SHARK NEWS

SHARK NEWS 4 NEWSLETTER OF THE IUCN SHARK SPECIALIST GROUP JULY 1995

Shark control measures:
the Natal Sharks Board and shark conservation

Sheldon Dudley

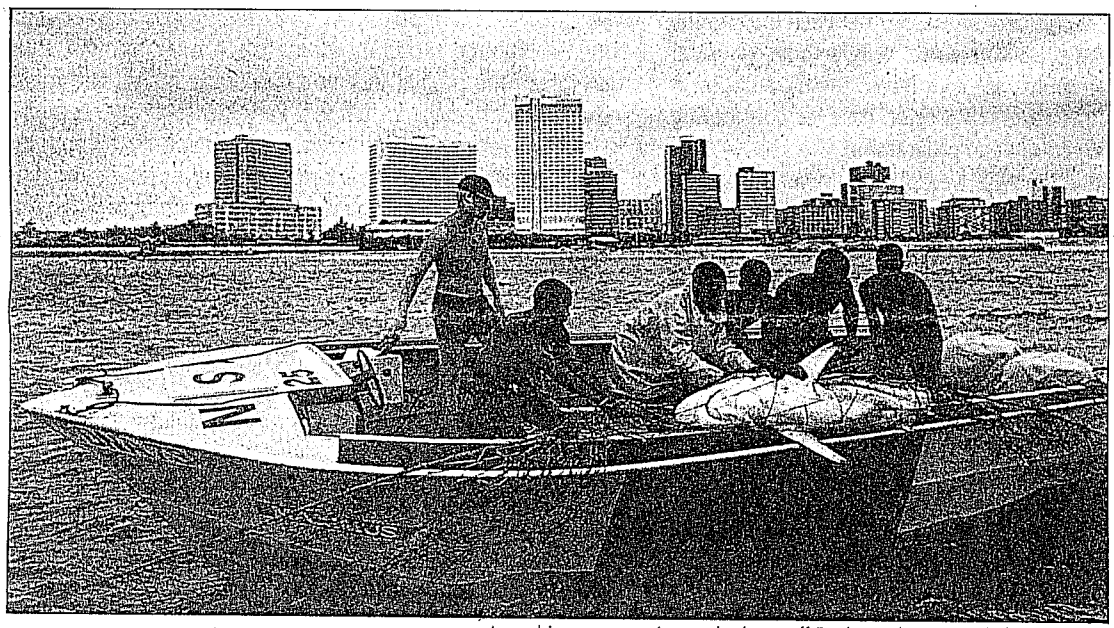
Introduction

Shark control measures exist to reduce the likelihood of an encounter between a large shark and a recreational user of the nearshore zone. This is achieved by locally reducing numbers of large sharks. The world's three major shark control programmes, which were introduced in response to public demand, are located in New South Wales (NSW) and Queensland, Australia, and in KwaZulu/Natal, South Africa. The programmes are controversial in both the scientific and the environmental arenas. The views of respondents to a recent opinion survey of members of the American Elasmobranch Society illustrate the controversy: of 65 respondents, 39 (60%) believed that shark control "is never justified – the Ocean is a wilderness area, and people who enter it do so at their own risk". AES President Don Nelson, in a plenary address to the Society's annual meeting in June 1994, expressed the personal opinion that it is "unethical to cleanse a wilderness area of its natural inhabitants to make it safer than natural for human use". Nelson did, however, concede that "certain well defined bathing beaches" might be excluded from the wilderness.

If one includes a prohibition of economic activity in one's definition of wilderness, the existence of commercial fishing immediately precludes the ocean from being considered a wilderness area. Be this as it may, I believe that to regard the ocean as a wilderness with regard to shark control but not recreational angling is inconsistent. Ethically, shark control differs little from angling in that both consist of the exploitation of marine resources for the benefit of human recreation. In the case of both angling and shark control, however, it is the function of scientists and managers to try to ensure that the utilisation of those resources is sustainable.

Current practice

The current *modus operandi* of the Natal Sharks Board (NSB), the organisation which runs the KwaZulu/Natal programme, entails the permanent maintenance of large-mesh (50 cm stretched) set-nets off a number of bathing beaches. Three 213 m x 6.2 m nets are used to provide protection at most beaches, although some beaches have more. The nets are not a barrier to sharks; about 35% of the catch consists of sharks moving offshore from within the protected area. The nets have an impressive record in terms of reducing the number of shark attacks at netted beaches. Between 1906 and the time nets were introduced in the 1950s and 1960s, there were 38 attacks resulting in either a fatality or a non-fatal but serious injury (e.g. limb amputation). Since nets were installed, and despite increasing bather numbers, there have been no fatalities and only three serious injuries.



A meshing crew services a shark net off Durban. Photo: Natal Sharks Board.

The nets take an annual catch of some 1,345 large sharks of 14 species, of which about 13% are tagged and released. About 90 t (whole weight) of shark is killed annually. There is a by-catch of some 80 dolphins (three species, 3% released), 380 rays (about ten species, 71% released), 70 turtles (five species, 36% released) and, because the mesh size is large, only a few teleosts.

Investigations to date indicate that the effect of the nets on shark numbers is localised and that the catches are sustainable, although the dynamics of this multi-species, constant-effort, constant-locality fishery are not well understood. Despite this apparent sustainability, the NSB attempts to minimise mortalities by releasing all live animals and by temporarily lifting the nets during the annual 'sardine run', the winter influx of pilchard *Sardinops sagax* shoals which are accompanied by large numbers of sharks and dolphins.

The NSB is also in the process of trying to determine whether fishing effort can be reduced without substantially reducing bather safety. A reduction in effort would have the dual benefit of reducing both catches and operating costs.

Investigations into effort reduction

The first step in the investigation into effort reduction was to conduct a comparison of the three major shark control programmes. Large-mesh set-nets are used in all three and in Queensland baited lines, or drumlines, are used as well. In NSW, the fishing gear is intermittently deployed off each protected beach for a total of about nine nights per month in an eight month season. In Queensland, the gear is continuously deployed off each beach in a 10–12 month season. In KwaZulu/Natal, deployment is continuous at each beach throughout the year. The monthly fishing effort, expressed as standard (100 m) net days per beach, deployed in season at a NSW beach and at a Queensland beach, is about 14% and 30% respectively of that deployed at a KwaZulu/Natal beach. The same three shark species are believed to have been responsible for most of the attacks in the three regions – the bull, or Zambezi, shark *Carcharhinus leucas*, the great white shark *Carcharodon carcharias* and the tiger shark *Galeocerdo cuvier*. While there are differences between the regions in terms of both shark distribution and the nearshore physical environment, these don't appear to have led to the differences in levels of effort. There is, therefore, an *a priori* case for considering effort reduction in the KwaZulu/Natal programme.

A workshop was held at the NSB headquarters near Durban on 29 November 1994 at which scientists from the NSB and other institutions discussed ways of determining the extent to which effort could be reduced. A number of proposals were put forward concerning ways of improving current understanding of the relationship between near-shore shark densities and the number of nets.

Additional experimentation

In addition to considering net reduction, the NSB is conducting two sets of experiments with the objective of reducing the by-catch both of small sharks and of other animals. Experiments with nets with a larger (70 cm) mesh size have been running for several years and the results are promising, the larger mesh continuing to catch sharks of a size considered to be potentially dangerous but at the same time taking fewer of the smaller sharks. Secondly, baited drumlines, similar to those used in Queensland, have been successful in catching large bull and tiger sharks but it is too early to compare catch rates with those of sharks taken in the nets. Very little non-shark by-catch is taken on the lines.

A third set of experiments aimed specifically at reducing the by-catch of dolphins entails the incorporation of air-filled floats into a number of nets in an attempt to improve the acoustic visibility of the nets to dolphin sonar.

Low catch rates dictate that all the experiments will have to run for some time in order to accumulate a statistically adequate sample.

A final research project consists of the development of an electrical shark repellent as an alternative means of providing bather protection. Although the repulsion of sharks using electricity is not a new concept, the NSB is hopeful that it may be able to develop a practical and affordable device.

In summary, the Natal Sharks Board is committed to carrying out its mandate of protecting bathers from shark attack, but is also committed to ongoing research into methods of reducing mortalities of marine organisms.

Sheldon Dudley
Natal Sharks Board, Private Bag 2,
Umhlanga Rocks, 4320, Republic of South Africa

Editorial

Shark control measures

Shark meshing programmes have now been underway in Australia and South Africa for several decades, from 1937 in New South Wales, 1952 in Natal and 1963 in Queensland. A number of other less well-documented shark control initiatives (frequently short-term and unplanned) have been undertaken elsewhere for swimmer protection, apparently all too often as a panic or public-relations response to one or more local shark attack incidents. Despite the potentially very high cost of shark control programmes in relation to the risk that they pose to the local population (Hamer 1993 suggested a risk of $1:10^7$ or 10^8 for shark attack in New South Wales without beach meshing and queried the economic rationality of the programme), the 1991 Shark Conservation Workshop held in Sydney, Australia, appears to have been the only international meeting to consider their results.

What has been learnt from the case studies presented in the proceedings of this workshop (Pepperell *et al.* 1993), in this issue of *Shark News* and from other sources?

There is a clear pattern of effect: all regular beach meshing programmes have produced a large initial catch of sharks during the first year or two of operation, followed by very marked decline and then a low and relatively steady catch rate. All have successfully protected the public, in that the (already infrequent) incidence of shark attacks ceased or fell to a very low level after meshing.

However, none of the programmes provide much if any information on shark population levels before or after meshing and the level of scientific information obtained (with the notable exception of the Natal Sharks Board programme) is generally poor. It is therefore difficult to determine whether the methods used for shark control were appropriate, whether judged in terms of economic costs, yield of scientific data, or impact on dangerous sharks *versus* other sharks and non-target animals. Virtually all have resulted in concern that the control programmes, particularly when using beach meshing, may be having unacceptable effects on by-catch including non-target sharks rays or threatened species such as small cetaceans and turtles.

It also seems clear that once shark control has been introduced to areas where there is a history of shark attack (whether or not the programme is necessary or effective), it is viewed by the beach touris industry and local bathing population as essential to safeguard thei continued economic health and survival. For political reasons therefore, it is almost impossible to abandon control programme once they have been initiated – a warning that it is very unwise to rus into poorly planned and expensive responses to shark attack incidents It is therefore reassuring to see that shark control programmes are no being more critically assessed and that at least some new initiative are being designed with more care (see opposite).

The organisers of the Second World Fisheries Congress next yea in Australia (see p.12) plan to run a shark control programme (publi safety/swimmer protection) workshop as an adjunct to the congres targeted to the relatively small group of biologists and manage involved in this field. It will be interesting to find out how attitude towards control programmes have changed during the five yea since the Sydney meeting as concern over the status of elasmobranc populations, dangerous or not, has grown.

References

Hamer, G. 1993. An overview of the New South Wales meshin program. In: J. Pepperell, J. West and P. Woon.

Pepperell, J., West, J., and Woon, P. 1993. *Shark Conservatio* Proceedings of an International Workshop on the Conservation Elasmobranchs held at Taronga Zoo, Sydney, Australi 24 February 1991. Zoological Parks Board of NSW, Australia

Shark control measures *(continued)*

Hawaii

The following is the abstract of a paper by Wetherbee, B.M., Lowe, C.G., and Crow, G.L. 1994. A review of shark control in Hawaii with recommendations for future research. *Pacific Science*, **48**(2): 95–115.

In an attempt to allay public fears and to reduce the risk of shark attack, the state government of Hawaii has spent over US$300,000 on shark control programmes between 1959 and 1976. Six control programmes of varying intensity resulted in the killing of 4,668 sharks at an average cost of $182 per shark. The programmes furnished information on diet, reproduction and distribution of sharks in Hawaii, but research efforts had a number of shortcomings.

Analysis of the biological data gathered was not directed towards the tiger shark *Galeocerdo cuvier*, which is responsible for most attacks in Hawaii. Reliable estimates of shark populations in Hawaii cannot be made based on catch data from control programmes because of sampling biases. Most of the information gained from the control programmes was not published in reviewed journals and is not readily available to the scientific community. The ability of the control programmes to reduce shark populations and to remove large sharks from coastal waters appears to have been stated with more confidence that is warranted, considering seasonal changes observed in shark abundance and variable fishing effort. Shark control programmes do not appear to have had measurable effects on the rate of shark attacks in Hawaiian waters.

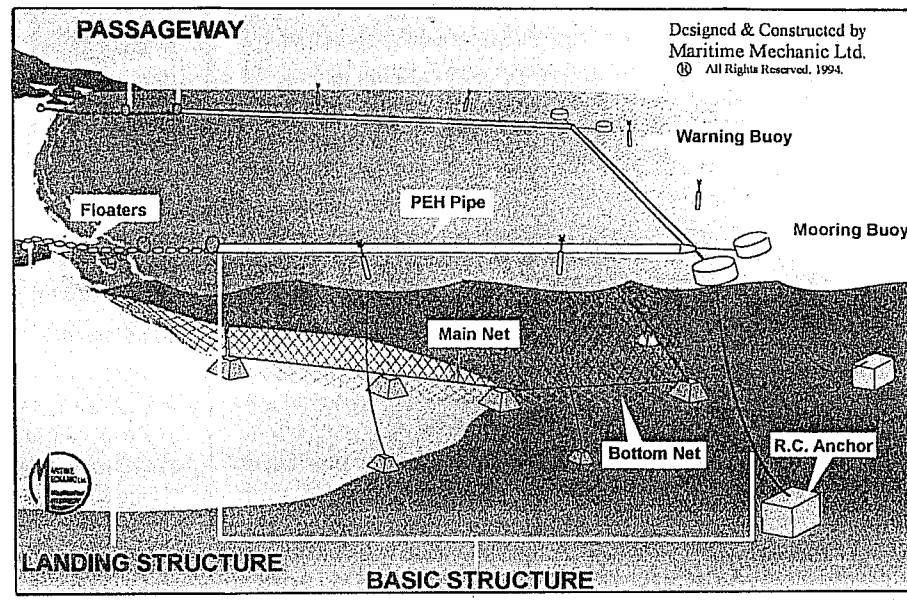
Implementation of large-scale control programmes in the future in Hawaii may not be appropriate. Increased understanding of the behavior and biology of target species is necessary for evaluation of the effectiveness of small-scale control efforts, such as selective fishing after an attack. Acoustic telemetry, conventional tagging, and studies on population dynamics concentrating primarily on the tiger shark may be used to obtain data about activity patterns, distribution, and population parameters, providing information useful for reducing the risk of shark attack in Hawaii and elsewhere.

Queensland, Australia

The following text is abstracted from Simpfendorfer, C. 1993. The Queensland Shark Meshing Program: Analysis of the results from Townsville, North Queensland. In: J. Pepperell, J. West and P. Woon, *Shark Conservation*. Zoological Parks Board of NSW, Australia.

Data from the Queensland Shark Meshing Program in the Townsville area were analysed for the period 1964 to 1986. The programme uses both anchored gillnets and baited drumlines, during 47 weeks of the year. Catch per unit effort data indicate that the programme has reduced the populations of hammerhead, blacktip and whaler sharks in the Townsville area by up to 80%, but has had little effect on the population of tiger sharks (thought to be a wide ranging species). Catches of hammerhead, blacktip and whaler sharks were highest in spring and summer, associated with nearshore migrations for pupping and mating. Tiger sharks showed no seasonal variation in the catch. Drumlines are more effective than nets at catching the more dangerous larger sharks and have a lower by-catch. The review recommended greater use of lines to reduce impacts on non-target species and more collection of scientific data from the catch (the latter has been attempted since a review in 1992).

The programme was effective in its aim of reducing shark attacks by cutting the numbers of dangerous sharks near popular beaches: there were 11 attacks prior to its introduction in 1963, but none subsequently. Withdrawing the programme would allow shark numbers and the likelihood of attacks to increase. There have been environmental effects, both on sharks and by-catch, but the species concerned are widely dispersed and often wide-ranging, and the areas affected by the programme are small and scattered. The effects on populations as a whole are therefore considered to be minimal.



Structure of shark prevention net used in Hong Kong. ® Maritime Mechanic Ltd. 1994.

Shark nets in Hong Kong

Hong Kong is famous for many things ... shark attack is not generally considered one of them. In the early 1990s, however, a number of incidents, including several fatalities, put sharks under the spotlight and sent government officials scurrying for a solution. The immediate reaction was to bring in a shark hunter from Australia to catch what was believed to be a large tiger shark (although the species was never confirmed). The privately-funded hunt was unsuccessful, but did dissipate public concern; an emotional response to an emotionally-charged situation.

Once the initial furore had died down, the government established a working committee which included representatives from the police force, fisheries, public safety, academia etc. to develop a 'shark attack response strategy'. This was in 1994 and the absence of incidents that year meant that this committee could discuss the issue rationally, taking time to look at responses to similar situations elsewhere, to learn more about what is and is not known about shark biology and attack, and to develop a plan that responded to local concerns and needs.

The plan that emerged included an education initiative introduced in the swimming season of 1994. Posters and leaflets were produced to advise the public of what to do in the event of shark sighting or attack and a contingency plan was established to deal with such events. Swimmers were warned of times and places to avoid swimming (based on the rather consistent profiles of the recent attacks) and aerial surveys were conducted at weekends. Shark exclusion nets were set-up as part of a pilot project at three popular swimming beaches to provide protection and peace of mind for bathers. The mesh characteristics of the netting were also selected to minimise by-catch, which totalled little more than a few cuttlefish and filefish last summer, according to weekly surveys by the company contracted to supply and maintain the netting. The final plan makes sense for Hong Kong and for addressing the apparently low risks of shark attack in the area.

STOP PRESS: As Shark News *went to print, we heard that there had been two more fatal shark attacks in Hong Kong. So far the government is resisting calls for a shark hunt.*

Yvonne Sadovy, University of Hong Kong

The American Elasmobranch Society's Captive Elasmobranch Census

With its first publication in 1989, the Captive Elasmobranch Census began documenting the numbers and species of elasmobranchs in captivity. The first census included 14 institutions located in the mid-western United States. A total of 137 specimens of 27 species were counted. In the census's second year those same institutions held 151 specimens of 29 species.

The census went national in 1991, with 47 facilities throughout the USA, keeping 1,649 specimens of 65 species. In 1992, the census went international for the first time, swelling the number of facilities to 107, holding 7,869 specimens representing 157 species.

The 1993 and 1994 censuses included 86 facilities from over 10 countries. A total of 60 species of sharks, 60 species of ray, and, although not technically elasmobranchs, 18 species of chimaera were documented. The 1995 census is still in press.

The Captive Elasmobranch Census is published each year through the generous help of several coordinators through the world. Census forms are distributed to each facility at the end of each calendar year. These forms are then compiled, published, and distributed later the following year. The census is organised by species, with a completed institutional directory and 'contact person' index following the census documentation. Each contributing institution is given a copy of the completed census in return for their participation.

The census is a valuable tool for enhancing captive husbandry, experimental collaboration, and general information exchange between individuals with elasmobranch interests. Through the use of the census, captive breeding programmes have been initiated, and specimen surplusing and exchanges have been solicited. Advances have occurred in nutrition, exhibit design, and understanding behaviour.

With the current efforts to make the economic community aware of the devastating effects improper management of elasmobranch populations can have on their futures, the census can be used by lawmakers to extrapolate the value of elasmobranchs as tourist attractions. By examining gate attendance records of those institutions which display elasmobranchs, policy-makers can determine what effect not displaying elasmobranchs can have on the economy of states and cities which have institutions exhibiting them. In doing so the economic importance of these creatures takes on a new dimension and gives weight to the arguments of conservationists and researchers working towards proper recognition of these creatures as more than just a simple protein source or vicious eating nuisance.

The Captive Elasmobranch Census is still not complete. With each passing year more institutions are added. Eventually, it is hoped that all institutions holding sharks and their relatives will be included. This can only better communication and thus our understanding of these fascinating creatures.

If your institution would like to take part in the American Elasmobranch Society's Captive Elasmobranch Census, please forward your institution's name, address, phone number, and fax number to:

Beth Firchau, Virginia Marine Science Museum, 717 General Booth Boulevard, Virginia Beach, Virginia 23451 USA.

Please include the name of a contact person to facilitate ease in communications.

Beth Firchau, Virginia Marine Science Museum, and
Warren W. Pryor, Animal Curator, Fort Wayne Children's Zoo

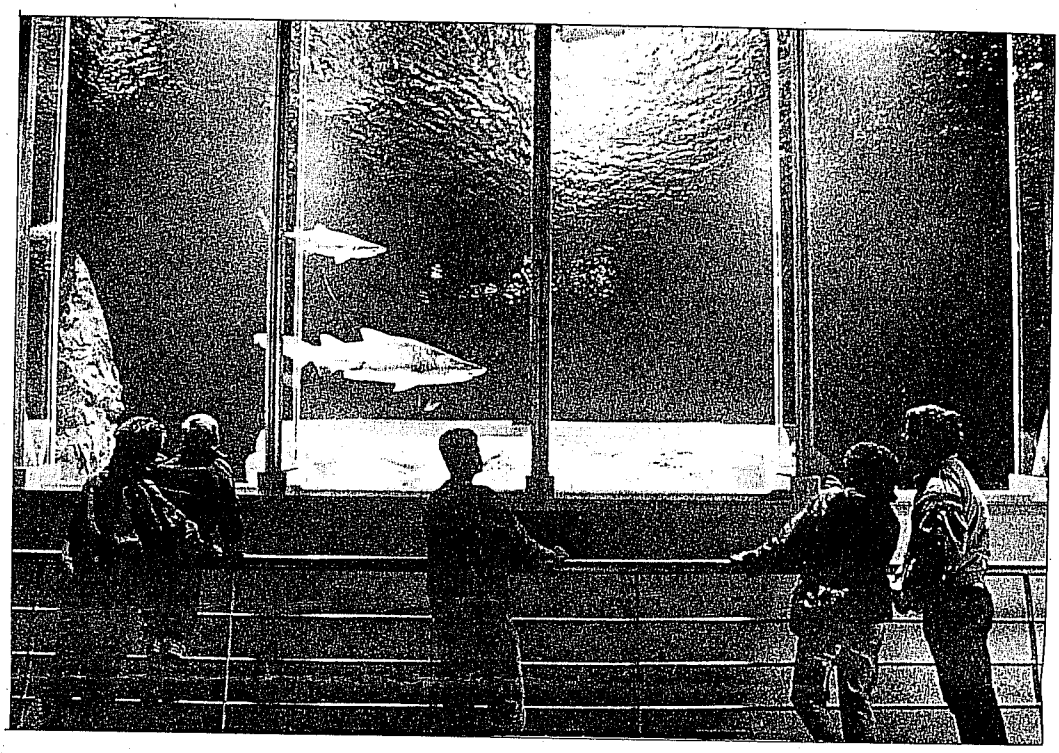


Photo: Sea Life Centres, UK.

American Elasmobranch Society

The American Elasmobranch Society (AES) was founded in 1983 as a non-profit organisation "... to advance the science of the study of living and fossil elasmobranchs ... the sharks, skates, rays and chimaeras." The Society was born of the need for a common forum and international clearing house for information on elasmobranchs.

Membership in AES is divided into two categories. "Affiliate" membership is provided to those who are interested in elasmobranchs but who are not currently professionally involved with elasmobranch research. It differs from our "Standard" membership in two ways. It does not require nomination by a member of the society, and it is a non-voting membership. All other membership benefits are provided including our quarterly newsletter, membership directory, and bibliography of elasmobranch research, published occasionally as a listing of all papers recently published on elasmobranchs.

Student dues are US$ 10.00 per annum (standard, affiliate, and foreign), while regular memberships are US$ 28.00 per year (standard, affiliate, and foreign).

For information about joining the American Elasmobranch Society, contact: Sanford Moss,
Biology Department,
University of Massachusetts Dartmouth,
285 Old Westport Road,
N. Dartmouth,
MA 12747-2300,
USA

Status of the largetooth sawfish
Pristis perotteti Müller and Henle, 1841

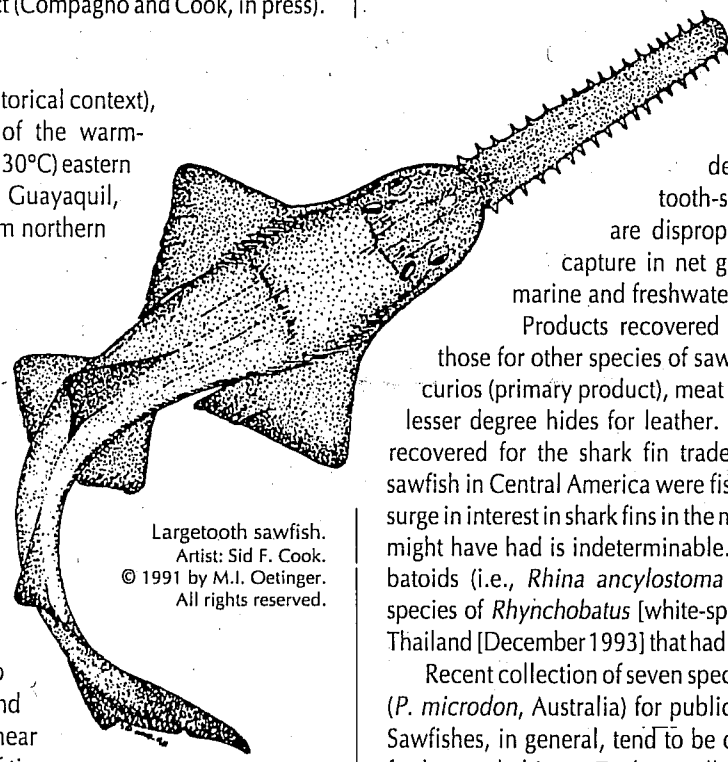
Compiled by Sid Cook, Leonard Compagno and Madeline Oetinger

Taxonomy

The largetooth [southern] sawfish is one of three to eight species of large to gigantic sawfishes in the genus *Pristis* which, with the monotypic *Anoxypristis cuspidata* (Latham) [knifetooth sawfish], comprise the Family Pristidae. The holotype was collected from freshwater in Senegal, West Africa. As with other species of this genus the taxonomy has been chaotic with a complex history of problems exacerbated by lack of adult specimens in collections, questioned identifications and a plethora of synonymies, which remain to be fully resolved. At the present time there is considerable difficulty determining how many valid species actually exist. For the purpose of this account we assign *P. zephyreus* [eastern Pacific] as a junior synonym for *P. perotteti*. Likewise we group this species into the *P. pristis* species complex along with *P. microdon*, a species from which *P. perotteti* may possibly prove not to be distinct (Compagno and Cook, in press).

Distribution and ecology

This is a relatively common (in a historical context), large-bodied euryhaline sawfish of the warm-temperate/tropical (>18°C to at least 30°C) eastern Pacific [from Mazatlan, Mexico to Guayaquil, Ecuador] and Atlantic Oceans [from northern Texas and Florida to Brazil (West Atlantic) and Gibraltar, Spain to Angola, south-west Africa (East Atlantic), also possibly the Mediterranean Sea]. It is widely but disjunctly distributed, being strictly confined to shallow (<10 m) nearshore marine, brackish and freshwater (river/lake) environments (Bigelow and Schroeder, 1953). Though not precisely known, it probably spends most of its time near or on the bottom. However, it is also commonly observed in the wild and in public aquaria swimming quite near the surface for extended periods of time.



Largetooth sawfish.
Artist: Sid F. Cook.
© 1991 by M.I. Oetinger.
All rights reserved.

In the Pacific it is reported from freshwater in the Tuyra, Culebra, Tilapa, Chucunaque, and Bayeno Rivers and at the Balboa and Miraflores locks in the Panama Canal, Panama; the Rio San Juan, Colombia; and in the Rio Goascoran, along the border between El Salvador and Honduras.

In its Atlantic distribution it is commonly found in freshwater rivers and lakes. It is noted for running far upstream in freshwater and has been recorded at least 1,340 km from the ocean in the Amazon (Manacapuru, Brazil); in Lake Nicaragua and the San Juan and other various east coast rivers of Nicaragua; Lake Yzabal and Rio Dulce, Guatemala; Rio San Juan and Magdalena River, Colombia; Mali or Senegal in the Falémé River; Saloum River of Senegal; Gambia; and the Geba River of Guinea-Bissau.

The largetooth sawfish is an adept predator feeding on a variety of small bony fishes, which it stuns with its saw before consuming, and animals (fish and invertebrates) it stirs from the substrate.

It is ovoviviparous giving birth to 1–11 fully developed young per litter with 7–9 young being the most common litter sizes. Size at birth is about 76 cm (TL) [Nicaraguan specimens]. In Lake Nicaraguan stocks the breeding season has been reported to be in early June and sometimes into July. After a five month gestation, young are born from early October to perhaps early December. Size at sexual maturity for both males and females is 2.4–3.0 m, at ten years of age (Thorson 1982). Maximum adult size is at least 5.7 m (TL) and possibly to 6.1 m (TL). It attains a maximum weight of at least 600 kg. Lifespan in the wild is unknown; Thorson (1982) suggests 30 years.

Conservation status

This species has been fished intensively at various locations within its range, with dramatic declines in local stocks noted as a result. In Lake Nicaragua (Central America) Thorson noted large catches during his preliminary visits to Granada in 1963 (T.B. Thorson, personal communication). However, intense efforts for both this species and the bull shark, *Carcarhinus leucas*, which occurred sympatrically in the lake led to rapid decline of stocks. Taniuchi (1992) did not see any sawfish or sharks in the lake during his survey of Central American freshwater elasmobranchs. He noted that during the entire previous season only one of each species had been reported in the fishery.

The fisheries for this species have been characterised by continued effort long after local stocks are completely decimated. Because of the long tooth-studded saw, all sawfish species are disproportionately subject to incidental capture in net gear set for other species in both marine and freshwater environments.

Products recovered from this species are typical of those for other species of sawfishes and include dried saws for curios (primary product), meat for human consumption, and to a lesser degree hides for leather. It is unknown if useable fins are recovered for the shark fin trade. Since stocks of the largetooth sawfish in Central America were fished down well before the current surge in interest in shark fins in the mid 1980s, the impact that practice might have had is indeterminable. However, the authors saw other batoids (i.e., *Rhina ancylostoma* [bowmouth guitarfish] and two species of *Rhynchobatus* [white-spotted guitarfish]) in the markets of Thailand [December 1993] that had been trimmed of fins for the market.

Recent collection of seven specimens of a closely-related species (*P. microdon*, Australia) for public aquarial display raises concern. Sawfishes, in general, tend to be of low to moderate abundance in freshwater habitats. Zealous collection efforts, even in the name of research, may seriously compromise a stressed reproductive population.

Selected bibliography

Bigelow, H.B., and Schroeder, W.C. 1953. Sawfishes, guitarfishes, skates, and rays. Chimaeras. *Fishes of the Western North Atlantic. Memoirs of the Sears Memorial Foundation for Marine Research* **1(2)**: 1–514.

Compagno, L.J.V., and Cook, S.F. In Press. The exploitation and conservation of freshwater elasmobranchs: status of taxa and prospects for the future. [*Journal of Aquaculture and Aquatic Science* (USA)].

Taniuchi, T. 1992. Report on preliminary investigation of freshwater elasmobranchs in Mexico and Central America. *Report of Japanese Society for Elasmobranch Studies* **29**: 33–49. [Japanese with English abstract].

Thorson, T. B. 1982. Life history implications of a tagging study of the large-tooth sawfish, *Pristis perotteti*, in the Lake Nicaragua-Rio San Juan System. *Environ. Biol. Fishes*, **7(3)**: 207–228.

Risk-prone management of the US Atlantic shark fishery

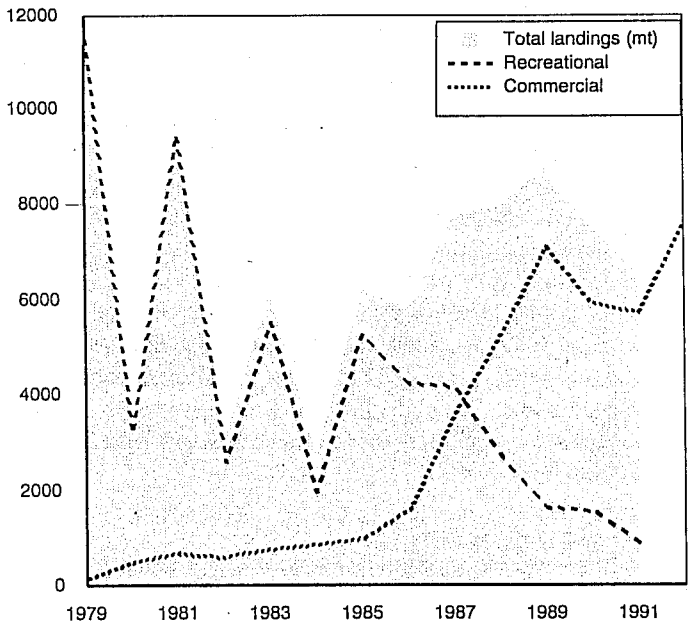
Merry Camhi, National Audubon Society

Introduction

It is widely accepted that sharks are highly vulnerable to overfishing because of their K-selected life history strategies. Indeed, shark fishery failure is the rule rather than the exception, and it has been estimated that nearly 90% of the shark fisheries in the 20th century have failed because of a lack of aggressive management once shark populations begin to decline (Compagno and Cook, in press). The United States is one of only three major shark-fishing nations that actively manage their shark fisheries (Australia and New Zealand are the others) (Bonfil 1994). In April 1993, after five years in development, the US National Marine Fisheries Service (NMFS) finally implemented the Fishery Management Plan for Sharks of the Atlantic Ocean (NOAA, 1993). In this plan NMFS has proclaimed that "sharks must be managed very conservatively". However, the current quotas and slowness to implement other conservation measures recommended by its own scientific experts suggest that NMFS has adopted a risk-prone agenda for shark management in the Atlantic, Gulf of Mexico, and Caribbean Sea.

A brief history

Commercial fishing for Atlantic sharks in the US began in the 1930s, and landings were relatively low (less than 2,000 mt) prior to 1986 (see graph below). By the mid-1980s, the popularity of shark meat had increased and the skyrocketing demand for shark fin soup in Asia led to rapid expansion of the Atlantic commercial shark fishery. At



Landings of shark on the US Atlantic coast

that time, NMFS was actively encouraging longliners from the over-capitalised tuna and swordfish fisheries to switch over to sharks, despite lack of an adequate assessment, data collection programme, or management plan. As landings grew to a peak of 7,122 mt in 1989 (NOAA 1993), so did concern over the status of previously abundant sharks. Many historical shark angling tournaments were abandoned because of declining catch rates. A fishery management plan (FMP) was finally drafted in 1989, but implementation was delayed until 1993 mainly because of uncertainty in estimating maximum sustainable yield (MSY) and overfishing (Hoff 1990). Unfortunately, this reluctance to take precautionary measures in the face of scientific uncertainty has become the operational mode of NMFS shark management.

Although the FMP needs much improvement, a number of beneficial conservation provisions were built into the plan. The FMP grouped 39 shark species in the management unit into three categories because species-specific data were lacking: large coastal sharks (22 species), small coastal sharks (7 species), and pelagic sharks (10 species). Although spiny *Squalus acanthias* and smooth *Mustelus canis* dogfish are taken in large numbers in directed fisheries they are not included in the management unit. Quotas were established for the large coastal and pelagic categories, and recreational bag limits were also implemented as an important first step toward reducing fishing pressure. Trip limits for large coastals (4,000 lbs) were imposed as well in 1994.

To improve management and data collection, commercial shark fishers must now obtain permits. Less than 200 of the 1,631 permit holders actively fish for sharks. NMFS is considering limiting access to reduce over-capitalisation in the fishery (M. Bailey, pers. comm.). Mandatory dealer reporting has been recently implemented. In an effort to discourage finning, the FMP prohibits landing only the fins and discarding the carcass. Yet this approach has not worked to reduce shark mortalities because the export of fins from sharks that are landed is still the driving force behind the fishery.

Risk-prone management

Almost all indicators suggest that Atlantic shark populations, especially those in the large coastal category, are in trouble. Total fishing mortality has greatly exceeded the MSY every year since 1979 (Hoff 1990). In 1994, NMFS convened a Shark Evaluation Workshop (SEW) (NOAA, 1994) composed of NMFS scientists and outside scientific experts to undertake a new stock assessment. The SEW confirmed that by 1986 the abundance of many of the large coastal species may have already declined by 50–75% from the 1970s levels. Ongoing declines in catch per unit effort estimates, average weight, and species richness all suggest that the large coastal assemblage is still declining (NOAA, 1994).

The FMP is considered by many scientists to be overly optimistic in its estimation of sustainable yields and recovery times (Burgess, 1995). To wit, NMFS used the period of maximum production (1986 to 1991 landings) as a biological reference and assumed that "any annual production, including the maximum, is sustainable." More reasonable and precautionary estimates of MSY would have been based on the entire data set from 1979, since many species had already undergone serious decline by 1986. In addition, although data on by-catch are notoriously incomplete, the FMP estimates that annual discards between 1979 and 1988 averaged 16,000 mt. This suggests that incidental catch of sharks in the swordfish, tuna, and shrimp fisheries exceeds the directed catch (Hoff, 1990). Yet it is not clear how this discard mortality is incorporated into the estimates of MSY, and little has been done to date to reduce the incidental catch of sharks on pelagic longlines or in gillnets.

NMFS has legitimately argued that an incomplete and inconclusive data base has hindered effective management. But so has NMFS's use of unrealistic life history traits in the FMP's population model. For example, the model relies on an annual

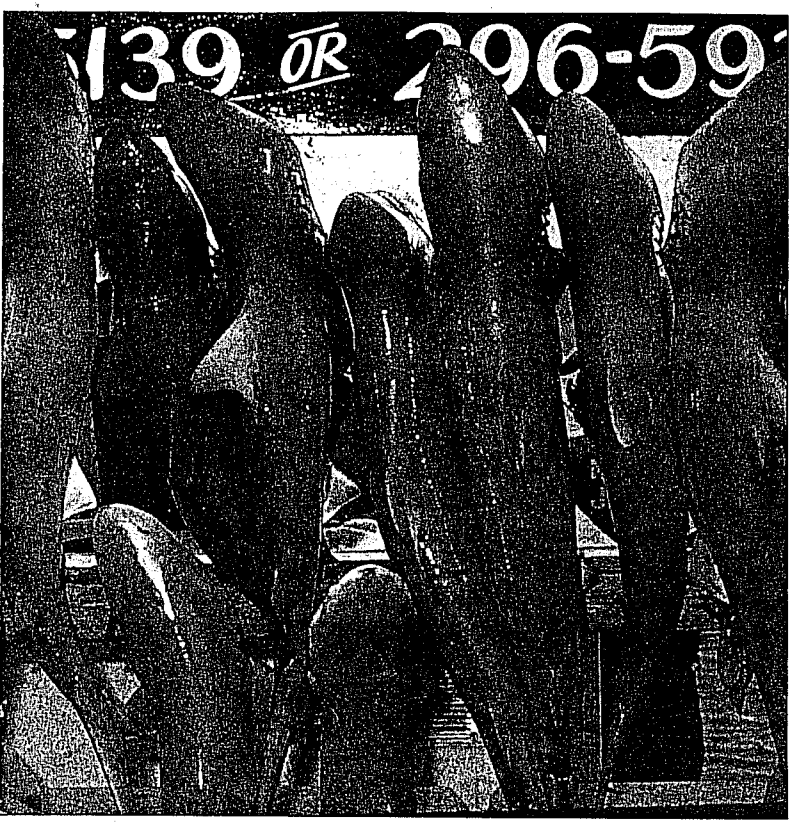


Photo: Page Chichester, Audubon Productions © 1990.

replacement rate of 26%, which is 2 to 10 times higher than is biologically realistic even for the fastest-growing species in the large coastal group (Musick 1994). Sandbar sharks *Carcharinus plumbeus*, which comprise almost 80% of the large coastal landings, have an intrinsic rate of increase of from 2% to 12% depending on the age of sexual maturity, fertility, and longevity modelled (Musick, 1994; Hoff, 1990). Estimates of survivorship employed in the FMP model (0.97 for sandbar sharks) are also unreasonably high (Hoff, 1990; Manire and Gruber, 1993). These erroneous assumptions led NMFS to predict a two-year recovery for the overfished large coastal species in the FMP (which was rejected outright by the SEW in 1994).

Yet almost all evidence on depleted shark populations suggests how wildly unrealistic a 2- to 6-year recovery is for these slow-growing creatures. The devastated porbeagle *Lamna nasus* fishery in the North Atlantic in the 1960s is just one example. When this fishery collapsed (after only 6 years), the population could not have been in much worse condition than some of the species that are currently managed under the FMP. The relatively fast-growing porbeagle should be more resilient to over-fishing than such slow-growing species as the sandbar shark. Yet the porbeagle has still not recovered even 30 years after commercial fishing essentially stopped. The Shark Evaluation Workshop advised NMFS that recovery of shark populations to 1970s level could take decades because of the low reproductive potential of most species. NMFS, however, seems content to 'recover' sharks to their already depleted 1986 levels.

Reversing the trends

Have the management measures instituted by NMFS, such as quotas and bag limits, been effective in reversing the decline of Atlantic shark populations? NMFS and the Shark Evaluation Workshop argue that it is too soon to tell. But the 1995 stock assessment (NOAA, 1995), based on 31 catch per unit effort time series, confirmed the warning of the 1994 SEW that "any total allowable catch might be considered risk prone" (SEW, 1994). In response, NMFS wisely agreed to cancel a previously scheduled quota increase for 1995. But because of flaws in the population model, many scientists, fishers, and conservationists have argued that the current quotas for large coastal sharks are still too high to permit recovery. Precautionary recommendations have ranged from reducing the current quota by 30% to a complete closure of the large coastal fishery until clear signs of recovery are evident.

Beyond reducing annual fishing mortality, the closure of nursery grounds during the pupping season was the single most important measure recommended by the 1994 SEW. The NMFS has not proposed action on nursery protection, although discussions are under way (M. Bailey, pers. comm.).

Small coastal sharks are subjected to high, but under-reported by-catch mortality in the Gulf of Mexico (Burgess, 1994). The NMFS has acknowledged that "declining catch per unit effort and life history characteristics indicating low productivity for pelagics and small coastals also suggest that a prudent approach is warranted for these groups." Still NMFS has failed to institute a quota for small coastals, to lower the large pelagics quota, or to address by-catch problems, all on the grounds of insufficient data.

For a shark fishery to be sustainable, management must be based on the biological constraints of the fish rather than driven by the short-term economic interests of the fishery. The NMFS repeatedly acknowledges the vulnerable nature of shark fisheries, yet continues to favour risk-prone policies while invoking scientific uncertainty as an excuse to avoid making tough management decisions. It may be many years before we have the kind of data we need to build robust population models or defensible estimates of MSY. In the meantime, given the life history traits of sharks, common sense alone argues for a more risk-averse management regime. We only need to look to the collapse of the New England groundfishery –or practically any shark fishery worldwide– to see the consequences of foot-dragging and reactive management.

Literature cited

Bonfil, R. 1994. *Overview of world elasmobranch fisheries. FAO Fish. Tech. Paper* 341, FAO Rome. 119 pp.

Burgess, G.H. 1995. Status of shark populations in the western North Atlantic. In: *Global Shark Action Plan.* IUCN Shark Specialist Group. In preparation.

Cook, S.F., and L.J.V. Campagno. 1995. The failure of shark fisheries: implications for management in southern Africa. In preparation.

Hoff, T.B. 1990. Conservation and management of the western North Atlantic shark resource based on the life history strategy limitations of sandbar sharks. Ph.D. Diss., Univ. Delaware, Newark, DE. 282pp.

Hoff, T.B., and J.A. Musick. 1990. Western North Atlantic shark-fishery management problems and informational requirements. In: *Elasmobranchs as living resources: advances in biology, ecology, systematics, and the status of the fisheries.* (H.L. Pratt, Jr., S.H. Gruber, and T. Taniuchi, eds.), pp. 455-472. *U.S. Dept. Comm., NOAA Tech. Rep.* NMFS 90.

Manire, C.A., and S.H. Gruber. 1993. A preliminary estimate of natural mortality of age-0 lemon sharks, *Negaprion brevirostris.* In: *Conservation biology of elasmobranchs* (S. Branstetter, ed.), pp. 65-71. *U.S. Dept. Comm, NOAA Tech. Rep.* NMFS 115.

Musick, J.A. 1994. Comments on proposed modifications of the fisheries management plan for sharks of the Atlantic Ocean. Submitted to NMFS Nov. 17, 1994.

NOAA. 1993. *Fishery management plan for sharks of the Atlantic Ocean.* NOAA, NMFS, U.S. Dept. Comm. Feb. 25, 1993.

NOAA. 1994. *Report of the shark evaluation workshop, March 14-18, 1994.* NOAA, NMFS. U.S. Dept. Comm. 47 pp.

NOAA. 1995. *1995 Shark evaluation annual report.* NOAA, NMFS. U.S. Dept. Commerce. 23 pp.

Elasmobranch research and conservation initiatives

Ocean Wildlife Campaign for the conservation of large pelagic fishes

Large pelagic fish –sharks, tunas, swordfish and marlin – are among the most threatened creatures in the oceans. These long-lived, apex predators, who play an important role in the structure and function of marine communities, have been seriously depleted because of relentless over-fishing and chronic mismanagement.

A coalition of US conservation organisations has recently established the Ocean Wildlife Campaign to strengthen management for these species from national to global levels. The aims of the Campaign are to reverse the declines in large pelagic fish populations and begin the hard work towards their restoration. Campaign steering members are the National Audubon Society, National Coalition for Marine Conservation, Natural Resources Defense Council, New England Aquarium, Wildlife Conservation Society, and World Wildlife Fund.

Shark conservation will be one of the primary targets of the Ocean Wildlife Campaign (OWC). The OWC is planning to produce an identification guide to sharks and shark parts (including fins) for species most threatened by international trade. The guide is intended to help shark fishers and fishery managers identify to species the sharks they are catching and monitoring, and to help CITES parties fulfil the recent CITES shark resolution (see opposite). The Campaign will also provide some sponsorship for the production and expanded distribution of *Shark News*. On a domestic level, the OWC will continue to push for more rational management of the US Atlantic shark fishery, including a reduction in quota for the heavily depleted large coastal shark category.

For more information on the Campaign, please contact David Wilmot, 666 Pennsylvania Avenue SE, Washington, DC 20003 USA. Fax: (+1) 202-547-9022; e-mail: dwilmot@audubon.org

Ocean Wildlife Campaign

Action Plan

The Shark Specialist Group has just received news of a grant from the Peter Scott Fund towards the costs of completing the compilation of the Global Shark Action Plan. Shark Group members should receive a copy of a letter with their mailings of *Shark News* asking for their contributions to the section on conservation priorities for elasmobranch conservation. However, all readers are very welcome to send in their comments to Sarah Fowler or Merry Camhi, *Shark News* Editors and Action Plan compilers. We are particularly interested in obtaining information on the socioeconomic importance of elasmobranchs for subsistence fishing communities and their value for tourism. Information on any other non-consumptive uses of these fish would be very useful.

Darwin Initiative for the Survival of Species

The Shark Specialist Group has recently been awarded a grant from the UK government's Darwin Initiative for conserving global biodiversity. The grant will fund a collaborative study with the Sabah Fisheries Department (also in liaison with projects being run by WWF Malaysia of the problems facing sharks, rays and sawfish in the rivers, estuarie and inshore waters of Sabah, East Malaysia (north Borneo). This study will be the first detailed regional investigation of the biodiversity distribution and conservation needs of elasmobranchs, which ar threatened in South East Asia by habitat degradation, fisheries an trade. Planning is still at an early stage but, in addition to taxonomi and biodiversity studies, it is hoped that the project will address th socioeconomic importance of elasmobranchs, the need for fisherie management, protected areas and education of local people, an provide the information needed by decision-makers for elasmobranc conservation. It will also be used to highlight freshwater elasmobranc conservation issues world-wide. Field work should take place mainl in 1996, and a final international workshop is planned for early 1997

Contact Sarah Fowler (*Shark News* editor) for more information

European Elasmobranch Society

The establishment of the proposed EES has come a step closer with th decision of a government conservation agency, Scottish Natura Heritage, to fund a feasibility study into setting up this European-wid non-governmental organisation. A meeting of potential nationa partners in the initiative should be held in Brussels later this year.

Elasmobranch Red List

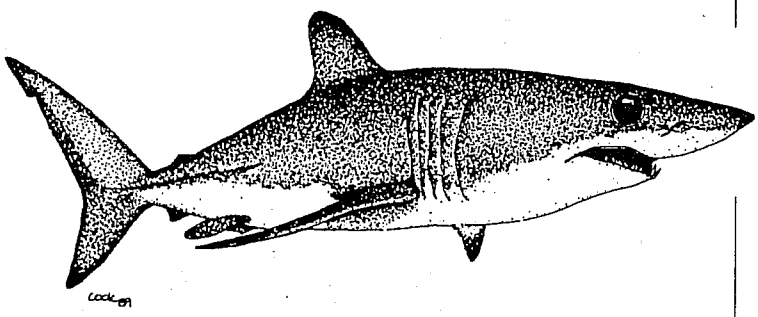
The IUCN has recently published its revised Red List categories an criteria (IUCN, 1994). These new criteria make it possible to includ long-lived, slow-breeding (i.e. K-selected) species on the globa IUCN Red List even where precise data on population size an declines are not available. This is because the new criteria measur population decline in terms of generations, in other words th capacity of the species to recover its number following exploitation It is therefore likely that a considerable number of elasmobranc species could qualify for listing under the new system. The 199 IUCN Red List, using the old system of categories, included just thre elasmobranchs, but the 1996 List should include many more, severa of which are likely to be of high priority for conservation attention

However, no systematic, global evaluation of the elasmobranch for their threat status has ever been carried out before, and the size c the task of attempting to assign Red List categories for the roughl 1,000 known species of elasmobranch species must not b underestimated. One of the difficulties that will arise is the paucity c population data and the lack of species-specific fishery data. Howeve this is not a cause for pessimism, since the new IUCN criteria provid a means for projecting and inferring the status from what little known. For example, the South Australian shark fishery has bee exquisitely modelled by CSIRO biologists. Using this multi-specie model as a framework, combined with other historical fishery dat and fishery-independent biological data, it may be possible t extrapolate results to other, less well-known elasmobranch fisherie and thus predict the likelihood of their decline and collapse.

With results required by 1996, for the CITES Animals Committe (see opposite), the next IUCN Red List and the Shark Action Pla the Shark Specialist Group urgently needs to raise funds to enab this work to be undertaken.

Canadian Atlantic shark management plan

The results of a seminar on shark management held on 28 March in Halifax, Nova Scotia, have now been released by the Canadian Department of Fisheries and Oceans (DFO). The seminar was attended by some 90 individual resource-users representing commercial, recreational and native interests, and operated on a workshop format with cross-sector representation. Its objectives were to identify and develop management policies for the developing Canadian Atlantic fishery for pelagic sharks (porbeagle, shortfin mako and blue sharks), under the DFO's mandate of resource conservation and sustainable development.



Shortfin mako *Isurus oxyrinchus.* © 1989 by Sid F. Cook. All rights reserved.

The DFO's News Release (17 May 1995) stated that all workshops reached consensus on a number of basic policy objectives.

1. Given the lack of scientific information and the cautious approach recommended by science, this fishery should be considered exploratory, not commercial, and directed primarily at data collection for stock assessment purposes.
2. Entry to the exploratory fishery should be strictly limited to those with historical attachment (past participants).
3. The recreational sector should also have access, linked to data collection.
4. Existing established fisheries with by-catches of shark (e.g. swordfish) should not be negatively affected by the licensing of a directed shark fishery or the setting of precautionary catch levels.
5. There must be strict adherence to monitoring and enforcement of the measures governing the exploratory shark fishery.

The scientific advice concerning the shark resource is unchanged from last year and continued caution should be exercised in the shark fishery. Once the status of the stocks has been determined, additional measures may be required to further restrict access to this fishery. The scientific advice also recommends precautionary catch levels be set as it is not possible to make recommendations concerning harvest levels at this time, given the lack of data available to carry out an assessment.

The Minister of Fisheries and Oceans, Brian Tobin, will be reviewing the results of the seminar and will shortly announce the 1995 Shark Management Plan, which was being drafted in Ottawa during May.

Copies of the seminar summary and report are available from Mike Calcutt, Resource Management Branch, Department of Fisheries and Oceans, 200 Kent Street, Ottawa, Ontario, Canada K1A 0E6.

Status of international trade in shark species

The full text of this Resolution (Conf. 9.17), passed at the 9th Meeting of the Conference of the Parties to CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) in 1994, is:

NOTING the increase in the international trade in parts and derivatives of sharks, and the document on this issue (Doc. 9.58) submitted by the United States of America;

CONCERNED that some shark species are heavily utilized around the world for their fins, skins and meat;

NOTING that levels of exploitation in some cases are unsustainable and may be detrimental to the long-term survival of certain shark species;

NOTING that, at present, sharks are not specifically managed or conserved by any multilateral or regional agreement for the management of marine fisheries;

NOTING further the ongoing initiatives to foster international co-operation in the management of fisheries resources;

CONCERNED that the international trade in parts and products of sharks lacks adequate monitoring and control;

RECOGNIZING that the members of the IUCN Species Survival Commissions's Shark Specialist Group are currently reviewing the status of sharks and the global trade in their parts and derivatives in the course of developing an action plan on shark conservation;

CONSIDERING that the Conference of the Parties has competence to consider any species subject to international trade;

RECOGNIZING that other intergovernmental organizations and bodies, including the Food and Agriculture Organization (FAO) of the United Nations, and the International Commission for Conservation of Atlantic Tunas (ICCAT), have undertaken efforts to collect elaborate statistical data on catches and landings of diverse marine species, including sharks;

RECOGNIZING further that the collection of species-specific data is a complex task, considering that there are some 100 species of sharks being exploited both commercially and for recreation, and that numerous countries utilize this marine resource;

THE CONFERENCE OF THE PARTIES TO THE CONVENTION

URGES the Parties to submit to the Secretariat all available information concerning the trade and biological status of sharks, including historical catch and trade data on shark fisheries;

DIRECTS the Animals Committee, with the assistance of experts as may be needed, to:

a) review such information, and information made available through consultation with FAO and other international fisheries management organizations and, where appropriate, to include information made available by non-governmental organizations;

b) summarize the biological and trade status of sharks subject to international trade; and

c) prepare a discussion paper on the biological and trade status of sharks, at least six months prior to the tenth meeting of the conference of the Parties; and

REQUESTS

a) FAO and other international fisheries management organizations to establish programmes to further collect and assemble the necessary biological and trade data on shark species, and that such additional information be provided no later than six months prior to the 11th meeting of the Conference of the Parties;

b) all nations utilizing and trading specimens of shark species to co-operate with FAO and other international fisheries management organizations, and to assist developing States in the collection of species-specific data; and

c) FAO and other international fisheries management organizations to fully inform the CITES Secretariat of progress on collection, elaboration and analyses of data.

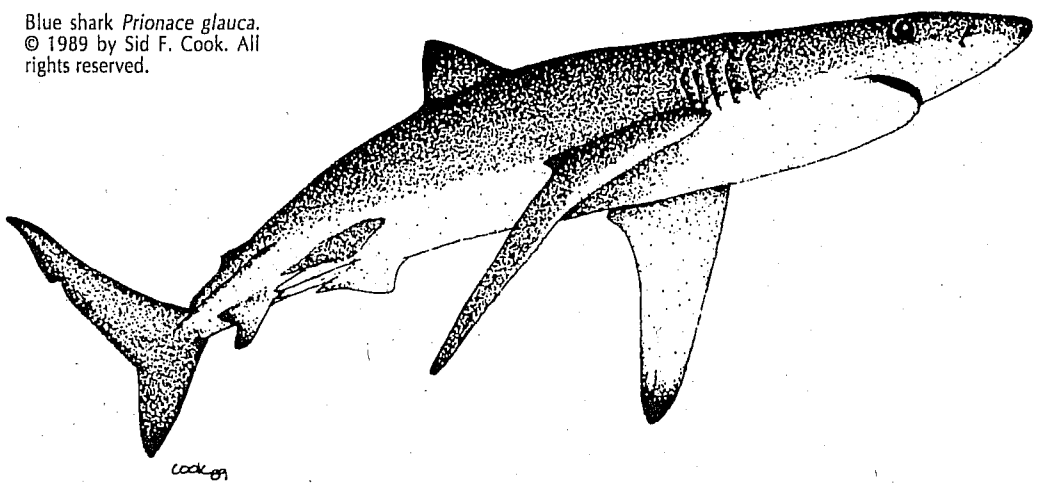
News

Shark by-catch in longline and gillnet fisheries operating from the south of Spain

A paper recently submitted to the *Fishery Bulletin* (V. Buencuerpo, S. Rios and J. Moron) gives some interesting figures on the importance of shark by-catch in swordfish fisheries in the eastern North Atlantic and Mediterranean Sea. Of 51,205 fish sampled in landings during 12 months from July 1991, 40,198 were sharks, 9,990 were swordfish and the rest other bony fish. A large number of immature sharks were taken. The paper also presents information about the population structure of shark species and suggests patterns of shortfin mako movements from catch data.

The authors suggest that the shortfin mako could be the species most seriously affected by this fishing pressure, although the blue shark is most commonly caught and large numbers of discards of this species at sea go unreported. Thresher sharks could also be very sensitive to fishing pressure because of their low reproductive rate and the small populations in the area. Hammerhead catches appear to have declined, although historical by-catch data are not available for any species of shark.

They conclude that international organisations such as the Tuna Commissions should be involved in the collection of fisheries statistics on the by-catch of pelagic shark populations. Studies of gear selectivity and discards are needed to properly evaluate shark by-catch in these fisheries. Management of the Atlantic swordfish fishery should be reoriented to a multi-species approach, with the effect of the pelagic shark by-catch and its economic implications included in the management model. However, the joint efforts of all nations operating longline fleets in the eastern Atlantic are required to provide a full assessment of the status of shark populations in the area.



Blue shark *Prionace glauca*.
© 1989 by Sid F. Cook. All rights reserved.

Editorial note:

The possibility of imposing an additional duty on the international tuna management bodies (i.e. IATTC, ICCAT, IPTP/IOTC, SEAFDEC and SPC/FFA), namely to undertake the monitoring of high seas shark catches, has been put forward by a number of readers of *Shark News* recently.

As one correspondent points out: they might not do so willingly, because of the extra work involved and because it appears to be outside their mandates. However, on this second point there are two reasons why it should be included in their remit.

First, sharks are a significant by-catch of most tuna fleets; with present high fin prices they cannot be disregarded from economic analyses.

Secondly, oceanic sharks and tunas often school together; a full understanding of tuna ecology and population dynamics cannot be achieved without an understanding of their associations with sharks.

Readers' comments on this suggestion would be received with interest.

Letter to the editor

Dear shark lovers,

It pleases me immensely to announce that the Portuguese Fisheries Department is finally devoting some attention to sharks. The project focuses on deep-sea fish and crustaceans and I have been invited to deal with the shark component. At this point we are studying age and growth of black-mouthed catsharks *Galeus melastomus* using the sharks' vertebrae but, eventually, we'll move on to other deep sea sharks and also stomach contents. The overall objective is to understand the food chain processes that occur in deep waters.

Sincerely,
João Pedro Correia,
Curator of Sharks (Lisbon Zoo) and
Researcher (Portuguese Institute of Marine Research)

Editors' note:
This is the first *letter to the editor* received by Shark News, and it was most gratefully received! Please remember that we are interested in receiving more information from our readers, although we do not guarantee to publish every communication sent to us.

Occurrence of *Odontaspis ferox* in the Western Equatorial Atlantic

A dry jaw received from fishermen operating off Natal, north-eastern Brazil, has been deposited in the Departamento de Pesca of the Universidade Federal Rural de Pernambuco, Recife, Brazil. The researchers who identified the species from its dentition (Roberto Menni, Fabio Hazin and Rosangela Lessa) note that this represents a notable large new extension to its known range.

[More details are available from the above-named at Depart. de Pesca, Univ. Fed. Rural de Pernambuco, Brazil.]

New readers of *Shark News*?

The notice opposite explains that we do not want to continue to go to the expense of posting copies of *Shark News* to people who do not want to continue to receive it. However, we are very keen to continue to expand our readership, particularly in countries where shark, ray and chimaeras are of existing or potential importance to fisheries or tourism or significant for other reasons. We are particularly aware that our readership in tropical and developing countries is low.

Please, therefore, send in the names and addresses of any individuals or institutes you think might benefit from receiving this newsletter. While the generous provision of sponsorship and reader donations is maintained we will continue to distribute copies free of charge.

Bibliography: technical reports and publications

Report of Japanese Society for Elasmobranch Studies, no. 31. December 1994.

The 44 page volume contains an editorial and six papers in Japanese, including the following. Those marked * have English abstracts.

*Taniuchi, T. Some biological aspects of sharks caught by floating longlines. 1. Species, distribution, species composition and hook rates.

*Takada, K. Stranding of a megamouth shark in Hakata Bay.

*Kitamura, T. Electrophoretic analysis of the sharks.

Tanaka, S. Research of freshwater elasmobranchs in Lake Nicaragua.

The status and conservation of sharks in Britain

Philip Vas, 1995. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 5: 67–79.

This 'viewpoint' article notes the comparative lack of knowledge on British sharks and their fisheries, and their lack of statutory regulation despite the large numbers of sharks taken by both commercial and recreational fisheries. The author sets out to review the current landings of sharks in the British Isles and uses the data to support the contention that immediate research should be undertaken to collect essential life-history information so that: (i) accurate assessments of current stock levels can be made and (ii) a long-term fishery management plan can be developed.

Proceedings of the Fourth Indo-Pacific Fish Conference, 28 November–4 December 1993. Systematics and evolution of Indo-Pacific Fishes.

Faculty of Fisheries, Kasetart University, Bangkok. 1994. 502pp. ISBN 974-553-153-7.

A few papers on chondrichthyans are included.

Subscription information for *Chondros*

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 educational backgrounds (readership ranges from age 11 to adults). Current readers include: scientists, fisheries managers, international agencies, national & state governments, students, libraries, commercial & 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 (**Currents**), periodic bibliographic updates (**SharkLit**), a coastal-estuarine-insular report section, editorials, new publications, news, reader comments (**Rahs! and Jaws!** and **Letters to the Editors**), and reader submitted cartoons (**Cartoon Corner**).

We are currently in V6(1995). *CHR* is published quarterly (4x/yr). Each issue runs at between 14–22 pages. **Subscription rates** [in US funds]: $22/yr in US, Canada and Mexico; $26/yr in all other countries. **Student rates:** subtract $5/yr from the rate for your country. **Contact:** Madeline Oetinger, Managing Editor, *Chondros*, 1003 Hermitage Drive, Owensboro, KY (USA) 42301-6004. E-Mail address [**madelino@ndlc.occ.uky.edu**]; Phn: (502) 683-7681; Fax: (502) 926-3196. Other information requests or submission inquiries can be directed *via* e-mail to [**74361,2215@compuserve.com**] (Sid Cook, Senior Editor). Previous volumes are also available. A bound volume containing V1(1), V2 and V3 [14 issues] is priced at $20 in USA, Canada and Mexico; $22 in all other countries, including postage and handling. V4 and V5 are available at the current subscription rates as unbound, individual issues.

URGENT: last chance to remain on the mailing list

The printing and distribution of the first four issues of *Shark News* have been sponsored to enable this newsletter to be sent free of charge to an international audience wider than our Specialist Group membership. However, we would now greatly appreciate receiving some feedback on the content and the future of the Newsletter, and need to update our address list.

If you have not already done so, please return the slip below with your name and address clearly printed on it with confirmation that you wish to continue to receive *Shark News*, or if you would like to be added to the circulation list. **If we do not hear from you, your address may be deleted from the mailing list to reduce costs.**

We are reluctant to introduce a formal subscription for this newsletter, which could cost more to administer than we will receive, particularly when handling foreign currency. We would, however, greatly appreciate contributions towards the cost of printing and mailing the newsletter and information on whether you would be prepared to pay a subscription in future. This should help us to continue to produce three or four copies a year and maintain the increased length of *Shark News*.

Donations should be sent by cheque in US$ to Sonja Fordham at the Center for Marine Conservation (marked payable to "CMC – Shark Specialist Group, account number #3060"), or in £ sterling to Sarah Fowler (payable to the "Shark Specialist Group"). Sarah Fowler can also accept credit card payments through the Nature Conservation Bureau. Addresses are given below.

Finally, please take this opportunity to send any comments on the newsletter and suggestions for articles for future issues to the editors, Sarah Fowler or Merry Camhi (addresses on the back page).

I would like to continue to receive Shark News:

Yes: ..... No: .....

I would be prepared to subscribe to future copies of Shark News:

Yes: ..... No: .....

I enclose a donation for production of the newsletter: .....
(Please state how much)

Please check here if you would like to remain anonymous: .....

Name: .....

Address: .....

.....

.....

.....

I wish to pay by Visa/MasterCard; please charge to my account.

My number is .....

Expiry date ..... Signature .....

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 Columbus Zoo is proud to be a sponsor of the fourth publication of *Shark News*. As part of the Zoo's ongoing attempts to support conservation and education internationally, we hope this issue continues to be a vital link between the members of the Shark Specialist Group and others.

The mission of the Columbus Zoo is to promote an awareness and understanding of our natural world through the encouragement of responsible conservation and the dynamics of education. Under the guidance of the Zoo's Animal Management, Health and Scientific Studies Committee, the Zoo promotes global awareness by assisting in legislative sponsorship and supporting over thirty international research and conservation initiatives. At home, the Zoo continues to make advances in education and environmental interpretation. Programming designed to encourage a holistic approach to conservation is offered throughout the year, in hundreds of programming efforts, reaching an audience of over 1 million annually.

Understanding our world allows us to understand ourselves. With each new advance towards this goal we insure our future. If we encourage proper management of our resources, creative information exchanges and exciting educational opportunities, we will promote understanding through true appreciation of the uniqueness and diversity of our natural world.
Beth Firchau, Columbus Zoo, Box 400, Powell, Ohio 43065-0400.

The Shark Specialist Group would also like to acknowledge the generous grant for this issue provided by the Natal Shark Board and the personal donations sent by the following: R.C. Anderson, T. Anderson, J.M.N. Azevedo, J. Barrull, I. Bianchi, C. Birkeland, D.P.S. Correia, G.S. Croft, C.J. Davies, S. Eastwood, M.P. Francis, M.J. Holden, E. Jones, J.W. Kirby, J.C. Krause, P.E. Roth, J.A. Seigel, B. Séret, S. Tanaka, G. Waller.

Meetings

ICES Study Group on Elasmobranch Fishes

15–18 August 1995. First meeting, ICES headquarters.

Fisheries Science of Sharks: a reality check

Symposium, 30 August 1995, Tampa, Florida, USA. To be followed by a workshop at the Mote Marine Laboratory, Sarasota, on 1–2 September. Contact Bob Hueter, fax: (813) 388 4312, for information.

4th Asian Fisheries Forum: towards sustainable fisheries

Beijing International Aquaculture and Fisheries Exposition, China. October 16–20, 1995. Contact: FISHASIA'95, 31 Min Feng Lane, Xidan, Beijing, China. Fax: (861) 6062346.

Symposium on the Systematics, Ecology and Resources of the Elasmobranchs

Ocean Research Institute, University of Tokyo, Tokyo, Japan. 2 days, November 1995. Japanese Society for Elasmobranch Studies. Contact: Professor Sho Tanaka, Dept. of Fisheries, Tokai University, 3-20-1 Orido, Shimizu City, 424 Japan.

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

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

Suggested themes and issues include: why do some fisheries survive while others collapse? How can fisheries resources be allocated? What is the scope for development of wild stock fisheries? What is needed to manage fisheries sustainably?

Abstracts invited by 31 August 1995. Contact the Congress Secretariat, PO Box 1280, Milton, Brisbane, Qld 4064, Australia. Fax: (07) 369 1512. Email: im@cc.qu.oz.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.

Production and distribution of this issue of *Shark News* was supported by the Columbus Zoo, Ohio, and Natal Sharks Board, South Africa.

Enquiries about the Shark Specialist Group and submissions to *Shark News* should be made to:

Newsletter Editor and Deputy Chair (Eurasia & Africa)
Sarah Fowler, The Nature Conservation Bureau Limited
36 Kingfisher Court, Hambridge Road
Newbury, Berkshire, RG14 5SJ, UK
Fax: (44) (0)1635 550230.
Email: 100347.1526@compuserve.com

Deputy Chair, (Americas & Oceania)
Dr Carl Safina, Dr Merry Camhi
National Audubon Society, Scully Science Center
550 South Bay Avenue,
Islip, NY 11751, USA
Fax: (1) 516 581 5268.
Email: internet:mcamhi@audubon.org

Designed and produced by the Nature Conservation Bureau Limited, 36 Kingfisher Court, Hambridge Road, Newbury, Berkshire, RG14 5SJ, UK.