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REPORT TO THE ICCAT SCRS ON THE PARTICIPATION IN THE 2ND ICES STUDY GROUP ON ELASMOBRANCH FISHES

Hideki Nakano and Yuji Uozumi

National Research Institute of Far Seas Fisheries
7-5-1, Orido, Shimizu 424, Japan

1. Introduction

Among marine fauna, elasmobranchs are one of the less well known groups both in terms of their biology and stock assessment. This fact seems to results from their low economical value and consequent low research priority in most fisheries institutes. However, this situation changed gradually due to the increase of public interest on the conservation of elasmobranchs (e.g., CITES) by the increasing catch both direct fisheries or as by-catch from no-target fisheries. The scientific symposia were also held in the Northwest and Northeast Atlantic, which are the annual meetings of the American Elasmobranch Society and the "Sharks, Skate and Ray Workshop" (Fowler and Earll, 1994). Other international meetings were the "United States-Japan Workshop" (Pratt, Gruber and Taniuchi, 1990) and "Sharks Down Under Conference" (Woon and Pepperel, 1991). Following this situation, the ICES established 2nd study group of elasmobranch fishes, because doubts of sustainability to exploitation was raised (Holden, 1977; Compagno, 1990; Anderson, 1990).

This study group meeting follows another ICES meeting on elasmobranch fisheries held in 1989 (Anon. 1989). The meeting was held under the chairmanship of Dr. H. da Silva (Portugal) from 15-18 August 1995 at ICES Headquarters, Copenhagen, Denmark. Seven participants from the member countries of ICES and two observers from ICCAT joined the meeting for the first time.

2. Terms of reference of ICES study group on elasmobranch fishes

The terms of reference of study group decided by the 1994 Statutory meeting of ICES are as follows:

a) review the status of elasmobranch stocks within the Northeast and Northwest Atlantic and, where possible, identify trends in biomass and recruitment;

b) identify the extent of the commercial and sport fisheries in which elasmobranchs are targeted or caught as by-catch and estimate the amount (biomass/numbers per size class) of elasmobranchs taken as catches and lost as discards;

c) describe/review the ecological role of elasmobranch species, their reproductive dynamics and predation of elasmobranchs by species or group of species;

d) coordinate techniques of age determination and age verification of elasmobranchs;

e) coordinate methods on modeling and assessment of elasmobranch stocks;

f) identify the development of compensatory mechanisms as a response to exploitation;

g) outline an action plan for attaining the goals set above.

3. Scope of the work of the study group

The group decided to list species which require information on either fisheries statistics, biology or status of exploitation in the Northeast and Northwest Atlantic, i.e., ICES and NAFO area, north of 35°N. The criteria used for the inclusion of a species in the list were based on available information about the direct and indirect capture of those species on a relatively large scale, or the likely expansion of fisheries that catch those species. The species list was attached as annex 3. In the species list, skates and rays were all amalgamated, but sharks were classified according to their habitat preferences as coastal, pelagic and deep-dwelling sharks.

4. Extent of commercial and sport fisheries

Fisheries description including type of fisheries which caught elasmobranchs, species caught by fishery and fishery statistics on the elasmobranchs were reviewed by country bases for both Northeast and Northwest Atlantic. The countries in the Northwest Atlantic are Canada and United State which consist with bottom trawl and pelagic fishery. In the Northeast Atlantic, countries including Denmark, France, German, Netherlands, Norway, Portugal, Azores, Spain, United Kingdom, Ireland, Belgium and Iceland which consist with demersal and coastal pelagic fisheries. The fishery for large pelagics, i.e., high seas fishery, was also reviewed by ICCAT observer using summary data of bycatch (ICCAT 1993). The landings and what species caught by major countries are as follows:

France

French catches of elasmobranch fishes are particularly varied; about 20 species of sharks, skates and rays are present in the commercial landings amounting to a total of 20,000 t in 1993. These landings have been decreasing over the last 15 years (40,000 t in 1981). Most species are benthic or demersal and 85% of catches are landed by trawlers. The most abundant species of sharks are *Scyliorhinus canicula* (4,441t, 21.5%) and *Squalus acanthias* (1,760t, 8.5%); the most abundant species of rays are *Raja naevus* (2,936t, 14.2%) and *Raja clavata* (1,531t, 7.4%).

Two pelagic species, *Lamna nasus* and *Prionace glauca* are caught by longliner fleet and with pelagic

nets. *Lamna nasus* is more especially fished by longliners in the Bay of Biscay and Celtic Sea; this activity is decreasing (640 t). *Prionace glauca* is landed by the tuna fleet with pelagic gillnets (187 t), longliners and coastal trawlers.

Germany

Elasmobranchs were only taken as bycatch mainly by bottom trawls and were either discarded at sea, or processed for fishmeal on board of factory trawlers. Only few selected species have been landed regularly, or at certain times for human consumption: e.g., a few skate species (*Raja spp.*) from the North Sea for local consumers at the coastline, regularly Spiny Dogfish (*S. acanthias*) for processing in a traditional way by smoking its belly lobes and body fillets, also sold fresh, and finally Porbeagle (*L. nasus*) being processed for shark steaks.

Netherlands

The Dutch fleet is composed primarily of beam trawlers which take elasmobranchs as bycatch. Data on landings of Elasmobranchs are separated into two categories: rays and sharks. Until 1970 skates were also noted as a separate category. Landings of rays from all ports have increased since about 1973. The major species landed were *Raja clavata* and *Raja montagui*. Landings of shark species have decreased since 1975/76. The major species landed was *Squalus acanthias*, most of which was exported. Porbeagles (*Lamna nasus*) were occasionally landed.

Norway

After World War II, Norway's spiny dogfish fishery grew fast and culminated in 1961 with a record catch of 31,479 t. The catch in the two following years came close, before it gradually declined and in 1986 was down to the level of 1946 (both just under 3,000 t). In the late 1980s, a spiny dogfish fishery developed in the fjords and coastal waters of Nord-Troendelag (ca. 65N), carried out by smaller local vessels, mainly with gillnets. This led to a temporary increase in landings. After a minor peak, 9,634 t in 1991 and most of it from this northern area, the trend goes down again. In recent years, only a few larger auto-line vessels have fished seasonally for spiny dogfish.

Norway's porbeagle fishery expanded in the early 1930s and reached a peak in 1933 (3,884 t). Landings in the early 1940s were low but rose to 2,824 t in 1947. Since then the trend has pointed downward for the fishery in European waters. Today the fishery is of little significance.

Basking sharks were taken for the liver oil only, but in recent years the fins have also been sold. The varying landings over the years do not give a true picture of the availability of fish. In the 1960s and 1970s more than 30 vessels would participate in the fishery for the whole or part of the season. In recent years only a few vessels take part.

Most of skates and rays are caught as by-catch in other fisheries. The catch is probably considerably higher than the recorded landings that in recent years seldom have exceeded 1,000 t.

Portugal

Skates and rays are landed from artisanal fisheries, mostly from demersal longliners. Landings of skates and rays from these fisheries have ranged between 1,000 and 2,000 t during 1986-93. Skates (Raja spp.) have not been separated by species in the national statistics.

Sharks are also caught from the fisheries mentioned above. Catches of sharks from those fisheries are mostly represented by the small-spotted catshark and the tope. To a lesser extent, the smoothhounds (Mustelus spp.) are also caught. Shark landings from artisanal fisheries ranged between 800 and 1,100 t during 1986-90.

United Kingdom and Ireland

Only spiny dogfish and rays (as a group) are presently being directed exploited in commercial fisheries around the British Isles. The greater proportion of the landings of dogfish and ray species arises as a by-catch in towed demersal gears. The Irish fleet have a seasonally directed trawl fishery for *R. montagui, R. brachyura, R. clavata*, and *R. naevus* off the east and south-east coasts.

Landings of sharks from waters along the shelf edge and in the Celtic Sea have increased since the late 1980s due to the activity of the Anglo-Spanish fleet and the advent of tuna drift-netting by a few Cornish and Irish boats.

Basking shark fishery peaked in 1951-55, when over one thousand sharks were taken annually. From 1983, a single boat targeted basking shark when they were available in the Clyde and northern Irish Sea, but this fishery has now ceased.

Canada

Spiny dogfish are the target of a new small directed fishery in the Scotia-Fundy area. Previous landings from foreign countries peaked at around 20,000 t in 1978. Stocks here have increased since the late 80's. The south Gulf of St. Lawrence fishery is also a new development. Research data suggest an increase in the abundance of spiny dogfish in the area in the last few years; no management measure are in place as the stocks are thought to be very large in relation to exploitation.

For the pelagic sharks, only the porbeagle was heavily exploited in the past, as a foreign fishery before the declaration of the 200 mile EEZ. Blue sharks and shortfin mako sharks have been caught incidentally to other pelagic fisheries for tunas and swordfish.

Fisheries for skates and rays in the Newfoundland region have increased since 1985. Survey data in several sub-areas has shown declines in the thorny skate biomass index and their average weight, and is a cause of concern. In the Scotian shelf, some estimates of by-catches are also available. Precautionary measures have been taken for this new directed fishery since 1994, and a TAC for the area is in place.

United States

Spiny dogfish biomass has increased 4- to 5-fold since the late 1960s. Total landings peaked at about 26,000 t in the mid 1970s owing to fishing by foreign fleets. US commercial landings never exceeded 5,000 t until 1981 and, from a level of about 4,200 t in 1987, increased five times to over 22,000 t in 1993. Discards from other fisheries, particularly by otter trawlers targeting groundfish, contribute an unknown but substantial fraction of the total mortality. Minimum estimates suggested 25,000 t of dogfish were discarded, of which 14,000 t killed.

Skates are frequently caught as bycatch during groundfishing operations and discarded. There are currently no regulations governing the harvesting of skates in US waters. Landing of skates off the Northeast US were 8,100 t in 1993, a 34% decrease from 12,300 t landed in 1992. Skates landings peaked in 1969 at 9,500 t, and declined quickly during the 1970s. Landings bottomed out at 500 t in 1981 and have since increased steadily.

Sharks of US Atlantic coastal waters have been exploited for many years. Due to successful food product marketing and increased sport fishing interest, exploitation increased dramatically after the first half of 1985. An intensive fishery has developed in both the Atlantic and Gulf of Mexico coastal waters. The fishery provides shark meat to domestic markets and fins for export to Asian markets. The major species group is composed of sandbar, blacktip, bull, spinner, dusky, bignose, night, lemon, tiger, sand tiger, nurse, silky, scalloped hammerhead and great hammerhead sharks. Other smaller sharks including fine tooth, black nose, and Atlantic sharp nose are also caught, but existing fishery targets the larger species.

Fisheries for large pelagics (ICCAT area)

The fisheries target large pelagics is composed longline, bait boat, gillnet, troll, harpoon and trap fisheries. Sport fishery also exist in some countries. Species list of elasmobranchs caught are available only for some fisheries and countries. It includes both coastal and pelagic species. Pelagic species commonly reported among fisheries are *Alopias superciliosus, A. vulpinus, Isurus oxyrinchus, I. paucus, Lamna nasus, Carcharhinus falciformis, C. longimanus, and Prionace glauca.*

5. Stock status

Stock status of major species caught by fishery which include spiny dogfish, porbeagle, basking shark, blue shark, kitefin shark, and, skates and rays for Northwest Atlantic and porbeagle, blue shark, shortfin mako, spiny dogfish, coastal sharks and skates for Northeast Atlantic were reviewed by country bases. Estimation of the stock status was conducted by various index by species and country, e.g., CPUE, catch, production model, and simulation model. The followings are topics of Northeast elasmobranch stock status.

Basking shark

The basking shark is widely distributed in the north-east Atlantic and, in most cases, the fishery takes place opportunistically whenever the sharks are available in shallow water (netting) or near the surface (harpooning). While there is evidence in the fishery data of apparent rapid declines in "local populations", the high variability in catchability, seasonally and from year to year, and the fluctuations in fishing effort do not allow firm conclusion on the species' status to be made.

Blue shark

CPUE data are available from recreational rod-and-line fisheries around the coasts of Ireland and south west England. The Irish fishery has taken a relatively stable annual catch of around 500 blue shark each year since 1978, during which time catch per boat day has varied between 1.34 and 4.18, with no discernible trend. These fish are part of a very extensive North Atlantic stock. It might be argued, therefore, that trends in local CPUE cannot be used to infer abundance changes or stock status, and that catch trends elsewhere (e.g., in tuna longline and gill-net fisheries) are also important.

Spiny dogfish

CPUE data are available either from commercial fisheries or research vessel surveys for most sea areas around the British Isles. These series suggest that the population in the North Sea increased in abundance between 1967 and 1977, when it is thought that there was a migration of *S. acanthias* into the North Sea, and then returned to the level observed in the early 1960s. The abundance of spiny dogfish might fluctuate widely in a particular sea, irrespective of the overall stock trends, and that short time of series (i.e., less than 15-20 years) are not useful for indicating the stock status of such a species which move wide range in a long-term.

Spiny dogfish is currently one of the most abundant demersal species in the Northwest Atlantic. It is observed that spiny dogfish biomass has increased 4- to 5-fold since the late 1960s by application of surplus production model.

Kitefin shark in Azores

There is a study of Fox's exponential surplusyeild model applied the Azorean kitefin shark fishery over the period 1977-1986. However, status of stock was not well described.

Skates in the Northwest Atlantic

Survey abundance indices for all species of skates combined are expresses as minimum population estimates from area-swept calculations, smoothed to better reflect resource trends. Over the time series from 1968 to 1994, smoothed survey indices for skates reveal three distinct trends. A slight decline in abundance occurred from 1968 to 1979, when a series low of 81,000 t was observed. Since 1980, the survey index has increased significantly, reaching its highest point in the time series, 151,000 t, in 1987. Since then, the abundance index has again declined somewhat, although values have remained well above the long-term (1968-1992) average of 112,000 t.

In some areas where skates are fully utilized, their number have been reduced to extremely low level (e.g., Irish Sea). Similarly, particularly vulnerable species in the Northwest Atlantic (e.g., barndoor

skate) appear to show signs of recruitment overfishing. The abundance of winter skate has declined in recent years on Georges Bank.

Skates in Canadian waters

The biomass indices from survey cruises in Newfoundland and Scotian shelf have shown various degrees of decline since 1976 for the first case and since 1986 for the second case. Most of these changes in abundance are attributable to thorny skate declines. This declines are correlated with declines in mean size and with a smaller size at maturity. Data from thorny skates suggests that these populations are sedentary, with limited movements in the region, and that this species can reach at least 20 years of age.

Although available information was often insufficient and fishery statistics including research data mixed with species in some cases, the group did not find any critical situation on the stock status of the species mentioned above. However, some skates in Canadian fishery and Northwest Atlantic indicated decline of the abundance.

6. Discussion on the biological aspect of elasmobranch fishes

The group discussed biological aspect of elasmobranchs, i.e., reproductive dynamics, ecological role of elasmobranchs, and age determination and verification.

On the concern of reproductive dynamics, elasmobranchs are considered K-strategists, which are characterized by slow development, late maturity, small reproductive effort, few young and long life. However, the flat growth curves exhibited by many species once they have reached maturity suggest that their reproductive effort is actually high. Thus, mortality, which plays a trade-off with reproduction and growth, is reduced. This reduced mortality is evidenced by the high longevity and iteroparity exhibited by elasmobranchs.

There are around 870 species of elasmobranchs, which occupy most ecological niches. Species range from sedentary benthic rays through filter feeding rays and sharks to fast swimming pelagic sharks. The ecological role of elasmobranchs concerned their potential impact as a predator and/or food competitor with other species. The example of replacement between teleost and elasmobranchs, i.e., between cod and dogfish and between flounder and skate were reviewed.

Not much is known about age and growth of elasmobranchs except several species. Verification of age was done much less species. The group discussed several technique of age determination and verification. Further study on age determination is necessary for the stock assessment.

7. Compensatory mechanisms

Stock-recruitment models are of major importance in fisheries science because the response of fish populations to exploitation will be greatly influenced by the response in recruitment to different levels of spawning stock biomass.

Though little is known about the nature of recruitment in elasmobranch fish populations, their large size
at birth, and consequent lower variability in mortality rates, should result in more deterministic processes than the processes observed in teleosts. There is some evidence that the fecundity of some elasmobranch populations has changed in a compensatory way. In any case, the plasticity of an elasmobranch population for changes in fecundity should be small.

The stock-recruitment analysis applied to the Northwest Atlantic population of spiny dogfish indicated compensatory mechanisms strong enough to inflect the stock-recruitment relationship. However, the group concluded that these results should not be extrapolated to other Elasmobranchs, since spiny dogfish is known to be one of the few species that has sustained long-term exploitation.

8. Recommendation and future plan

Following the discussion mentioned above, the group recommend several action to the Demersal Fish Committee of the ICES in 1995. Recommendations includes to change ICES fisheries statistical data base, should be divided into details including some species bases, to require the countries collecting fishery statistics by species, to stress the need of biological research on elasmobranchs, and to hold next study group meeting on elasmobranchs near future, if possible with cooperation of another international fishery committee, e.g., NAFO, ICCAT.

9. Comments as observers of ICCAT

The fisheries in the ICES area, north of 35°N, are mainly demersal ones and then benthic elasmobranchs are major concerned, while tuna-related fisheries and pelagic elasmobranchs are of major concerned of the ICCAT. Some pelagic species caught by major fisheries in the ICES area are seasonal migrants which have a large extent of distribution. Therefore, the ICCAT is expected as a main body which has responsibility for research and stock assessment of such species. In the case of the ICES, there are accumulation of the fishery statistics and research data on some benthic elasmobranch species, because it has a long history and huge effort of research activity. Thus, the study group could conclude on several major items including the stock status of some species. In the ICCAT, research effort should be urgently increased for collecting statistics on bycatch species, making future research plans and as well as assessing the impact of tuna fisheries. It is beneficial to maintain and development closer links between ICCAT and ICES and other fishery organization in exchange of knowledge on the elasmobranchs.

References

Anderson, E.D. 1990. Fishery models as applied to Elasmobranchs fisheries. *In* Elasmobranchs as Living Resources: Advances in the Biology, Ecology, Systematics, and the Status of the Fisheries (H.L. Pratt, Jr., S.H, Gruber, and T. Taniuchi, eds.) U.S. Dep. Commer., NOAA Tech.
Rep. NMFS 90. 473-484.

Anon. 1989. Report of the study group on elasmobranch fisheries. ICES C.M. 1989/G:54. 35pp.

Compagno, L.J.V. 1990. Shark exploitation and conservation. *In* Elasmobranchs as Living Resources: Advances in the Biology, Ecology, Systematics, and the Status of the Fisheries (H.L. Pratt, Jr., S.H, Gruber, and T. Taniuchi, eds.) U.S. Dep. Commer., NOAA Tech. Rep. NMFS 90. 891-414.

Fowler, S.L. and Earll, L.C. (eds) 1994. Proceedings of the second European Shark and Ray Workshop, 15-16 February 1994. Tag and Release Schemes and Shark and Ray Management Plans. Unpublished Report.

Holden, M.J. 1977. Elasmobranchs. *In* Fish Population Dynamics (J.A. Gulland, ed). John Wiley and Sons, New York. 187-215.

ICCAT Secretariat. 1994. Summary of the survey of tuna fisheries by-catch, 1993., ICCAT Coll. Vol. Sci. Pap. XLII (2): 442-451.

Pratt, H.L., S.H. Gruber and T. Taniuchi (eds) 1990. Elasmobranchs as living resources: Advances in the biology, ecology, systematics, and the status of the fisheries. U.S. Dep. Commer., NOAA Tech. Rep. NMFS 90. 391-414.

Woon, P. and J. Pepperell. 1991. Sharks Down Under: Conference schedule and abstracts. Sydney Taronga Zoo, 24 February-1 March, Sydney, Australia.

ANNEX 1. Participants list joined the study group on elasmobranch fishes in the ICES.

R. Bonfil-Sanders	Canada
M.H. DuBuit	France
S. Mykklevoll	Norway
H. Nakano	ICCAT (Observer)
M.G. Pawson	UK
H.M. Silva	Portugal (Chairman)
M. Stehmann	Germany
Y. Uozumi	ICCAT (Observer)
P. Walker	Netherlands

ANNEX 2. List of documents submitted in the study group on elasmobranch fishes in the ICES.

Bradziak, J., P. Rago, and K. Sosebee. (Draft). Application of a biomass dynamics model to the spiny dogfish stock in the northwest Atlantic. NMFS Northeast Fisheries Science Center. 39Pp.

ICES 1995a. 6.5 Deep-water fisheries resources south of 63°N. *In* the Report of the ICES advisory committee on fishery management, 1994. Part 2. ICES cooperative research report. 69-127.

ICES 1995b. Report of the study group on the biology and assessment of deep-sea fisheries resouces. ICES C.M. 1995/Assess:4 Ref.:G. 91pp.

Rago, P.J., K.A. Sosebee, J.K.T. Brodziak, S.A. Murawski, and E.D. Anderson. (Draft). Distribution and Dynamics of Northwest Atlantic spiny dogfish (*Squalus acanthias*). Northeast Fisheries Science Center Reference Document 94-19.

Silva, H.M. 1987. An assessment of the Azorean stock of kitefin shark, *Dalatias licha* (Bonn, 1788). ICES. C.M. 1987/G:66. 10Pp.

Silva, H.M. 1993. A density-dependent leslie matrix-based population model of spiny dogfish, *Squalus acanthias*, in the NW Atlantic. ICES. C.M. 1993/G:54. 17Pp.

Simon, J.E. And K.T. Frank. 1995. An assessment of the skate Fishery in division 4VsW. DFO Atlantic Fisheries Research Document 95/71. 41pp.

Vas, P. 1995. Viewpoint: The status and conservation of sharks in Britain. Aquatic conservation: Marine and Freshwater ecosystems, (5): 67-79.

ANNEX 3. Species listed in the study group on elasmobranch fishes in the ICES.

ELSMOBRANCH SPECIES LIST (NE ATLANTIC)

Skates and rays

Raja batis	Blue skate
Raja brachiura	Blond ray
Raja circularis	Sandy ray
Raja clavata	Thornback ray
Raja fullonica	Shagreen ray
Raja montagui	Spotted ray
Raja naevus	Cuckoo ray
Raja nidarosiensis	Norwegian skate
Raja oxyrinchus	Longnose skate
Raja radiata	Starry ray

Sharks

Coastal sharks

Cetorhinus maximus	Basking shark
Galeorhinus galeus	Tope shark
Mustelus mustelus	Smoothhound
Mustelus asterias	Starry smoothhound
Scyliorhinus canicula	Small-spotted catshark
Scyliorhinus stellaris	Nursehound
Sphyrna lewini	Scalloped hammerhead
Sphyrna zygaena	Smooth hammerhead
Squalus acanthias	Spiny dogfish

Pelagic sharks

Alopias vulpinus	Thresher
Alopias superciliosus	Bigeye thresher
Isurus oxyrinchus	Shortfin mako
Lamna nasus	Porbeagle
Prionace glauca	Blue shark

Deep-dwelling sharks

Apristurus spp.	Deep-water catsharks
Centrophorus granulosus	Gulper shark
Centrophorus squamosus	Leafscale gulper shark
Centroscillium fabricii	Black dogfish
Centrosymnus coelolepis	Portuguese dogfish
Centrosymnus crepidaper	Longnose velvet dogfish
Dalatias licha	Kitefin shark
Deania calcea	Birdbeak dogfish
Deania profundorum	Arrowhead dogfish
Etmopterus princeps	Great lanternshark
Etmopterus pusillus	Smooth lanternshark
Etmopterus spinax	Velvet belly
Galeus melastomus	Blackmouth catshark
Heptranchias perlo	Sevengill shark
Hexanchus griseus	Sixgill shark
Odontaspis ferox	Smalltooth sand tiger
Scymnodon ringens	Knifetooth dogfish
Somniosus microcephalus	Greenland shark
Somniosus rostratus	Little sleeper shark

ELSMOBRANCH SPECIES LIST (NW ATLANTIC)

Skates and rays

Raja eglanteria	Clearnose skate
Raja erinacea	Little skate
Raja garmany	Leopard skate
Raja laevis	Brandoor skate
Raja ocellata	Winter skate
Raja radiata	Starry ray/Thorny skate
Raja senta	Smoothtailed skate

Sharks

Coastal sharks

Carcharias taurus	Sand tiger shark
Carcharhinus acronotus	Blacknose shark
Carcharhinus altimus	Bignose shark
Carcharhinus brevipinna	Spinner shark
Carcharhinus falciformis	Silky shark
Carcharhinus isodon	Fine-tooth shark
Carcharhinus leucas	Bull shark
Carcharhinus limbatus	Blacktip shark
Carcharhinus obscurus	Dusky shark
Carcharhinus perezi	Coral reef shark
Carcharhinus plumbeus	Sandbar shark
Carcharhinus porosus	Small tail shark
Carcharhinus signatus	Night shark
Carcharodon carcharias	White shark
Cetorhinus maximus	Basking shark
Galeocerdo cuvier	Tiger shark
Ginglymostoma cirratum	Nurse shark
Mustelus canis	Dusky Smoothhound
Negaprion brevirostirs	Lemon shark
Odontaspis noronhai	Bigeye sand tiger shark
Rhincodon typus	Whale shark
Rhizoprionodon porosus	Caribbean sharpnose shark
Rhizoprionodon terraenovae	Atlantic sharpnose shark
Sphyrna lewini	Scalloped hammerhead
Sphyrna mokarran	Great hammerhead
Sphyrna tiburo	Bonnethead shark
Sphyrna zygaena	Smooth hammerhead
Squatina dumeril	Atlantic angel shark
Squalus acanthias	Spiny dogfish

Pelagic sharks

Alopias vulpinus	Thresher
Alopias superciliosus	Bigeye thresher
Carcharhinus longimanus	Oceanic whitetip shark
Isurus oxyrinchus	Shortfin mako
Isurus paucus	Longfin mako
Lamna nasus	Porbeagle
Prionace glauca	Blue shark

Deep-dwelling sharks

Centrophorus granulosus	Gulper shark
Centrophorus squamosus	Leafscale gulper shark
Heptranchias perlo	Sevengill shark
Hexanchus griseus	Bluntnose sixgill shark
Hexanchus vitulus	Bigeyed sixgill shark
Odontaspis ferox	Smalltooth sand tiger