I tend to set my personal goals too high. In the case of the SSG perhaps I set them unrealistically high. First, I felt unable to establish regular communication with the membership. Email went a long way towards rectifying this but still communications were not what I would have liked. This was compounded by the lack of Vice Chairpersons in several ocean areas.

Most frustrating and personally disappointing was my inability to raise funds to support the work of the Group. One of my primary objectives in establishing the SSG was to identify and prioritise key conservation research projects and fund the prioritised projects. I regret that I was not able to even begin to identify research priorities.

Over the past several years as research budgets in the United States began to shrink, pressures at my University mounted as more requests came in for me to write research grant proposals and increase my teaching load. This put me in direct conflict with my volunteer position as Chair of the SSG. Was I to raise money for shark conservation to support the SSG or get grants for the University of Miami and my research station at Bimini? It was thus that I had to make a hard choice and tendered my resignation.

I want to express my sincere gratitude to the members of the SSG who worked so hard to make shark conservation more than an obscure footnote in the International Conservation Community. I especially want to thank Sarah Fowler and Merry Camhi for bringing together the efforts of the membership and translating these into tangible results: newsletter, slide set, grant proposals, funds etc.

I will miss the excitement and action of leading dedicated scientists and conservationists in the good fight of trying to reverse the ever-escalating slaughter of cartilaginous fishes in the world's oceans. I will miss it even more as I read about the inevitable successes of the SSG now that we are on a roll. Again let me express my deepest gratitude to the members and wish for your continued success in this important task.

Sincerely yours,

Samuel H. Gruber, immediate past Chairman, SSG

Editorial

This issue of *Shark News* should remind us that, despite its name, the interests of the Shark Specialist Group (SSG) also include the sharks' close relatives and more numerous elasmobranch species, skates and rays. These fascinating fish often do not attract the same attention as the highly publicised sharks, despite the fact that they are probably as heavily exploited by directed fisheries and in fisheries by-catch. In some cases they are even more vulnerable.

The mobulids (devil fish and mantas, pages 1 and 3) are particularly long-lived and slow breeding species, with a potential economic value from sustainable tourism which could far outweigh their value to fisheries. (Has the value to the diving industry and local community of the famous rays of 'Stingray City' in the Caribbean, a major attraction on the international sports diving circuit, ever been assessed? If so, please send this information in to *Shark News* – it would be an interesting case study to feature.)

The rarely recorded and critically endangered freshwater stingrays, including the giant rays first described from the Chao Phraya River in Thailand (page 5), are thought to be perilously close to extinction as the result of fisheries combined with habitat degradation. In contrast, the colder waters of the North Sea have supported long-term intensive fisheries of a few species of skate and ray at a level of exploitation which some scientists might have thought impossible (page 8), while other species have declined to vanishing point in some areas.

Some of the SSG's current initiatives are noted elsewhere. Members are being invited to become involved in the process of Red Listing elasmobranchs (assessing their conservation status) for several purposes: the new IUCN Red List (to be published in 1996), the Shark Action Plan (final draft due August 1996), and for our contribution to the CITES review of the status of sharks in international trade. We are also cooperating with those undertaking the study of international trade in sharks and shark products.

Progress toward the fulfilment of the CITES shark resolution is under way (see page 4). However, it is still far too early to determine whether CITES Appendix listings should be recommended for any elasmobranch species, because we and others are still collecting the necessary background information. Once the results of the above studies are available, the SSG will need to assess whether any elasmobranch species, subject to international trade, is or may be threatened with extinction. The SSG must then discuss whether a CITES listing to monitor or control trade would be appropriate or effective in improving its status. Fortunately, there is time for such discussions to take place: listing proposals for additions of species to the CITES Appendices must be submitted to the CITES Secretariat by no later than January 1997.

These subjects will be discussed at the next major meeting of the Shark Specialist Group scheduled to take place at the World Fisheries Congress in Brisbane, August 1996. A special one-day symposium, "Sharks and Man: Worldwide Management and Conservation" will also take place at the Congress. Please note that, if you want to submit a paper for any of the three symposium sessions (shark fisheries management, shark control programmes (public safety), and shark conservation), you should send in your abstract NOW (see page 12).

Finally, it is very sad to feature a farewell message from our former chairman alongside this editorial. We will greatly miss Sonny's leadership and guidance. I have been appointed as Acting Chair in his place and, with the help and support of the Group's Deputy/Vice Chairs and members, will do my best to keep the SSG running smoothly for the rest of the current triennium (until the end of 1996).

Sarah Fowler,

Acting Chair, Shark Specialist Group

Manta rays in the Yaeyama Islands

Hajime Ishihara and Kimiya Homma, Suido-sha and Kyowo Concrete Industry

Mr Takashi Itoh, a professional diver, has been living on Obama Island (near Iriomote Island) for 18 years, and observing the manta rays *Manta birostris* which occur nearby and are abundant in the Yonara Channel between Obama and Iriomote Islands. Using an identification method based on a combination of patterns of ventral markings and signs of shark bites, he has been able to distinguish more than one hundred and thirty individual manta rays during this 18-year period. As a result, migration, schools, age, feeding, predators, reproduction and behaviour have been described.

Migration

Manta rays are abundant in two kinds of locale; at feeding stations and cleaning stations. At their feeding stations, manta rays swim slowly in the surface layer and are absorbed in feeding. At their cleaning station, rays hover at a depth of 15–20 m and wait to be cleaned by a wrasse, *Labroides dimidiatus*, or small shrimps. Rays migrate daily between feeding and cleaning stations. While many manta rays stay near the Yaeyama Islands all year round, some migrate annually to other islands such as Kerama Island, which is about 350 km east of the Yaeyama Islands.

Schooling

Mr Itoh once observed a school of about 50 manta rays some 17 years ago, and one of about 30 rays about seven years ago. Recently, schools have numbered 14 to 15 fish at most, although the total number of manta rays in the area may not have decreased. Young rays and pregnant females are also represented in a school. No other fish, including no other mobulids, are involved in the group.

Swimming style

S-shaped, U-shaped and omega-shaped swimming styles (viewed from in front) have been recorded.

Mating behaviour

Copulation has not been seen, but behaviour which appears to be related to mating activity is often observed, with male and female manta rays somersaulting together in the water column. This behaviour is observed in spring and autumn and lasts for as long as one month.

Reproduction

One female was seen to bear a single pup three times during a six to seven year period. Thus the pregnancy may last up to two or three years. Parturition was not observed, although this has been recorded in the magazine *Skin Diving*, in a volume of about 1975 to 1977. Nursing behaviour is not seen, the new-born pup is left in the water after birth. Age at maturity for females may be about six years.

Jumping behaviour

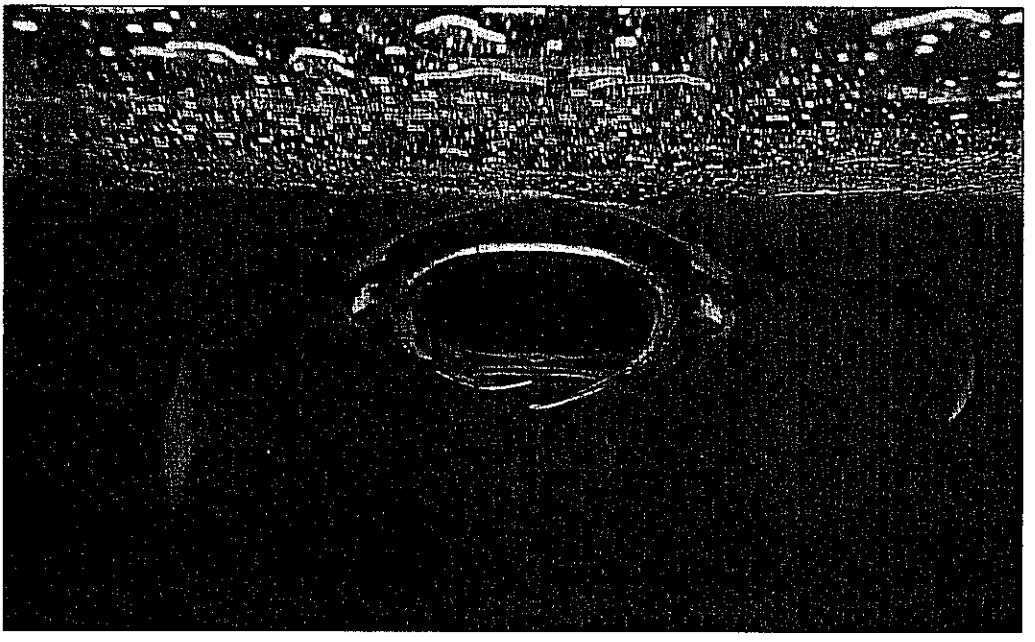
Jumping behaviour is often observed. It appears that the rays do this for fun, and that this behaviour does not seem to be related to parturition or the removal of parasites and remoras. Three types of jumping are observed: jumping forwards and landing head-first, jumping forwards and landing tail-first, and backward somersaults.

Age

One male ray, which appeared to be some four to five years old when first sighted, has been observed for 15 years. It is, therefore, considered that the ray's life span is more than 19–20 years.

Predators

Sharks may be the most common predator of manta rays, because the marks of shark bites are often seen. However, it is uncertain whether sharks eat the whole body of manta rays. Killer whales are not seen near the Yaeyama Islands.



Manta ray *Manta birostris*, showing omega-shaped swimming style. Pohnpei Island. Photo: Kimiya Homma.

Black manta

Manta rays whose ventral surface is dark are usually called 'black manta' at Pohnpei Island, where about 50% of all manta rays are black. At Yaeyama Island only two black manta rays have been observed. Both were male and the first of these has not been seen for several years.

Mr Itoh intends to continue to observe the behaviour of manta rays in the Yaeyama Islands and we will continue to have a fair relationship with him. We ourselves will be conducting a survey of manta rays at Pohnpei Island, in the Caroline Islands.

Erratum: Shark nets in Hong Kong

It was stated in the article entitled "Shark nets in Hong Kong" in *Shark News* 4 that a shark hunt which took place in Hong Kong in 1993 was government-funded. This is not correct. The shark hunter brought into Hong Kong was funded by a Hong Kong newspaper and subsequently received assistance and support from various government departments in effecting the hunt.

Yvonne Sadovy, University of Hong Kong

Editor's note: This detail was correct in a subsequent reprint, generously sponsored by Maritime Mechanic Ltd, the company responsible for the installation and maintenance of shark prevention nets in Hong Kong.

An update on the CITES shark resolution

Merry Camhi, National Audubon Society, and Sonja Fordham, Center for Marine Conservation

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was created in 1973 to protect species from over-exploitation by international trade. Species that are threatened with extinction and that are, or may be, affected by trade are listed on Appendix I, whereas species that may become threatened if such trade is not properly controlled are listed on Appendix II. As of October 1995, 130 countries are Parties to CITES.

Of the approximately 400 species of sharks in the world, about 100 species are exploited for the global shark trade. TRAFFIC (the wildlife trade monitoring programme of WWF and IUCN) has reported that international shark fin exports doubled between 1980 and 1990. The rapid growth in shark fisheries has been driven primarily by the Asian demand for fins, but sharks are increasingly exploited for their cartilage and meat as well. Although no shark species are currently listed on the CITES Appendices, delegates at the 1994 CITES meeting acknowledged the impact that international trade may be having on sharks by passing a unanimous resolution aimed at improving our knowledge of shark populations in trade (see *Shark News 3*, p. 1).

The CITES shark resolution

The shark resolution directs the CITES Animals Committee to compile and review existing data on the biological and trade status of shark species subject to international trade, and to prepare a discussion paper on these data prior to the 10th CITES meeting in June 1997 (see resolution text in *Shark News 4*, p. 9). It also requests that the Food and Agriculture Organization of the United Nations (FAO), in conjunction with international fisheries management organisations, establish data collection programmes for monitoring shark status and trade. New information generated from these programmes will be presented at the 11th CITES meeting in 1999. The unprecedented resolution, spearheaded by the delegations from the US and Panama, was the first time that CITES members agreed to review the effects of international trade on a group of species that was not already listed on the CITES Appendices.

Implementing the resolution

In March 1995, Dr Francisco Palacio, representing the delegation of Panama, presented the CITES resolution to the FAO Committee on Fisheries (COFI) and asked for COFI's support in fulfilling the resolution. As a result, the Fisheries Department of FAO has agreed to collaborate with CITES in the preparation of documents for an expert meeting on shark status and trade. In addition, Dr Jose Castro, representing the US delegation, requested information from CITES Parties to begin the process of data collection and analysis as called for in the resolution.

Sharks were again on the agenda when the CITES Animals Committee convened in September 1995 in Guatemala. Panama and the US continued their leadership role at the meeting.

Panama, represented by Dr Palacio, suggested that FAO should be the focal point for data collection and actions necessary to implement the CITES resolution. The Chair of the Animals Committee noted, however, that the resolution directs CITES to undertake certain actions, such as the status review, and therefore it was neither possible nor appropriate to ask another organisation, such as FAO, to take on primary responsibility. Yet it was also noted that, because FAO has significant experience with fisheries issues, their cooperation and input will be very valuable to the Animals Committee in fulfilling the terms of the CITES resolution.

Dr Castro, of the US delegation, gave a compelling presentation to the Parties explaining why sharks are so vulnerable to fishing pressure and international trade. In addition, TRAFFIC gave the Parties an update on their 18-month study of the international trade in sharks and shark products, which is being undertaken in cooperation with the IUCN Shark Specialist Group (SSG). TRAFFIC and the Center for Marine Conservation have teamed up to develop management recommendations based on the trade study findings. The final joint report will be published in 1996. The SSG, represented by Dr Merry Camhi and Sonja Fordham, introduced the participants to an array of global shark conservation initiatives that the SSG is currently undertaking, including the production of a Global Shark Action Plan and an IUCN Red List of threatened elasmobranchs. In helping to fulfil the resolution, the SSG also plans to provide information to CITES on the status of shark species, with an emphasis on those species most important in international trade.

Where we go from here

It was decided in Guatemala that: 1) the CITES Secretariat will formally request that all Parties submit data on their shark fisheries and trade to the Secretariat; 2) these data will be provided to both Panama and the US for analysis and report; and 3) Panama will host an expert consultation early next year among FAO and other intergovernmental organisations to discuss the current status of sharks, shark fisheries and international trade. NGO participation will be restricted to IUCN, TRAFFIC and other organisations that have data to contribute to the goals of this meeting.

The use of CITES for marine fish conservation

Although CITES is considered to be one of the most successful international wildlife conservation tools for species in trade, few marine fish have received the conservation benefits of CITES to date. This stems in part from the misconception that many marine fish populations are inexhaustible and extinction-proof because of their wide ranges and high fecundity.

In addition, marine fish, including sharks, have not benefited from CITES because most people think of fish primarily as a food and commodity. Yet fish are also wildlife. They are subject to the same biological constraints, and therefore suffer similar impacts from international trade, as many terrestrial wildlife species already monitored or controlled under CITES. Sharks, in particular, can be seriously threatened by such trade because their K-selected life history strategies make them highly vulnerable to over-exploitation.

Because of the tremendous economic value of fish, there is strong political resistance to addressing the problems of depleted and over-exploited fish populations within the context of CITES. Contrary to the concerns of many fishing nations, an Appendix II listing would only regulate, not prohibit, international trade in sharks. Such regulation can be used to protect species for their ecological value (i.e. keeping populations at a level that maintains their role in marine ecosystems - Article IV.3). Until shark fisheries throughout the world are managed by effective management agreements, CITES may provide the best mechanism to help protect shark populations from over-fishing, through the monitoring and control of international trade.

Shark fishery management has always been hampered by a lack of data on historical catches, imports and exports in shark products, life history characteristics, and species-specific population status. The information gained from this pivotal resolution could be a critical first step toward the establishment of effective shark management programmes.

SSG members interested in contributing information toward the implementation of the CITES resolution should contact Sarah Fowler or Merry Camhi at the addresses on page 12.

Status of the giant freshwater stingray (whipray)

Himantura chaophraya (Monkolprasit and Roberts 1990)

Compiled by Leonard J.V. Compagno and Sid F. Cook

Taxonomy

The giant freshwater stingray (whipray) is one of eight apparently obligate freshwater species of dasyatids (four *Dasyatis* spp. and four *Himantura* spp.) of the much larger Family Dasyatidae (whiptail stingrays). Other members of the family believed to be found at least occasionally in freshwater include the brackish-marginal *Himantura schmardae* and several euryhaline species: two *Dasyatis* spp., two *Himantura* spp. and *Pastinachus* [=*Hypolophus*] *sephen*.

H. chaophraya was only formally described in 1990, though its existence had been known for some years. The type locale is listed as the Central Chao Phraya River of Thailand. It has been previously misidentified in Australia as *Dasyatis fluviorum* Ogilby, 1908 [estuary stingray] and may have been listed under the old name of *Himantura polylepis* (Bleeker) in Indonesia.

Distribution

The giant freshwater stingray is known from highly disjunct locales including fresh waters in Thailand in the Chao Phraya, Nan, Mekong, Bongpakong, Tachin and Tapi Rivers. It is also recorded from Mahakam Basin [Borneo], the Fly River Basin [New Guinea], and from Australia in the Gilbert River [Queensland], the Daly and South Alligator Rivers [Northern Territory], Pentecost and Ord Rivers [Western Australia]. It may occur in most of the large rivers of tropical Australia. However, it has not been recorded from marine waters in any of its known range.

Description

This species, one of the largest living dasyatids, has a characteristic rounded disk, a prominent snout tip and a long whip-like tail without cutaneous folds. It reaches a size of up to 200 cm disk width, and 600 kg in weight (Thailand and most other locales in range). However, Australian specimens are reported as only reaching slightly more than 100 cm (disk width). Males mature by 110 cm disk width. Young are born at about 30 cm disk width. Maximum lifespan in the wild is unknown.

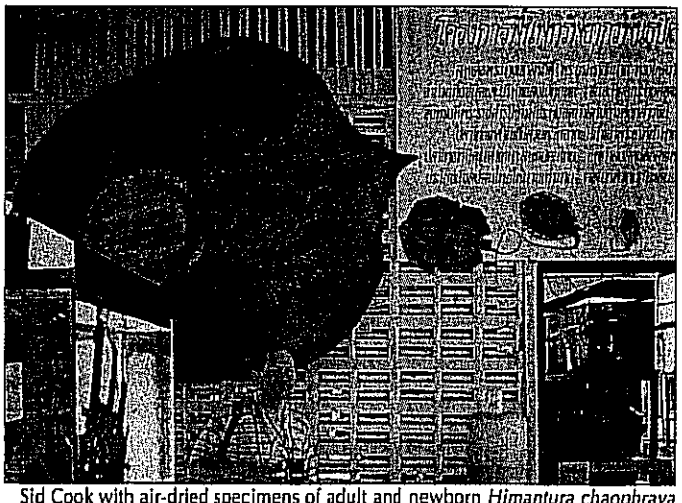
Conservation status

The giant freshwater stingray has been taken by fishermen on the rivers of Central Thailand, in fisheries for bony fishes, notably giant gouramy (*Osphrenemeus gouramy*) and giant river catfishes (*Pangasius* spp.). In 1992 Thai fishermen reported 25 individuals of *H. chaophraya* in their catch, but by 1993 reported landings had dropped to three.

Due to a complex series of factors causing degradation or habitat alteration in riverine habitats in the region, only about 30–31 of the 190 species of indigenous Thai freshwater fishes are estimated to reproduce in the wild, although it is likely that a somewhat higher biodiversity exists in backwater habitats where small, isolated pockets of endemism undoubtedly occur.

Habitat-degrading factors having a negative impact on Thai riverine environments include over-harvesting of forest canopy, leading to drought upstream and flooding downstream during monsoon conditions which further leads to excess siltation; dam building to control flooding, which leads to silt build-up and retention of agrochemicals behind impoundments; and development of lands adjoining river habitats, which facilitates degradation and destruction of ray habitats with deposition of broad-spectrum wastes. The dams effectively isolate portions of the reproductive populations of all riverine stingrays (*H. chaophraya*, *H. oxyryncha* [=*krempfi*], *H. signifer* and *Dasyatis laosensis*) from intermixing during mating, dramatically cutting the diversity of the gene pool for any given species. In the case of some very low density riverine elasmobranch species, like the sawfishes, a combination of fisheries and habitat changes have effectively eliminated them from the Chao Phraya and adjoining freshwater habitats, where they have not been reported for some 40 years.

The precipitous decline of riverine stingrays in Thai fresh waters has led the Thai government to implement an experimental program for captive propagation to try to stabilise levels of biodiversity while they attempt to solve problems with degradation of river habitats. The authors observed the operations at Chainat, Suppraya Province, Central Thailand, in December 1993, where healthy individuals of *H. chaophraya* ranging in size from 0.45 m to 1.6 m in disk width and ranging from an estimated 50 kg to 500 kg were observed, along with healthy individuals of *Himantura signifer* (white-edged freshwater whipray) and *Dasyatis laosensis* (Mekong freshwater stingray). One *Himantura oxyryncha* [=*krempfi*] (marbled freshwater stingray) in poor condition died while the authors were at the facility.



Sid Cook with air-dried specimens of adult and newborn *Himantura chaophraya* at Chainat, Thailand. Photo: Sarah Fowler.

In the South Alligator (and possibly East Alligator) River which runs through Kakadu National Park, concern has arisen for both the giant freshwater stingray and riverine occurrences of the bull shark (*Carcharhinus leucas*), related to possible adverse effects of silt carrying heavy metals and radio-isotopes from experimental uranium mines around Coronation Hill and along the Alligator Rivers in the Park.

Further research is urgently needed to ascertain the status and possible threats to this species in other parts of its range (Borneo, New Guinea and Indonesia).

IUCN threatened species assessment

This species should be considered **Critically Endangered** throughout its known range. It has been and will continue to be affected by the complex and synergistic effects of the restrictions of its obligate freshwater habitat, fishing pressures and habitat alteration/destruction. The possibility of biological extinction in the wild is considered extremely high.

Editor's note: The above is a greatly abbreviated version of the draft account supplied by the authors for the Shark Action Plan. The original includes many references and is available from the Editor. The threatened species assessment is provisional until agreed by the Shark Group, and based on criteria given in: IUCN (1994). *IUCN Red List Categories*. Gland, Switzerland.

Critically endangered large coastal sharks, a case study: the sandbar shark, *Carcharhinus plumbeus* (Nardo, 1827)

Jack Musick, School of Marine Science, Virginia Institute of Marine Science, College of William and Mary, Gloucester Point, VA 23062

Taxonomy

The sandbar shark, *Carcharhinus plumbeus* (Nardo, 1827), is a medium to large-sized requiem shark (Carcharhinidae) with a relatively short rounded snout, distinctive high triangular dorsal fin placed over or before the pectoral insertions, dermal ridge between the dorsal fins, large serrated triangular upper teeth, and narrow awl-shaped lower teeth. In life this species is light grey above and pristine white below, often with a brassy hue and white stripe along the flank. Originally described from the Adriatic Sea, it was subsequently described under various other names from other localities. Some names in recent use include: *Carcharhinus millberti, Eulamia milberti, Galeolamna stevensi* and *Carcharhinus japonicus.*

Distribution and ecology

The sandbar shark is a coastal species typical in many aspects of its biology of many other common coastal sharks. The species has been recorded from the western Indian Ocean, south-east Asia, Japan, Australia, and Hawaii. Its occurrence in the Eastern Pacific is debatable. The sandbar shark occurs in the eastern Atlantic and Mediterranean and is the most abundant large coastal shark in the western north Atlantic and eastern Gulf of Mexico. Tagging and genetic studies suggest that sandbar sharks from Cape Cod, Massachusetts, to the northern Yucatan peninsula in Mexico are comprised of a unit stock separate from the population reported from Trinidad to Brazil.

In the western North Atlantic, the sandbar shark exhibits strong seasonal movements. Adult female sandbar sharks migrate north into the middle Atlantic Bight in May and early June, when sea water temperatures approach 19°C, and use estuarine waters such as Chesapeake Bay and Delaware Bay as pupping grounds. Immediately after pupping these large females move offshore to 20–50 m depth. Neonates and juveniles aged 1–4 years utilise estuarine habitats during the summer. Larger juveniles use shallow coastal habitats (<20 m). Although the juvenile population in the middle Atlantic Bight exhibits approximately a 1:1 ratio of females to males, the adults are represented almost solely by females (very occasionally adult males are taken at greater than 100 m depth at the edge of the continental shelf). Adult males appear to inhabit the southern part of the range and are common off Florida and in the Gulf of Mexico. Sandbar sharks migrate south below Cape Hatteras, North Carolina, and further in September or October when seawater temperatures fall to 18–20°C. Some large juveniles and adults may migrate as far as southern Florida, Cuba and Mexico, while small juveniles and other larger juveniles and some adults may winter in warm waters at the edge of the Gulf Stream off the Carolinas. Off South Africa similar seasonal migrations into high latitudes in spring and lower latitudes in fall appear to occur. Island populations such as in Hawaii appear to be seasonally resident.

Sandbar sharks are euryphagous predators feeding on a wide variety of smaller demersal teleosts and elasmobranchs, as well as on cephalopods, and various crustaceans.

The sandbar shark is viviparous with a yolk sac placenta. Gestation has been estimated at 9–12 months in the western North Atlantic, 11–12 months off South Africa and the East China Sea, and

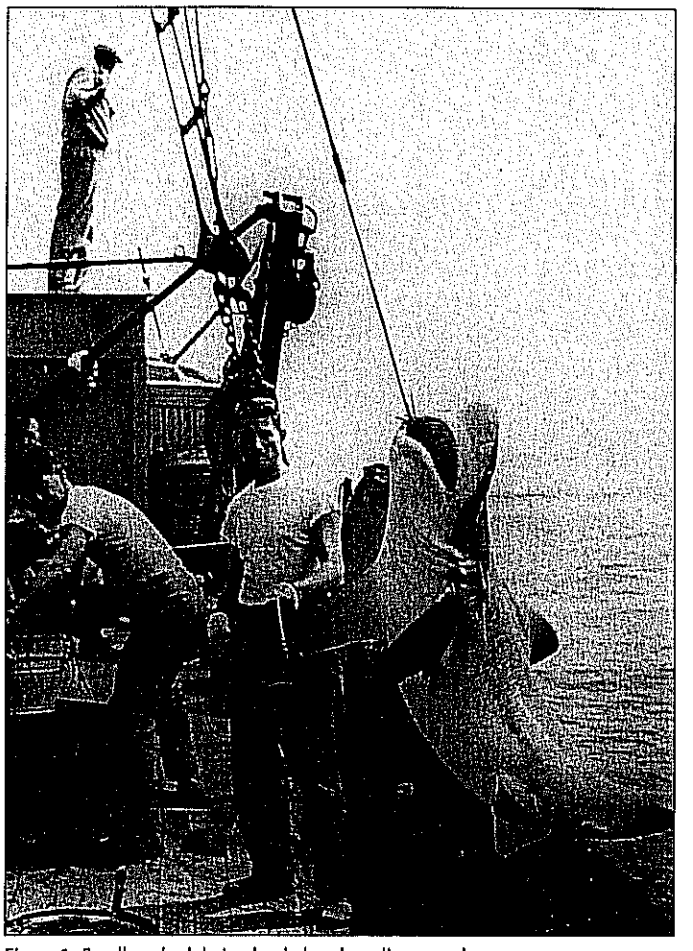


Figure 1. Sandbar shark being landed on long-line vessel.

10–12 months off Taiwan. Females apparently have young only every other year, with about 50% of mature females being pregnant off Taiwan. Conversely, only 17–27% of mature females captured off Florida were pregnant. However, most of the mature females examined in the mid-Atlantic Bight of the US in summer are pregnant or recently have born young. Therefore, the pregnancy rate in the western North Atlantic is probably near 50%, but it is difficult to obtain a synoptic sample of the entire population of mature females because of their wide geographic distribution and seasonal movements. Litter size is variable and depends in part on the size of the mother. In the western Atlantic, where female sandbar sharks mature at about 179–183 cm TL, litter size averages 8.4–9.3 (range = 1–14). Whereas in Hawaii where females sandbar sharks mature at 150 cm TL, mean litter size is only 5:5 (range = 1–8). Within a given geographic area litter size is only very weakly correlated with the size of the mother. In general, size at maturity, maximum size and litter size decrease from the western Atlantic to the western Indian Ocean, to Taiwan and Australia, to the east China Sea, and to Hawaii. Size at birth varies slightly by region, but does not follow the same geographic pattern. New born pups range from 56–75 cm TL with pups averaging 60–65 cm TL in most areas. Maximum reported size is 234 cm TL for females and 226 cm TL for males.

Sandbar sharks are slow-growing K-selected species. Although growth and age at maturity may be accelerated under captive conditions, wild populations grow very slowly and mature at a relatively late age. In the western Atlantic the von Bertalanffy growth coefficient, K, has been estimated to be very low (0.039 to 0.089) in validated studies using annuli on vertebral centra. Maturity in these studies was estimated at 13–16 years. However, in another study based on growth rates calculated from tag/recapture data, growth was considerably slower and age at maturity was estimated to be 29 years. Considerable debate has arisen concerning the discrepancy between the two methods, including the small tag/recapture sample size and the possible effects

of tagging on growth rates. Regardless, sandbar sharks grow slowly and mature late.

Conservation status

Sandbar sharks are significant components of coastal shark fisheries world-wide. In the western Atlantic this species contributes up to 60% of the catch and 80% of the landings in the directed long-line fishery. In addition, the sandbar shark is second only to the blue shark (a pelagic species) in the US Atlantic recreational shark fishery.

During the last twenty years, recreational and commercial fisheries for sharks along the US Atlantic coast and in the Gulf of Mexico have expanded at rapid rates. Recreational catch has been estimated at 2.5 million sharks (*ca.* 35,000 mt) annually; 20–40% of this is killed. Driven by increased marketability, the commercial fishery has rapidly expanded since 1985, with landings exceeding 7,100 mt in 1989.

Increased exploitation of sharks prompted the development of a US Fisheries Management Plan (FMP), implemented in 1993 for the shark resources of the Atlantic and Gulf coasts. In addition, several states (Virginia, North Carolina, Texas and Florida) have enacted laws to regulate shark fishing in their respective regions (14% of commercial and 64% of recreational catches occur in state controlled waters).

Regardless, a Scientific Review Panel of Experts concluded in April 1994 (Anon., 1994) that the stocks of large coastal sharks were depleted to much lower relative levels than realised in the FMP, and that stock recovery would take decades rather than two years as stated in the plan. Consequently, the Panel recommended that the total allowable catch (TAC) of sharks not be increased in 1995 as recommended in the management plan, but that the TAC remain constant. Some members of the Panel suggested that the TAC be reduced instead of being held constant or that the fishery be closed.

The annual rate of replacement (r) used in the FMP model, 26% per year, is much higher than that calculated to be biologically possible for both fast-growing and slow-growing carcharhinids using accepted demographic models. Recent modelling in our laboratory suggests that for sandbar sharks the annual population increase rate can vary from 2.5% to 11.9% with an age at maturity of 15 years. If a more conservative age of first maturity of 29 years is used, then the maximum annual population increase rate would be 5.2%. These low rates of intrinsic increase are probably close to the real situation and reflect the K-selected life history parameters typical of virtually all sharks. The unrealistic r value used in the FMP was calculated using a surplus production fishery model based on a time series of commercial catch data. Such models may be useful for fast-growing, short-lived teleosts, but are inappropriate for slow-growing, long-lived fishes such as sandbar sharks. Most sharks, and large coastal species in particular, have life history characteristics that make them particularly vulnerable to overfishing. In the western Atlantic sandbar shark stocks have been reduced by 85–90% in just ten years because of over-exploitation. In addition, the age structure of the population has been shifted dramatically toward younger age classes. Adult females are very uncommon. Under the IUCN criteria for listing threatened species, the western North Atlantic population of sandbar sharks would be classified as "Critically Endangered" (IUCN, 1994).

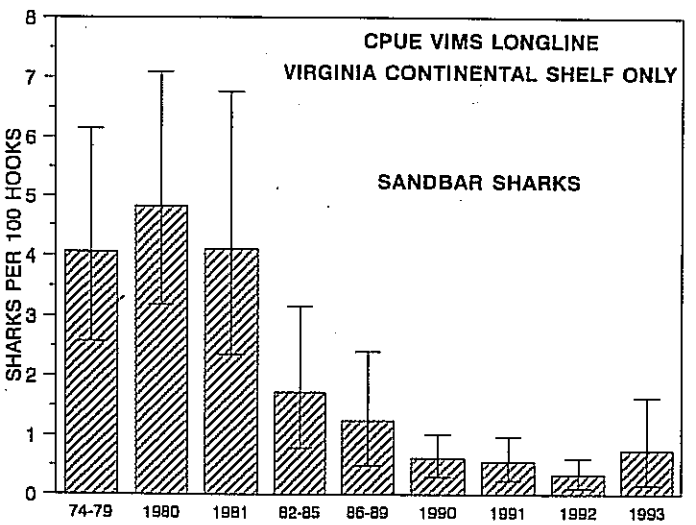


Figure 2. Catch per unit of effort of sandbar sharks expressed as sharks per 100 hooks for the years 1974-1993. Data collected during scientific surveys conducted by the Virginia Institute of Marine Science in coastal waters of the mid-Atlantic Bight of the USA. (Some years pooled to equalise sampling effort.)

This species continues to support a substantial fishery after such a severe population decline only because of the very large size of the original stock. Under the current FMP, the target fishery mortality (F = 0.25) can only lead to a continued population decline (Sminkey and Musick, in press). The western North Atlantic shark fishery is a multi-species fishery. Many species less common than the sandbar shark have undergone similar population declines, and at least one, the dusky shark *Carcharhinus obscurus*, has undergone an even greater population decline. This species matures at a larger size and later age than the sandbar shark and may reproduce only every three years.

The naive assumption of some resource managers that marine fish populations are not vulnerable to extinction because they are 'open', with large geographic ranges and unlimited immigration, is unfounded (Huntsman, 1994). Coastal stocks of even large migratory species such as sandbar sharks have discrete geographic boundaries. Over-fishing can rapidly deplete K-selected species. It may be true that fisheries will collapse of their own accord when stocks become so reduced that they are no longer profitable to pursue, but the notion that fisheries will become economically extinct before extinction of target species is not true. In a mixed-species fishery, where all species are subjected to the same fishery mortality rate, less-abundant species could be driven to extinction while numerically dominant species still continued to support the fishery. Thus, Manire and Gruber's (1990) concern that many shark species might be vulnerable to extinction appears to be well founded. Even if the fishery were completely closed, stock recovery of the sandbar shark and other large coastal species in the western North Atlantic would take several decades. The collapse of large coastal shark stocks in the western North Atlantic provides strong support for Congdon *et al.*'s (1993) contention: "The concept of sustainable harvest of already-reduced populations of long-lived organisms appears to be an oxymoron".

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Editor's note: The above is an abbreviated version (excluding most references) of the material supplied by the author for the Shark Action Plan. The IUCN threatened species assessment is provisional until agreed by the Shark Specialist Group.

Sensitive skates or resilient rays? – a North Sea perspective

Paddy Walker, NIOZ, P.O. Box 59, 1790 AB Den Burg, Texel, NL

At the beginning of the century rays and skates were considered quite common in the North Sea. For example, between 1907 and 1909 the biomass of rays and skates caught by Dutch trawlers was as high as that of whiting, haddock, cod and small plaice. More than 600 tonnes were landed annually, of which half were thornback rays *Raja clavata* and half common skates *Raja batis*. Nearly 5,000 fishing boats were in operation; small sailing boats which operated locally. The estuaries of the rivers Schelde and Maas were regularly fished and in the summer stingrays *Dasyatis pastinaca*, as well as thornback rays, were often caught. There was a lively standing net fishery for stingrays in the Wadden Sea, which lasted until the 1930s. The stingrays were caught for their liver oil, a guaranteed cure for ailments such as rheumatism. Fishermen even soaked their underwear in the oil to protect themselves from bitter weather. Thornback rays were regular visitors in the Wadden Sea in the summer months, although there is no evidence that this species spawned there.

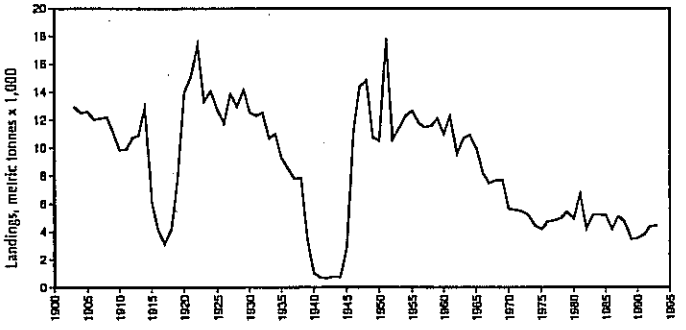

Figure1. Landings of rays and skates as reported to ICES in thousand metric tonnes.

The present situation is quite different. The common skate is seldom caught in the southern and central North Sea and has not been caught in Dutch coastal waters since the mid 1950s. With the exception of a few individuals, no rays (thornbacks or stingrays) have been caught in the Wadden Sea since 1966. In the 1930s fishermen started complaining about the lack of rays in the Wadden Sea which was then attributed to the extensive fishing of the stocks in the North Sea. Thornbacks and stingrays have been rare off the northern coast of Holland since the 1970s, although stingrays are still caught in the estuaries in Zeeland.

The situation in the North Sea as a whole is not much more optimistic and there has been concern about the status of the stocks of rays and skates in the North Sea, following a steady decline in landings since the 1960s. Analysis of landing statistics from the International Council for the Exploration of the Sea (ICES), which have been published annually since 1903, shows that landings of rays and skates have decreased significantly since the beginning of the century, both between the two World Wars and after WWII (see Figure 1). Present landings (approximately 4,000 tonnes) are a quarter of what they were in the 1920s. Landing statistics are obviously a poor indication of the actual abundance of fish. However, considering the increase in fishing effort which has occurred in the past three decades, the returns would seem to be decreasing. Unfortunately, because the majority of the landing statistics are not detailed to species level, it is difficult to identify the current status of the skate and ray stocks in the North Sea. Although the North Sea represents only part of the area of distribution for most species, it is unlikely that local depletion of stocks will be alleviated from elsewhere at the current level of fisheries exploitation, as most species appear to be quite sedentary. The Dutch coastal waters form an example.

Rays and skates represent a by-catch in the beam trawl fisheries for other demersal fish species such as sole and plaice. Although usually only the large individuals will be landed for consumption, the size and shape of the juveniles and their thorniness means that they have a large chance of being caught. Normally they would be discarded, but juvenile thornbacks and spotted rays *Raja montagui* have been known to be sold at fish markets. There are nine different species of rays and skates, of which the most abundant (the starry ray *Raja radiata*) is not landed for consumption but is discarded. The chances of survival of discarded rays are unknown. The fact that these species are a by-catch makes it difficult to take management measures which will protect them, without affecting the catch of commercially more important fish species.

The level of exploitation that rays and skates can withstand is unknown and is species-specific. Possibly the situation is less dramatic than it appears; some scientists believe that rays and skates are quite resilient because they are still around (with a few notable exceptions) despite intensive fisheries. It's a complex problem, and one which deserves more attention.

European news

ICES Elasmobranch Study Group meeting

The August meeting produced synopses for elasmobranch stocks and fisheries in European and eastern North American waters (ICES/NAFO regions). Its recommendations include collaboration on key issues for the sustainable exploitation of elasmobranchs – an important first step towards a more organised and integrated approach to the study of elasmobranchs and their fisheries in the North Atlantic. The report should be available from the ICES Secretariat, Palaegade 2–4, DK-1261 Copenhagen K, Denmark (http://www.ices.inst.dk/).

There will be an article on this meeting in issue 6 of *Shark News*, including the response of the 1995 Annual ICES Scientific Committee.

Proposal to improve EC fisheries records

A new proposal for an EC Council Regulation (COM(95) 322 final) will, if agreed, establish a list of fish species to be recorded in fisheries logbook and landing declarations. The proposal is intended to form a basis for fisheries management and enforcement of conservation measures and contribute to systematic recording of regulated and highly migratory species. A total of 194 'species' of fish and invertebrates are listed, including all those subject to TAC, protected, newly fished, and of particular scientific or commercial interest. Simplified lists will be adopted for specific zones and only contain relevant species. However, the proposal does 'lump' many species together (e.g. all skates and rays fall within a single category). Other elasmobranchs listed are the basking shark, spiny dogfish, dogfish sharks (Squalidae), porbeagle, smoothhounds (*Mustellus* spp.), and mako shark.

European Elasmobranch Society

A meeting of potential national partners in the initiative to establish this non-governmental organisation was held in Brussels in September, partly grant-aided by Scottish Natural Heritage. Representatives attended from eight European countries: France, Germany, Italy, Netherlands, Portugal, Spain (Catalonia), Switzerland and the UK. Delegates discussed the related national and regional initiatives underway or planned in Europe, agreed the aims and objectives of the proposed EES, and discussed the type of organisational structure which would be appropriate for the headquarters and the national or regional branches or member bodies. It was agreed that formation of the EES should go ahead and another meeting should be held early in 1996 to report on progress. Contact the Editor for more information.

The role of aquariums in the conservation of sharks

Juan Sabalones, Senior Aquarist, National Aquarium in Baltimore, Maryland, USA

Sharks have been a source of fascination for centuries. With a few notable exceptions, the nature of most human contact with sharks was likely to be brief and fraught with negative overtones. This led to much speculation about what they were really like, most of it inaccurate. Only recently has technology (scuba diving, submersibles, underwater photography and cinematography) allowed us to observe sharks in the wild and learn more about their true nature. Unfortunately, such first hand observation is available only to a relatively small sector of the public, with most of the rest relying on the media (print, film and television). The only other place to observe sharks first hand is at a public aquarium. In terms of a shark conservation movement, this is where aquariums can be most valuable.

One definition of conservation is "the planned management of a natural resource to prevent exploitation, destruction or neglect." It is reasonable to expect that such management effort needs public support as a major component. The total number of people that attend public aquariums in a year in North America alone is over 100 million. These institutions are frequently used by the media as information resources because aquariums are in the business of educating their audience by providing the most accurate, well-informed picture of sharks available. Aquariums, then, can significantly influence the image of sharks beyond the millions of people that walk through their doors. Helping to correct the negative image of sharks and highlighting their positive aspects will go a long way towards increasing public support for their conservation. Several other species with similar concerns have benefited from such image makeovers.

At the National Aquarium in Baltimore (NAIB), this desire to upgrade the image of the shark affects our approach in several ways.

In terms of exhibitry, it means dealing with the negative image by highlighting the multifaceted nature of a very old, very successful class of animal. This means explaining their role in the environment and talking about their conservation needs. In terms of species displayed, the impression that all sharks are large man-eaters such as Great Whites, Bulls or Tigers can be corrected by displaying and highlighting the smaller, more exotic looking sharks. This will emphasise the fascinating diversity of shark species and the fact that the vast majority of sharks are of the smaller, non-threatening type.

When educating the media and the public, all presentations on sharks are divided into three parts. In the first part the negative image of the shark is dealt with by using strategies such as discussing the relatively low incidence of shark attacks, especially in comparison to other animals (saltwater crocodiles, elephants, farm pigs and bees, for example, kill more people per year). The second part stresses the positive contributions and features of sharks, such as their importance to the environmental balance. The third part deals with the conservation needs of the shark. When properly rehearsed, this presentation can be condensed to a few minutes or expanded to an hour lecture. If this approach is consistently used during all contacts with the media and the public, it soon becomes second nature.

Another way in which aquariums can promote the conservation of the shark is through the promotion of research. Research into better methods of husbandry is a good place to start. A recent report to the IUCN by the Shark Specialist Group (SSG) noted that the impact of aquariums on wild populations of sharks was insignificant. Nevertheless, it is important to constantly strive for even higher standards in the husbandry of sharks and to encourage captive breeding. This will lessen the need to take them from the wild. Another place to promote research is in areas of the wild used as collecting sites. The NAIB participates in a National Marine Fisheries Service (NMFS) shark tagging study. Over the last ten years we have tagged and released nearly 200 sharks during the course of our collecting trips. We (in cooperation with the NMFS) are also in the preliminary stages of a population index of juvenile sandbar sharks in the Delaware Bay. This Bay, which we have fished regularly for nearly 14 years, is an important nursery ground for juvenile sandbars and sand tiger sharks.

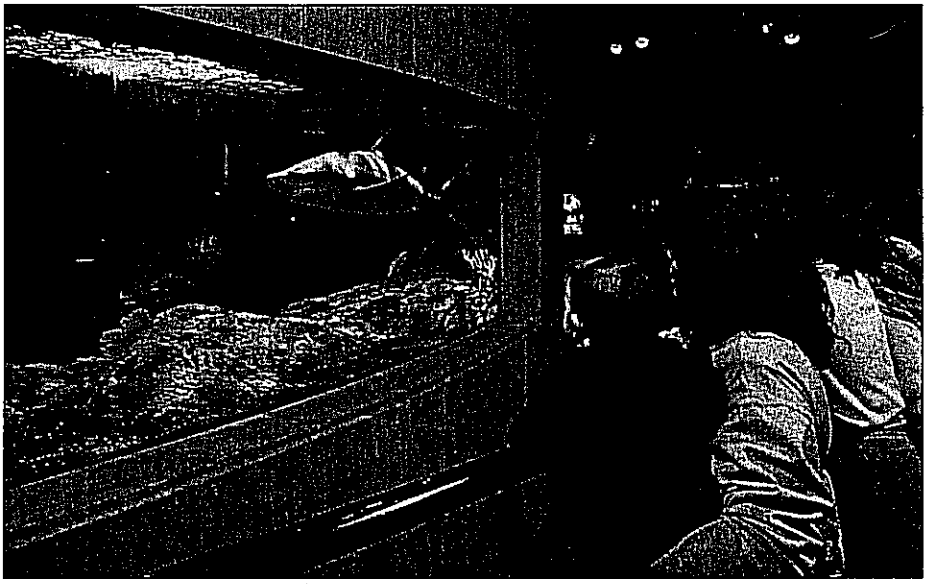

Photo: National Aquarium in Baltimore, George Grall.

The Shark Specialist Group of the IUCN is currently developing a shark conservation Action Plan. As members of the SSG, we are proposing to create a subsection of this group composed of representatives of as many aquariums world-wide as are willing to enlist. In this fashion those aquariums that display sharks can add their input to the shark conservation movement.

Sharks are a proven draw for the public. At the NAIB the shark exhibit has been the most popular exhibit for almost the entire history of the aquarium. It is probable that this is also the case at most institutions that display sharks. That popularity can be used to the good advantage of the shark conservation movement.

Shark Info

Shark Specialist Group member Erich Ritter has just launched a new Zurich-based media information service. Shark Info will provide a clearing house to convey accurate and interesting information from the shark research community to educate the general public through the news media. Initially focused on German-speaking Europe, the service will make articles and photographs available free of charge to newspapers, magazines, TV and radio stations. Its objective is to ensure that the increasing public interest and awareness in sharks and rays is maintained without the need to resort to sensationalist and inaccurate reporting.

For more information contact Shark Info, Walchestr. 17, CH-8006 Zurich, Switzerland. Phone: (+ 41) 01 363 1270, Fax: (+ 41) 01 363 1706.

Galapagos under siege

Recent events in the Galapagos Islands continue to raise concern about the future of all living marine resources, including sharks, in the archipelago. On 3 September 1995, a group of individuals in Galapagos closed the road to the National Park Headquarters and Charles Darwin Research Station, occupied the Park Headquarters, closed the road to one airport, and took over another airport. In addition, they threatened to take tourists hostage and burn parts of the National Park. This is the third time since August 1994 that a small interest group has threatened violence against the conservation institutions of the Galapagos Islands.

The 'strike' resulted from discontent over a decision by Ecuador's President Duran-Ballen to veto a new special law for the Galapagos. The law would have, among other things, turned over the majority of the control and management of the Galapagos National Park and other natural resources to local political interests. Such a precedent would pose a grave threat to the integrity of the Galapagos Marine Resource Reserve. These same political interests have fought necessary controls on sea cucumber fishing and have pressed to open the Galapagos to large-scale export fisheries (Camhi 1995).

As we go to press, the situation is worsening. Although the sea cucumber fishery is officially closed, more than 600,000 sea cukes per month are being exported to Asian markets, along with sea horses, pipefish and sea urchins. Despite the official ban on shark fishing in the Reserve, there is evidence that illegal shark finning continues.

The conservation community supports President Duran-Ballen in his refusal to negotiate with individuals that incite violence and threaten destruction of public resources. A special law is needed for Galapagos to address the issues of unsustainable marine resource exploitation, uncontrolled immigration, introduction of exotic species, and appropriate socio-economic development for Galapagos residents. But Ecuador must reject the path of intensive fishing for export markets if the Galapagos Islands are to remain an ecological treasure of national and global significance – and a long-term and dependable source of income for Ecuador.

Camhi, M. 1995. Industrial fisheries threaten the ecological integrity of the Galapagos Islands. *Conservation Biology* 9(4): 715–719.

Merry Camhi

Cyanide spill in the Essequibo River, Guyana

Regrettably fulfilling one of the predictions made by Compagno and Cook (1995), the Essequibo, Guyana's largest river, was affected in August by a major cyanide waste spill. More than 25 million gallons of the toxic chemical were reported in *Earthweek* (Chronicle Press) to have escaped from a gold mine operated by US and Canadian companies. Large numbers of fish, mammals and birds were killed and public drinking water supplies threatened as the spill flowed 50 miles downstream. International relief teams rushed to divert the cyanide into a holding pond near the mines, which use the chemical to extract gold.

Species potentially affected by this spill may have included the bull shark *Carcharhinus leucas*, largetooth sawfish *Pristis perotteti*, and smoothback river stingray *Potamotrygon orignyi*. The stingray is well-recorded from the Essequibo as part of a wider distribution that includes Venezuela, Guyana, French Guiana, Suriname, the Columbian and Brazilian Amazon and Pará River drainages.

Cyanide and related cyanogenic glycosides are listed as "supertoxic" compounds by Turkington (1994). Fewer than seven drops of most liquid forms can kill a 68 kg (150 lb) man in less than 15 minutes, depending upon factors that alter rate of absorption. Cyanides act through interference with enzyme activity at oxygen sites in haemoglobin of red blood cells and myoglobin in muscle tissue for vertebrates, and the counterpart oxygen-carrying porphyrins for invertebrates (haemocyanin etc.). Binding of sites is regarded as irreversible, with death depending on how much oxygen deprivation occurs as a percentage of total innate oxygen-carrying capacity for given porphyrins and animal size. Small animals are considered to be disproportionately susceptible to fatality at lower ambient cyanide levels.

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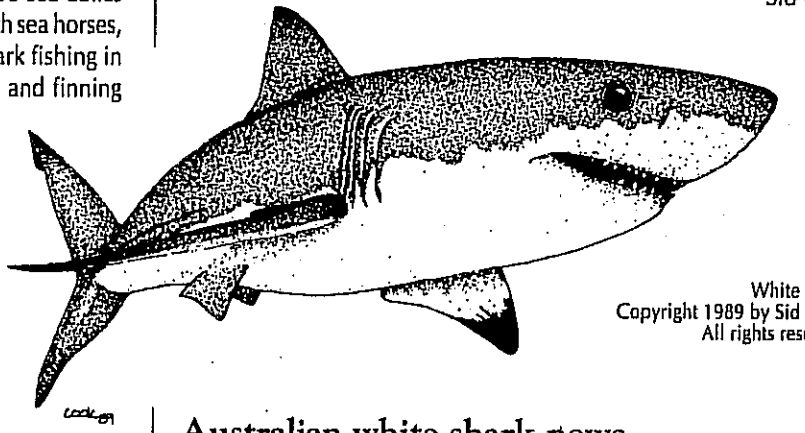
Sid Cook



White shark.

Australian white shark news

Earlier this year, the South Australian Fisheries Department circulated a discussion paper which included a proposal for the protection of the great white shark in State waters. Responses to this paper are still being considered: In September, the Australian Seafood Industry Council announced that it had adopted a recomendation to seek an end to targeted fishing for this species in the waters of all Australian states, and would be writing to the states' fisheries management agencies to seek their views on the recommendation. (Targeted fishing is actually only a very limited activity in Australia; far more white sharks are taken as by-catch in fisheries or beach meshing programmes.) This recommendation has been welcomed and supported by the Australian Marine Conservation Society.

We hope to feature an article updating readers on progress with these initiatives in the next issue of *Shark News* (No. 6).

Large coastal Atlantic shark fisheries closure notice

The National Marine Fisheries Service closed the commercial fishery for large coastal sharks in the Western North Atlantic Ocean, including the Gulf of Mexico and Caribbean Sea, at 2300 hours local time 30 September 1995, through 31 December 1995. This action was necessary to prevent exceeding the semiannual quota for the period 1 July through 31 December 1995. Fishing for pelagic and small coastal sharks could continue and the recreational fishery was not affected by this closure.

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Joint publication of The Great Barrier Reef Marine Park Authority, The World Bank and The World Conservation Union (IUCN). Contact: Environment Department, The World Bank, Room S 5-143, 1818 H Street NW, Washington, D.C. 20433. Fax. (+1) 202 477 0568.

Copeia. 1995. No. 3. Papers from the American Elasmobranch Society symposium on Elasmobranch Genetics, 1992.

Includes: Gaida, Evolutionary aspects of gene expression in the Pacific angel shark, *Squatina californica*; Eitner, Systematics of the genus *Alopias* with evidence for the existence of an unrecognized species; Heist, Graves and Musick, Population genetics of the sandbar shark *Carcharhinus plumbeus* in the Gulf of Mexico and Mid-Atlantic Bight; Dunn and Morrissey, Molecular phylogeny of elasmobranchs; and Chang, Sang, Jan and Chen, Cellular DNA contents and cell volumes of batoids.

A database compiled from early case histories in the International Shark Attack file. 1995. H.D.Baldridge.

Covers cases 1–1655 of the File, dating to early 1971.

Shark Attack: a program of data reduction and analysis. 1974. H.D.Baldridge.

Summarises trends in shark attack world-wide.

Both the above may be purchased from The International Shark Attack File, Florida Museum of Natural History, Division of Fisheries, University of Florida, Gainesville, FL 32611, USA. Fax. (+1) 904 392 1721, email [gburgess@flmnh.ufl.edu]. Send check or money order for US$11.00 each, payable to the American Elasmobranch Society.

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Chondros is a semi-technical periodical publication [ISSN:1021-0253] related to work with biology, fisheries, use, management, conservation and human interactions with sharks, skates, rays, sawfishes and chimaeras worldwide. Its style is understandable to a broad range of backgrounds. Current readers include: scientists, fisheries managers, international agencies, national and state governments, students, libraries, commercial and recreational fishermen, conservationists, divers/other recreational ocean users and the general public interested in learning more about sharks and related species. A focus of the publication is the reporting of ongoing work in a timely manner through original articles and scientific notes. It also includes book reviews, conference notes, job announcements, cooperative research and information sharing requests, periodic bibliographic updates, editorials, new publications, news, reader comments, and cartoons.

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Return to: *Shark News* Editor, The Nature Conservation Bureau Limited, 36 Kingfisher Court, Hambridge Road, Newbury, Berkshire, RG14 5SJ, UK. or (with donations in US$) to: Sonja Fordham, Center for Marine Conservation, 1725 DeSales Street NW, Washington, DC 20036, USA.

The Ocean Wildlife Campaign (the Campaign) is honoured to be a sponsor of the fifth issue of *Shark News*. The Campaign recognises the importance of information exchange in furthering conservation efforts; to that end we hope the fifth issue of *Shark News* will promote increased discussion and international cooperation on all aspects of chondrichthyan conservation.

The Ocean Wildlife Campaign is a coalition of six conservation, education, and research organisations, including: the National Audubon Society; National Coalition for Marine Conservation; Natural Resources Defense Council; New England Aquarium; Wildlife Conservation Society; and World Wildlife Fund. The Campaign was established to strengthen management for large ocean fishes on the global, international, and national levels. Large ocean fishes – tunas, sharks, swordfish, and marlin – are among the most magnificent creatures in the sea; many of these highly migratory species are also severely over-exploited due to unsustainable and indiscriminate fishing practices.

The Campaign's aim is to reverse the declines in large ocean fish populations and set in place mechanisms for their rebuilding. In addition, we are a voice reminding everyone that fish are wildlife, too, and that we all share the responsibility to ensure that future generations will find thriving populations of these fishes in healthy oceans. Join us! The Ocean Wildlife Campaign, 666 Pennsylvania Avenue, SE, Washington, DC 20003.

The Shark Specialist Group would also like to acknowledge the grant for this issue provided by the Columbus Zoo and the donations sent by the following: A. Bianchi, E. Bourne, C.R. Bradbury, M. Bright, U.L. Gomes, M. Hill, R. Kindlimann, J. Koop, P. Kunzlik, J. Lambert, L. Li, M. MacQuitty, A.R. Marques, J. McEachern, J. Minow, C.U.D.P. Paracpe, H.J. Pearson, D. Perrine, RSPCA, F. Serena, A.E de Siqueira, A.G. White.

Meetings

Symposium on the Systematics, Ecology and Resources of the Elasmobranchs

Ocean Research Institute, University of Tokyo, Tokyo, Japan. November 1995. Japanese Society for Elasmobranch Studies. Contact: Professor Sho Tanaka, Dept. of Fisheries, Tokai University, 3-20-1 Orido, Shimizu City, 424 Japan.

PACON96. The 7th Pacific Congress on Marine Science and Technology.

Honolulu, Hawaii. 8–12 June 1996. Contact: Dr Narenda Saxena, PACON, P.O. Box 11568, Honolulu, Hawaii 96828, USA. Fax: (+1) 808 956 2580. Email: saxena@wiliki.eng.hawaii.edu

Second World Fisheries Congress: Developing and Sustaining World Fisheries Resources: the state of science and management

Brisbane, Queensland, Australia. 28 July–2 August 1996.

Contact: Congress Secretariat, PO Box 120, Milton, Brisbane, Qld 4064, Australia. Fax: +61 7 369 1512. Email: im@cc.qu.oz.au

Sharks and Man: Worldwide Management and Conservation

Brisbane, Queensland, Australia. 3 August 1996.

This one day symposium will follow the World Fisheries Congress and include three sessions on Shark fisheries management, Shark control programs (public safety), and Shark conservation.

For more information or to submit abstracts (which should be sent in as soon as possible), contact Dr John Stevens, CSIRO Marine Laboratory, GPO Box 1538, Hobart, Tasmania 7001, Australia. Fax. + 61 02 325 000. Email: John.Stevens@ml.csiro.au

IUCN World Conservation Congress

Montreal Conference Centre, Canada. 14–23 October 1996.

Details from IUCN, 28 rue Mauverney, 1196 Gland, Switzerland.

5th Indo-Pacific Fish Conference

Noumea (New Caledonia). October 1997.

A symposium will be devoted to Chondrichthyan fishes. Contact B. Séret, Antenne ORSTOM, Muséum National d'Histoire Naturelle, Laboratoire d'Ichtyologie, 43 Rue Cuvier, 75231 Paris cedex 05, France. Fax: (33) 1 40 79 37 71. Email: seret@mnhn.fr

Editorial details

Shark News aims to provide a forum for exchange of information on all aspects of chondrichthyan conservation matters for Shark Group members and other readers. It is not necessary to be a member of the Shark Specialist Group in order to receive this newsletter.

We will publish articles dealing with shark, skate, ray and chimaerid fisheries, conservation and population status issues around the world; circulate information on other relevant journals, publications and scientific papers; alert our readers to current threats to chondrichthyans; and provide news of meetings.

Publication dates are dependent upon sponsorship and receiving sufficient material for publication, but the target is three to four issues per annum.

Manuscripts should be sent to the editors at the address given on this page. They should be composed in English, legibly typewritten and double-spaced (generally 750–900 words, including references). Word-processed material on IBM-compatible discs would be most gratefully received. Tables and figures must include captions and graphics should be camera-ready.

Authors' name, affiliation and address must be provided, with their fax number and email address where available.

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