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**REPORT OF THE
STUDY GROUP ON ELASMOBRANCH FISHES**

By Correspondence

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1 INTRODUCTION

1.1 Participants

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M. Pawson	UK
P. Rago	USA
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1.2 Terms of reference

The Demersal Fish Committee recommends that:

The Study Group on Elasmobranch Fishes (Chairman: Dr. P. Walker, Netherlands) will work by correspondence in 1998 to:

- a) prepare a report in 1998, outlining the progress made in recent initiatives in elasmobranch research, which will include the following:
 - i) an outline of the work done by the Study Group on the Assessment of Other Species And Shellfish (SGASSO), in exploring methods of evaluating the status of elasmobranch stocks,
 - ii) a summary of scientific work by ICES member countries on the biology and status of spurdog/spiny dogfish (*Squalus acanthias*) stocks,
 - iii) an outline of initiatives taken by international organisations, e.g. ICCAT and FAO, to evaluate the stock status of particular (mostly targeted) species,
 - iv) a summary of the existing USA and proposed Canadian Shark Management Plans,
 - v) an outline of initiatives taken in the USA and Europe (through the EEA (European Elasmobranch Association)) relative to shark tagging programmes;
- b) compile the available information on the species-specific catch data, distribution, abundance and biology of the NE and NW Atlantic spurdog/spiny dogfish (*Squalus acanthias*) stocks in order to review and evaluate the geographical distribution, life history patterns and compensatory mechanisms exhibited by the species, using the outcome of the SGASSO as a theoretical framework;
- c) provide clear guidelines and terms of reference in relation to ICES' need for information on elasmobranch stocks and identify the actions ICES needs to take;
- d) identify the foundations for the establishment of an Elasmobranch Working Group, in which ICES co-operates with other scientific and management bodies.
- e) plan a meeting in 1999.

SGEF will report progress to the Living Resources Committee at the 1998 Annual Science Conference and to ACFM before its October 1998 meeting.

2 BACKGROUND

The Study Group on Elasmobranch Fishes met in 1997 with the aim of carrying out analytical assessments and evaluating the effects of exploitation on chosen stocks; to prepare identification sheets; to re-evaluate the ICES species coding and to consider the status of the Study Group.

The Group succeeded only partially in carrying out analytical assessments and evaluating the effects of exploitation on chosen stocks due to lack of data and member representation. However, the other objectives were met more fully. The identification sheets are ready and funding is being sought for their publication; the new species coding has been passed on to FAO (although there was some uncertainty about the category 'non-Rajidae rays or skates nei' which should cover the case where a ray/skate have been identified as a Rajiformes and at the same time determined not to belong to the Rajidae family, the name given was 'Rajiformes non-Rajidae'). See Section 12 below. The past year has seen a number of new initiatives in the management and conservation of elasmobranchs and it was felt that the Study Group should follow, participate in and evaluate these initiatives, in view of its own terms of reference. Therefore, it was decided to work by correspondence in 1998 and to report to the Annual Science Conference in Lisbon in September. In October 1997 the SGEF presented the 1997 report to ACFM, and a short piece on skates and rays in the North Sea was included in the ACFM 1997 report.

In January 1998 a precautionary TAC for Skates and Ray of 6060 metric tonnes was introduced in the North Sea. This level is based on landing statistics from the past 5 years. The precautionary nature of the TAC is from the point of view of allotment of fishing rights in the North Sea, and not necessarily from a biological perspective.

Canada has applied a TAC of 1000 t in 1997 and 1998 to its Northwest Atlantic porbeagle fishery. This is a reduction in the TAC from 1500 t in 1995 and 1996. Before then, there was no TAC in place.

3 STUDY GROUP ON THE ASSESSMENT OF OTHER SPECIES AND SHELLFISH (SGASSO)

In 1997 the SGASSO used a number of data sets to explore alternative methods of assessing marine species, including elasmobranchs. SGASSO recommended at its 1997 meeting that in 1998 it would concentrate on unassessed species in the North Sea, including skates and rays, as follows (Report of Study Group on the Assessment of Other Species and Shellfish, October 1997, ICES CM 1998/ACFM:8).

"Taking the intense survey, market and discard sampling activity into account, North Sea species seems to be an obvious choice for assessment in this group. The non-assessed species can be divided into three groups:

1. Deep (or medium deep) water species for which the North Sea area is marginal to the stock distribution.
2. Species where the North Sea might be an appropriate area for stock definition.
3. Rays and skates where overfishing is a recognized problem."

In 1998 SGASSO will meet in August, after the SGEF report has been submitted. It is hoped to give a verbal account of the relevant details at the 1998 ASC in Lisbon.

4 A SUMMARY OF SCIENTIFIC WORK BY ICES MEMBER COUNTRIES ON THE BIOLOGY AND STATUS OF SPURDOG (*SQUALUS ACANTHIAS*) STOCKS

The available published data were treated extensively in the 1997 report of the SGEF (ICES, 1997). Since then, three reports have appeared in which spurdog has been treated, two for the spiny dogfish stock in the Northwest Atlantic (NEFSC 1998 a, b) and one by Pawson and Vince (1998) which covers shark fisheries in the Northeast Atlantic.

NEFSC (1998a) provides the most recent assessment of spiny dogfish in the Northwest Atlantic. Information is provided on: temporal/spatial patterns and biological characteristics (size/sex) of the commercial landings (1962-1997), trends in recreational landings (1981-1996), estimated discards, research vessel survey relative abundance and biomass indices (1967-1997), and research vessel size/sex frequency distributions (1968-1997). Estimates of total and fishable biomass (1968-1997) were derived using the swept-area method applied to the survey data. Annual fishing mortality rates during 1982-1997 were estimated using a 'change-in-ratio' method applied to male and female spiny dogfish survey abundance indices, and also by the length-based Beverton and Holt method using the length frequency distributions in the commercial landings and the spring research vessel trawl surveys. A size and sex-structured equilibrium model incorporating known life history parameters was used to estimate yield per recruit and female pups per recruit for various levels of F and minimum size at entry to the commercial fishery.

The assessment results indicate (NEFSC 1998b: p. 2) that:

"The spiny dogfish stock in the Northwest Atlantic has begun to decline as a consequence of the recent increase in exploitation. Swept-area estimates of the fishable biomass (defined as ≥ 80 cm fish) increased six-fold from 1968 to [a peak of about 300,000 mt] in 1989 [but] have since declined to less than 150,000 mt. Research vessel survey data document a steady increase in both abundance and biomass since the early 1970s, but total biomass indices in the last several years have been stable at 600,000 mt. Owing to the targeting of females in the landings, the estimated minimum biomass of females ≥ 80 cm has declined more sharply than the combined male-female ≥ 80 -cm biomass. Length frequency data from US commercial landings and research vessel survey catches indicate a pronounced decrease in average length of females in recent years. In 1997, 75% of the females landed in the NEFSC spring trawl survey were below the length at 50% maturity."

"The estimated number of pups per recruit is below 1.0, and yield per recruit is less than 0.9 kg (maximum yield per recruit of 1.2 kg occurs at an F of 0.25 [assuming $M = 0.092$ based on an assumed longevity of 50 years]). The average F during 1994-1996 was 0.25, and was projected to be 0.41 in 1997. Thus, it is likely that current fishing mortality rates will result in negative replacement, and the stock will eventually decline. Removal of a large fraction of the spawning stock since 1990 will likely reverse the increase in population biomass that occurred in the late 1970s and 1980s. Biomass of males and immature females in the 36-70 cm range should decrease over the next decade as the small cohorts produced in the 1990s grow. Moreover, replacement of the spawning stock, i.e., accumulation of large females in the 100-cm range, could take another decade."

The management advice developed/rendered for this stock at the 26th Northeast Regional Stock Assessment Workshop (NEFSC 1998b; p. 28) was:

"In order to establish a long-term sustainable fishery, F should be reduced to a threshold level of about 0.13. This rate of fishing mortality, which is about half the recent average, is the level associated with both maximum yield per recruit and a female pup per female recruit of 1.0 at a length of entry to the fishery of about 70 cm, and can be viewed as a candidate overfishing reference point. Given the evidence for a single unit stock in the Northwest Atlantic, coordinated assessment and management of this stock with Canada should be considered."

The Stock Assessment Workshop categorized the spiny dogfish stock as "over-exploited". In April 1998, based on the Stock Assessment Workshop's determination, the stock was officially identified as "overfished" by the US National Marine Fisheries Service and notification was given to the Mid-Atlantic and New England Fishery Management Councils (which share joint management responsibilities in the US for spiny dogfish) that a fishery management plan must be developed within one year (i.e., by 3 April 1999) that will end overfishing and rebuild the stock. Since April, the two Management Councils have been actively engaged in developing a Spiny Dogfish Fishery Management Plan.

Pawson and Vince (1998) set the available data on spurdog in the NE Atlantic in the framework of fishery management, the management planning process, conservation and trade. The report includes information on geographical range, distribution of the fishery, fishery statistics and an overview of published information on stock assessment and life history models. No steps have yet been taken to manage the species.

5 AN OUTLINE OF INITIATIVES TAKEN BY INTERNATIONAL ORGANISATIONS E.G. ICCAT AND FAO TO EVALUATE THE STOCK STATUS OF PARTICULAR (MOSTLY TARGETED) SPECIES

5.1 ICCAT

The following information is from a personal communication from P.M. Miyake (ICCAT Secretariat).

In 1994, following a proposal by CITES to list several shark species as endangered at the 9th Meeting of the Conference of Parties to CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora), ICCAT agreed at their Standing Committee on Research and Statistics (SCRS) to carry out a survey to ascertain shark bycatch species. In 1995 it was concluded that under the mandate of the Commission "ICCAT has responsibility for collecting information on catches of sharks and other fishes which are coincidental to fishing effort directed toward tuna and tuna-like species". FAO was recognised as being the focal point for data collection of shark catches and that other regional agencies should collaborate with FAO.

5.2 FAO

5.2.1 Introduction and objectives

In October 1998, FAO will hold a Consultation on the Conservation and Management of Sharks in Rome. Prior to this a meeting of the Technical Working Group (TWG) on Sharks was held in Tokyo between 23 and 27 April, with the main objective of reviewing draft Guidelines and Plan of Action for the Consultation. The TWG consisted of 20 experts, 9 observers, a technical secretariat (4 members and an advisor) and 3 representatives from FAO. It was chaired by Dr. Suzuki of Japan. A list of participants is provided in Appendix I.

In the context of the documents prepared by FAO and for this report, the term 'shark' is used to mean all Chondrichthyans, including sharks, rays, skates and chimaera's. Obviously not all aspects of the guidelines and plan of action will be relevant to all the taxonomic groups or species and note has been made of this accordingly.

This paper will present an overview of the results of the meeting and some of the discussions. During the meeting the views and scientific arguments of all participants was taken into consideration and the expertise of those involved has been recognised. Any mistakes in this brief overview are all my own.

5.2.2 Working strategy

A number of documents had been prepared by FAO prior to the meeting. Some were to function as background documents for information only, others were draft versions of future FAO reports. The following documents were made available:

Working papers for the TWG:

- Draft notes on Guidelines and Plan of Action.
- Guidelines for the Conservation and Management of Elasmobranchs.
Part I: Directed Fisheries.
Part II: Bycatch.
- Introduction to an Action Plan on Management of Elasmobranch Fisheries.

Papers for the direct support of the work of the TWG:

- An overview of Shark Fisheries by Region.
- Review of data needs for Shark Management.

(FAO) Documents in preparation pertinent to sharks, only for reference and unofficial for the TWG (expected publication date in brackets):

- Status of Shark Species (June 1998).
- FAO Case Studies in Management of Elasmobranch Fisheries (October 1998).
- Shark Species Catalogue (February 1999).
- Shark Utilisation, Marketing and Trade (December 1998).

Most of the work occurred during plenary sessions of the TWG, but for the discussion of the guidelines for conservation and management, two sub-groups were formed, which later reported to the plenary. The reports of the two groups will be included as an appendix in the final report as presented at the Consultation in October.

5.2.3 Guidelines and Plan of Action

The draft guidelines as circulated by FAO were divided into those for directed fisheries and bycatch fisheries. This was considered to lead to a large degree of repetition as many of the aspects will be the same and it was decided to combine the two and to elaborate when necessary. Two working groups were set-up dealing with: (i) data needs for conservation and management; and (ii) management itself.

Introduction

An introduction to the guidelines and plan of action was drawn up with the following points:

- Background: i.e. the global increase in shark landings and relatively low productivity of many shark species; the lack of public awareness for the conservation needs of sharks; and the low market value (and hence research priority) of the species.
- Guiding principles: biological sustainability and 'rational long-term use'; maintenance of biodiversity of sharks and their ecosystem structure and function; the 'precautionary approach' where the absence of adequate scientific data should not be a reason for postponing or failing to take conservation or management measures (although it was felt that some sort of discussion as to when to apply the precautionary approach was needed as well as the citation from the relevant passage in the FAO Code of Conduct); and the that the interests of fisheries and fishermen are recognised.
- Specific problems associated with the management of shark stocks including the taxonomic problems especially for batoids, lack of catch and effort data, lack of biological parameters, that multispecies fisheries take a variety of species with different potential for sustainable use, heading gutting and finning sharks at sea makes it difficult to identify species, lack of data on critical habitats, little facility to co-ordinate collection of data on trans-boundary species and, last but not least, lack of funds.
- Shark management needs to be highlighted in respect to that of other (teleost) species because of the greater problems of identification to species level, the close stock-recruitment relationship, the long recovery times in response to overfishing and the complex spatial structure (size/sex segregation).
- Objectives of the conservation of sharks were described as: protect biodiversity and ecosystem structure and function; control threats to shark populations by implementation of harvest strategies; improve and develop frameworks for establishing and co-ordinating effective consultation; and identify and pay special attention to particularly vulnerable or threatened species.

Guidelines

The draft guidelines for data needs for conservation and management highlighted the following:

- Estimation of catches and effort (data requirements, methodology, supporting activities).
- Stock structure and migration - especially for highly mobile species.
- Fishery independent abundance indices - i.e. research surveys.
- Biological information.
- Monitoring of catch information (size/sex).
- Life history information (age and size at maturity, breeding cycle, fecundity).
- Ecological information (trophic relationships, behaviour).
- Economics of the fishery.
- Social aspects of the fishery.
- Marketing and international trade data.

The draft guidelines for management included the following points:

- Improving the reporting and recording of captures, landings and trade.
- Management measures.
- Using established regional bodies to lead co-ordinated efforts in data collection, co-operative research and developing appropriate comprehensive management measures; these measures could then be implemented by national bodies.
- Management of a multispecies fishery: taking biology of all species into account, attention for least productive, technological improvements of management measure to mitigate impacts on shark populations and fishermen themselves.
- Compliance with international guidelines.
- Socio-economic issues.
- Ethical and moral issues concerning finning. No consensus was reached and no guideline was formulated. This aspect was discussed in plenary and wording was added to the plan of action on resource utilisation, from a management and not an ethical point of view.

Plan of Action

The draft Plan of Action as proposed by the TWG includes the following:

Introduction:

- The introduction stresses the need for nations and/or regional management bodies to develop national or regional plans of action to apply the Guidelines for the Conservation and Management of sharks.

Categories of action:

- Data and research information - i.e. mechanisms for improving and disseminating (species) data collection; international programmes for transboundary species; establish internet web page; update 1984 FAO Shark Catalogue and develop catalogues for skates and rays (batoids) and chimaeras; development of a procedures manual.
- Legal frameworks for national implementation of the plan of action.
- Mechanisms for implementing management - i.e. extending the responsibilities of existing bilateral, multilateral and international bodies which have responsibility for the provision of fisheries management advice on sharks and where necessary establish new agreements; establish international mechanism to co-ordinate and review the implementation of the Plan of Action; provide for management of total fishing mortality for sustainability, study methods for obtaining compliance, provide adequate enforcement.
- Human resources capacity building - i.e. regional training workshops on shark research, species identification and monitoring procedures (together with proposed procedures manual); facilitate development of shark research, monitoring and management.
- Funding - without adequate funding implementation of Plan of Action will be impeded; seek additional funds and take advantage of 'The Year of the Ocean'.
- Resource utilisation - i.e. increased utilisation of sharks caught.
- Once regional agencies are identified establish Ad Hoc Group to co-ordinate and monitor progress on world wide basis; such a group should likely be developed under auspices of FAO.

5.2.4 Discussion

The above is an overview of the work achieved by the TWG during the course of the meeting. Obviously with such a large and varied group, many aspects of conservation and management were discussed in detail, some of which have not resulted in guidelines or points in the plan of action.

Although the TWG has indicated a certain priority in data needs and action points, it was felt to be outside the remit of the group to recommend actions or species which deserve the most attention. It is clear that regional and/or national experts are best suited to implement the guidelines and plan of action and to define priorities. In this respect, the work done by the TWG should provide much needed support for the process of elasmobranch conservation and management. The group has succeeded in pooling its expertise and has presented a wealth of information to FAO, which will be a backbone for the October consultation. If FAO continues to take the lead in this extensive co-ordination of expertise, as was suggested at the meeting, then it has laid the foundations for a global working group on Chondrichthyans. Such a large scale approach is necessary for two reasons: (i) the paucity of resources (including personnel); (ii) the wide ranging distribution of many Chondrichthyan species.

As far as ICES is concerned the mechanism for implementation of management measures is already in place. Management advice on elasmobranchs has not been given up until now due to the lack of adequate stock assessment models and data, precisely as emphasised above. However, there are a number of species for which the Study Group could reasonably be expected to give advice in the future, e.g. spurdog (*Squalus acanthias*) and skates and rays (*Raja* spp.) and priority should be given to those. However, priority must also be given to highlighting the need for information on those species which, despite a lack of detailed knowledge, can be expected to be especially vulnerable to overexploitation, such as the deep-water sharks. Inclusion of other species in a management advice procedure such as blue shark, mako or kitefin shark, is dependent on the proposed contribution of members from southern Europe, e.g. Portugal and Spain. However, due to the wide ranging distribution of the species they are not adequately covered by ICES surveys. In this respect, the work done by ICCAT in reporting shark catches to FAO should be taken into account as this will provide a database for management advice. The blue shark would be a good species on which the Study Group could concentrate its activities in this respect.

6 A SUMMARY OF THE US AND CANADIAN SHARK MANAGEMENT PLANS

6.1 USA-Atlantic Sharks Fishery Management (the following information was supplied by Margo Schulze and Rebecca Lent of NOAA and is given in detail in Appendix II)

6.1.1 Background and objectives

History

On June 30, 1989, 5 Fishery Management Councils asked the Secretary of Commerce to develop a Shark Fisheries Management Plan (FMP). The major concerns were:

- Late maturity & low fecundity of sharks.
- Increasing fishing mortality.
- Possible overfishing of the resource.

The Councils requested a ap on commercial fishery; the establishment of a recreational bag limit; the prohibition of "Finning"; and that a data collection system should be set up. The first draft was drawn up in October, 1989; second draft in April, 1991; and the third draft in October, 1991. The final FMP/FEIS was given preliminary approval December, 1992 and the final FMP was implemented in April, 1993.

Objectives

- Prevent overfishing of shark resources.
- Encourage management of stocks throughout ranges.
- Establish data collection, research & monitoring.
- Increase benefits to US while reducing waste.

The Shark Fisheries Management Plan manages 39 species in 3 groups (large coastal, pelagic and small coastal) and deals with commercial and recreational fisheries. The current status of the 3 groups is: large coastal (22 species) - overfished; pelagic (10 species) - fully fished; and small coastal (7 species) - fully fished.

A complete overview of the Shark Fisheries Management Plan and the species concerned is given in Appendix II.

6.2 Canada - Canadian Atlantic Pelagic Shark Integrated Fishery Management Plan 1997 - 1999.

The major points are summarised here and the details are given in Appendix III.

6.2.1 Executive summary

As a result of the downturn in the traditional groundfish fisheries, there has been a rise in Canadian interest to exploit large pelagic sharks off Canada's East coast. Since sharks are typically slow growing and produce few young per year, their life history characteristics makes them highly susceptible to over-exploitation. Scientific information on the stock status of sharks is limited. This management plan is intended to provide the basis for a Scientific Monitoring Fishery by enabling a minimum number of Canadian exploratory shark fishing licences to direct for shark while providing detailed scientific data on stock abundance and distribution. The information derived from this Scientific Monitoring fishery will be used to determine whether or not a commercial shark fishery is sustainable after 1999 and, if so, under what conditions.

6.2.2 Management Objectives/Issues

Pelagic sharks have been exploited on Canada's east coast since the 1960's. The downturn in the traditional groundfish fisheries has raised recent interest in these resources. First discussions on an Atlantic management plan for pelagic sharks were undertaken in 1994 with an interim plan developed for 1995 (Anon. 1995). This plan was rolled over into 1996, with minor modifications, to provide time for the development of the more comprehensive plan given herein.

This plan is designed to govern the exploitation of the following shark species during 1997 - 1999:

- porbeagle.
- blue.
- shortfin mako and other sharks, excluding spiny dogfish.

The long-term vision of this Plan is the maintenance of a biologically sustainable resource supporting a self-reliant fishery. Conservation will not be compromised and a precautionary approach will guide decision-making. The objectives are:

- To provide for a reasonable scientific basis for management. This implies the collection of information essential to assess the health and potential of shark stocks in Canadian waters and which allow establishment of yield and effort levels for long-term sustainable harvesting.
- To control the commercial and recreational shark fisheries in Atlantic Canada so that they are economically viable in the long-term.
- To foster partnerships with the industry on the scientific study and management of this resource.

The fishery is at the exploratory, commercial and stock assessment stage, in which the emphasis is on determining whether or not the resource can sustain a commercially viable operation and collecting scientific data in order to build a preliminary database on stock assessment and distribution. For the duration of this Plan, fishing licences will remain exploratory.

The Plan further covers strategies and performance indicators, the domestic consultative process, international considerations and management measures such as licensing, quota/precautionary catch levels, by-catch restrictions, processing of caught and/or landed shark, gear restrictions, fishing season/area restrictions, monitoring of fishing activities.

7 AN OUTLINE OF THE INITIATIVES TAKEN IN THE USA AND EUROPE RELATIVE TO SHARK TAGGING PROGRAMMES

7.1 USA and Canada

Porbeagle

Research programs on shark distributions rely mainly on tagging studies. In 1962, the United States National Marine Fisheries Service (NMFS) initiated a shark tagging program which relied heavily on the volunteer participation of sport and commercial fishers. These program activities, although heavily concentrated in the north-eastern US, have become international in scope and at the end of 1994, taggers from 31 countries were involved (Casey et al, 1995). This program has tagged 942 porbeagle sharks between 1962-97 within the coastal waters of New England and the Canadian Atlantic; 96 have been recaptured and indicate movement within this area. To date, there is no evidence of long distance migrations like those of the blue or mako shark (Kohler and Natanson, pers comm).

From 1961-84, Canada conducted a number of projects to tag large pelagic fishes, mainly swordfish and tunas; in a number of cases, sharks caught incidentally during these projects were also tagged (Burnett *et al.* 1987). Eight porbeagle were tagged; none have been recovered. In 1994, Canada initiated a shark tagging program in cooperation with sport and commercial fishers. Since the inception of the shark tagging program, 270 porbeagle sharks have been tagged and released throughout the Canadian Atlantic. To date, twelve recoveries have been made. One recapture was made in the Gulf of Maine and one on the Grand Banks; the other ten were all recaptured on the Scotian Shelf.

Aasen (1963) reported that 92 porbeagle sharks had been tagged in the Northwest Atlantic in 1961. He indicated that porbeagles tagged on Platts Bank in the Gulf of Maine had been recaptured on the Scotian Shelf, in the Gulf of St. Lawrence, and on the Grand Banks. Myklevoll (1989) indicated that a total of about 550 porbeagle sharks had been tagged in the Northwest Atlantic and that 47 recaptures have been reported; however he reported no details of recapture locations.

Stevens (1990) reported that 26 porbeagle sharks had been tagged by recreational anglers in the coastal waters of England. Eight recaptures ranged from northern Norway to northern Spain and he concluded a homogeneous stock structure in the eastern Atlantic. Porbeagle sharks have also been tagged by recreational anglers in coastal waters of Ireland (Green, pers. comm) but no details are available.

Porbeagle sharks are thought to prefer cold temperate waters. Castro (1983) suggested that they preferred waters colder than 19°C, while Scott and Scott (1988) suggested that the preferred temperature is colder than 16°C. Preliminary data collected recently by commercial fishers in the Canadian Atlantic indicate this preference is in the range of 10-14°C. Carey *et al.* (1981) and Block and Carey (1985) demonstrated that porbeagle maintain an elevated body temperature, as much as 5°C above ambient water temperature, by means of a large suprahepatic rete mirabile, or counter-current heat exchanger. This capability likely contributes to the tolerance or preference of these relatively cold temperatures. This cold water temperature preference would largely restrict the species distribution to the north temperate waters of the Canadian continental shelf. It would also limit the occurrence of this species off the eastern United States.

In summary, the stock structure of the porbeagle shark is presently unknown, although the history of the fishery suggests that separate populations may exist in the east and west Atlantic. Based on tagging, there is no evidence of long distance migrations, as in blue and mako sharks and for pragmatic purposes, the stock is defined by NAFO Subareas 3 to 6.

Blue

In 1962, the United States National Marine Fisheries Service (NMFS) initiated a shark tagging program relying heavily on the volunteer participation of recreational anglers and commercial fishers. The program activities, although heavily concentrated in the northeastern US, have become international in scope, and at the end of 1994, taggers from 31 countries were involved (Casey *et al.*, 1995). Since its inception, the program has tagged over 46 species of sharks and 20 species of other fishes (Casey and Kohler, 1991). In 1994 alone, participants in the program tagged 4448 blue sharks with recoveries 335 being made from 1994 and earlier releases (Casey *et al.*, 1995). The program has relied on two basic tags, a jumbo rototag (plastic cattle ear tag) which is inserted through the first dorsal fin and a dart tag (stainless steel dart with monofilament streamer and plexiglas capsule with reward message inside) (Casey, 1985). Dart tags are preferred because they can be applied in the dorsal musculature of the back without bringing the animal onboard the vessel, are applied with simple inexpensive equipment, are visible, and contain return instructions in several languages. The jumbo rototag requires that the animal is brought on board the vessel for attachment, thus causing greater stress to the animal and greater danger to the tagging personnel. A periodic newsletter keeps participants informed of releases, recoveries and other biological and management items related to sharks, along with the detailed information on recoveries and the names of the returnees. From 1961 to 1984 Canada conducted a number of projects to tag large pelagic fishes, mainly swordfish and tunas; in a number of cases, sharks caught incidentally during these projects were also tagged (Burnett *et al.* 1987). During that program, 2003 blue sharks were tagged; 17 of the tagged blue sharks have been recovered. In 1994, Canada initiated a shark tagging program in cooperation with recreational anglers and commercial fishers. Since its inception, 49 blue sharks have been tagged, and 2 recovered. This species has comprised the largest part of the sport fishing catch off the Northeast coast of the US and consequently has had the greatest tagging effort directed to it as well as the greatest number of recoveries. The generally accepted hypothesis is that blue sharks are transatlantic in nature, but those found off the eastern seaboard of North America are part of a population restricted to the North Atlantic (Casey and Kohler, 1991). This stock definition is similar to that for the Pacific blue shark population in extent, trans-Pacific and restricted north of the equator (Nakano, 1994).

Mako

Since its inception in 1962, the United States National Marine Fisheries Service (NMFS) cooperative shark tagging program has tagged over 46 species of sharks and 20 species of other fishes (Casey and Kohler, 1991). In 1994 alone, participants in the program tagged 400 shortfin and recovered 41 from 1994 and earlier releases (Casey *et al.*, MS1995). From 1961 to 1984 Canada conducted a number of projects to tag large pelagic fishes, mainly swordfish and tunas; in a number of cases, sharks caught incidentally during these projects were also tagged (Burnett *et al.* 1987). During that program, 110 mako sharks were tagged, of which 5 have been recovered. In 1994 Canada initiated a shark tagging program in cooperation with recreational anglers and commercial fishers; only 1 mako has been tagged in that program. Between 1962 and 1989, 2459 mako sharks were tagged by the NMFS cooperative shark tagging program, most off the north-eastern United States. Slightly under 10% (231) had been recovered by 1989. Casey and Kohler (1992) synthesized the existing knowledge on mako sharks. This summary is largely derived from that report. They hypothesized that mako sharks found in the Northwest Atlantic are a single population limited to the North Atlantic and in their eastern distribution to areas west of the Mid-Atlantic Ridge. This stock concept is based on 231 recoveries (9.4% of releases). Although the movements are presented as a clockwise movement pattern, the tag recoveries do not provide evidence of a well defined seasonal movement (Casey and Kohler, 1992). Only one recovery was made in the

eastern North Atlantic. While the distribution of recoveries can be explained by the 'Sargasso Sea warm water' hypothesis, the pattern of movement is not well explained. Very small makos have been reported during summer from the Gulf of Mexico to the Grand Banks thus providing no indication of a restricted nursery area. While little is known about the reproductive biology of this species, Casey and Kohler (1992) suggested that adult females may remain far offshore in the warm water when pupping; thus the young would be distributed over a wide area. This hypothesis is similar to that for blue sharks (Casey, 1985) pertaining to the distribution of pregnant females.

7.2 Europe

At the 2nd Annual General Meeting of the European Elasmobranch Association a proposal for a collaborative European tagging programme were discussed. The legislation necessary for the programme is unclear as yet, but contact has been sought with the British Home Office to clarify the issue.

Major objectives of the tagging programme can be summarised as follows:

To develop a collaborative tag and release programme, with input to a steering group made up of representatives from ICES and/or the proposed coordinating body for the Concerted Action Plan, participating national laboratories, the European Elasmobranch Association and its member organisations, existing independent tagging programmes (not presently linked with national laboratories), and angling representatives. This tagging programme will contribute to the Concerted Action Plan for collaborative research proposed by the ICES SGEF 1997 report, and appear in the proposed register of available data on elasmobranch fishes (if this SGEF recommendation is taken up in time). The Steering Group should liaise with all existing independent tagging programmes, and invite them to become involved, so that their data can be incorporated and made more widely available to the international research community.

The following actions are required:

- i. Define scientific objectives. Use these to determine the minimum standards for data collection and set out the scientific principles under which the tag and release programme will operate, taking into account lessons learnt from existing and historical tagging exercises, in Europe and the Americas.
- ii. Define the administrative and reporting framework for the programme, taking into account the existing international recapture reporting scheme. Draw up a memorandum of agreement between participating bodies represented on the steering group.
- iii. Determine legal licensing requirements in participating countries.
- iv. Define a limited number of species (initially), the tagging targets for these species, and minimum data collection requirements.
- v. Draw up funding proposals. Identify and approach sources of funds, including commercial sponsors.
- vi. Start one or more small grant-aided or commercially-sponsored pilot schemes in 1998, at least one of which will be UK-based, to test and refine methodology.

The proposal gave an overview of the present situation, the eventual constraints involved, methodological considerations, analysis and funding requirements. The proposal was discussed at length during the meeting and a Steering Committee was proposed, but until the position on the legislation is made clear, this group exists on paper only.

8 **COMPILE THE AVAILABLE INFORMATION ON NE AND NW ATLANTIC SPURDOG (*SQUALUS ACANTHIAS*) STOCKS**

The full term of reference for this heading is: "compile the available information on the species-specific catch data, distribution, abundance and biology of the NE and NW Atlantic spurdog stocks in order to review and evaluate the geographical distribution, life history patterns and compensatory mechanisms exhibited by the species, using the outcome of the SGASSO as a theoretical framework." As stated in Section 4, three reports have recently been published, two concerning the status of spurdog in the NW Atlantic (NEFSC, 1998a; 1998b) and the other discussing the available

information on spurdog from a management perspective (Pawson and Vince, 1998). Although there are data on the catch data, distribution, abundance and biology of the spurdog stocks, evaluating the geographical distribution, life history patterns and compensatory mechanisms exhibited by the species is really an issue for a future meeting and, in retrospect, not something to be dealt with by correspondence. Moreover, the objective of using the outcome of the SGASSO as a theoretical framework was a little premature as the SGEF has not yet provided the SGASSO with the appropriate data, nor has the SGASSO been in a position to discuss the necessary models.

9 PROVIDE CLEAR GUIDELINES AND TERMS OF REFERENCE IN RELATION TO ICES' NEED FOR INFORMATION ON ELASMOBRANCH STOCKS AND IDENTIFY THE ACTIONS ICES NEEDS TO TAKE

In the Statement of Conclusions of the Intermediate Meeting of Ministers in Bergen, March 1997 it is stated that stock assessments of elasmobranch species will be expected within 10 years. In order to meet this requirement the ICES SGEF must be equipped with: (i) a theoretical framework for stock assessment; (ii) an adequate data base; and (iii) representation from the member countries. Moreover, the Study Group will have to prioritise as far as species and/or areas are concerned, with emphasis on the NE Atlantic. The most realistic way forward as far as the above three points are concerned is for the group to: (i) liaise with the SGASSO (as is already the intention); (ii) ensure strong links with the Concerted Action Plan (which has a high chance of being funded), in which the Chair of the SGEF is a participant; (iii) improve the representation from member countries, which will only occur if the Study Group has a remit to actually assess stocks for management purposes. It appears, therefore, that there are two options for the future of the SGEF:

1. the Study Group remains an *ad hoc* group with the aim of collating available biological information, but not for assessment or management purposes;
2. the Study Group becomes an assessment WG and seeks actively to improve the theoretical background, data base and member commitment, by liaising with SGASSO, using input from the Concerted Action Plan. In this case priorities would have to be made as far as species and/or areas are concerned. In the 1996 and 1997 SGEF reports (ICES, 1996, 1997) four species or species groups are mentioned which could serve as first priorities. These are: spurdog (*Squalus acanthias*); skates and rays (*Raja* spp.); deep-water sharks; and the blue shark (*Prionace glauca*).

Option 2 is the most attractive from the point of view of the requirements for management purposes. If the CAP is financed, then there is an immediate improvement in data availability, which could be of use to the SG/WG. Moreover, if the FAO Plan of Action is accepted by the national governments at the Consultation in October, then there is the possibility of a 'top-down' framework for management measures.

10 IDENTIFY THE FOUNDATIONS FOR THE ESTABLISHMENT OF AN ELASMOBRANCH WORKING GROUP, IN WHICH ICES CO-OPERATES WITH OTHER SCIENTIFIC AND MANAGEMENT BODIES

At the meeting of the FAO Technical Working Group on Sharks, held in Tokyo, a proposal was made to form an *Ad Hoc* Shark Working Group, to be coordinated by FAO. Although the status of this is uncertain, the need for coordination at a global level was made quite clear by members of the Technical Working Group.

11 SPECIES CODING

The species coding as suggested by the SGEF in 1997 has been submitted to FAO. However, there are two point which need clarification. The first is that two categories are known as catsharks (GAU = *Galues* spp. and API = *Apristurus* spp.). The proposal of the SG is to call GAU 'crest-tail catsharks' and API 'deep-water catsharks'. The second point is the coding for skates and rays, which is currently as follows:

RAJ	Rajidae	Rays and skates, nei
RJR	<i>Raja radiata</i>	Starry ray
RJH	<i>Raja brachyura</i>	Blonde ray
RJI	<i>Raja circularis</i>	Sandy ray
RJE	<i>Raja microocellata</i>	Small-eyed ray

RJU	Raja undulata	Undulate ray
RJA	Raja alba	White skate
RJY	Raja fyllae	Round ray

The proposal of the SG is to have a category BAI = all rays and skates, which is subdivided into Rajoidea (skates) and all other rays; the Rajoidea should then be divided into SKA (= *Raja* species) and all other rajoid skates (e.g. *Bathyraja*). The category RAJ shown above would be removed and all the species listed above would fall under SKA. The entire FAO STATLANT coding list is given in Appendix IV.

12 1999 MEETING

12.1 Background

It is expected that a Concerted Action Plan will be funded by the European Union. The objective of the Action Plan is to prepare a proposal for stock assessment of some elasmobranch fishes in European waters. If this is the case, then there will be a focal point for the collection and dissemination of data and research results. With the participation of the Chair of the SGEF in the CAP, a link has been made to this initiative. The need for a meeting in 1999 is really dependent on: (i) the status of the group (*ad hoc* SG or Assessment WG); and (ii) the outcome of the CAP. The need for a meeting and the terms of reference should be decided at the ASC in Lisbon.

13 INFORMATION SUPPLIED TO THE STUDY GROUP ON COMMERCIAL LANDINGS AND SURVEY DATA

Data have been supplied to the Study Group on the commercial landings of elasmobranchs in 1997 from Germany. These are available in ICES files and will be used as necessary for future work.

Commercial landings and survey data from the Azores on tope shark, skates and rays and kitefin shark were also supplied to the Study Group, by Alex da Silva. The full data set is available in ICES files and will be used as necessary for future work. The major results are summarised in the Figures 13.1 to 13.6.

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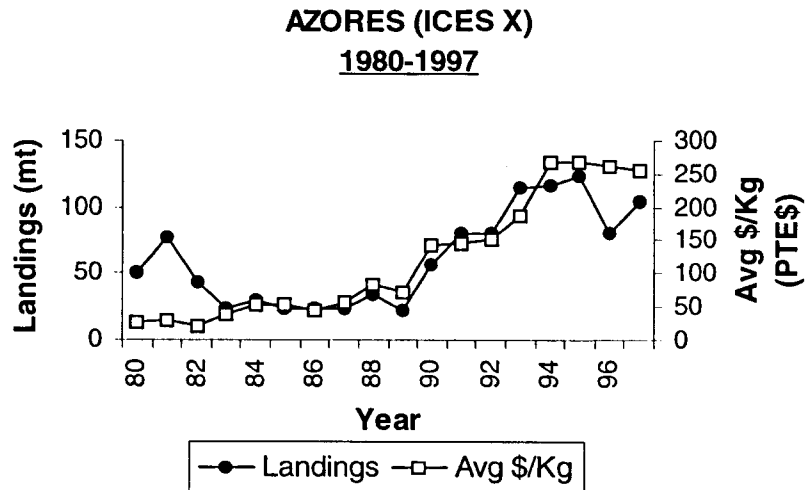


Figure 13.1 Reported commercial landings and average price per Kg of tope shark, *Galeorhinus galeus*, in the Azores archipelago (ICES Area X), 1980-1997.

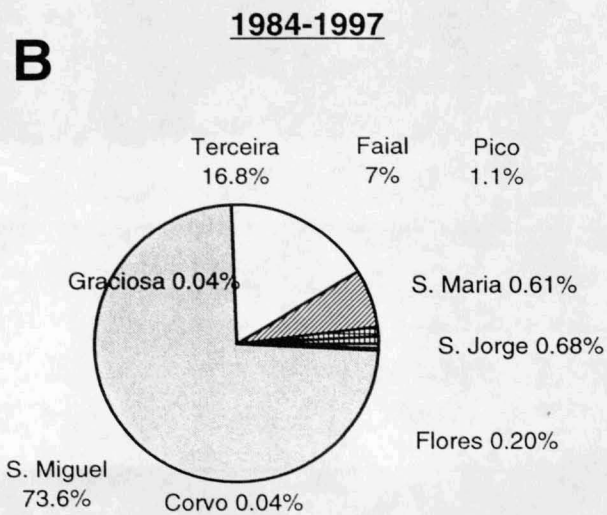
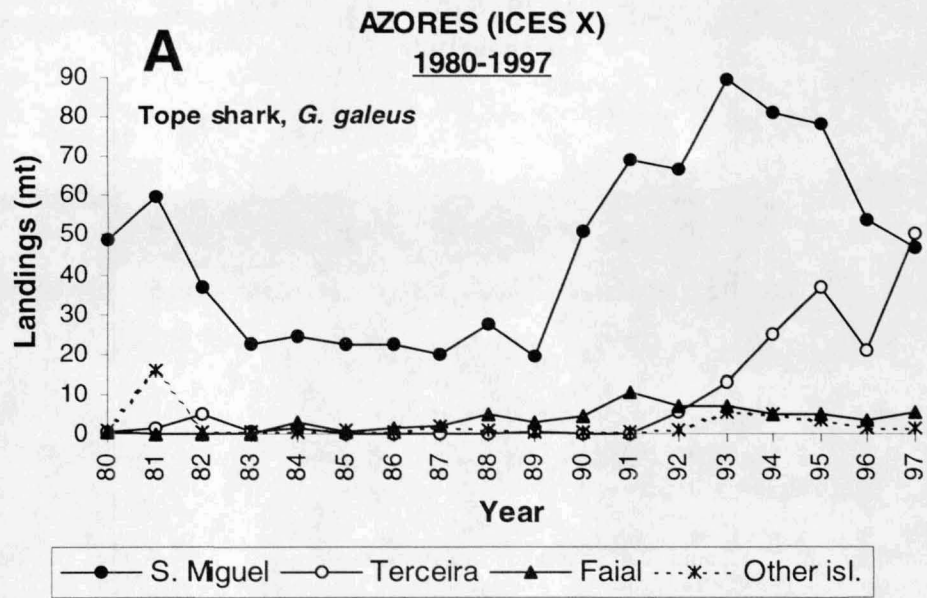


Figure 13.2 Commercial landings (mt) of tope shark, *Galeorhinus galeus*, reported for each Azorean island (ICES Area X), 1980-1997. A - Yearly landings per island. B - Landing proportions per island during 1984-1997 (period for which landings were reported for overall archipelago).

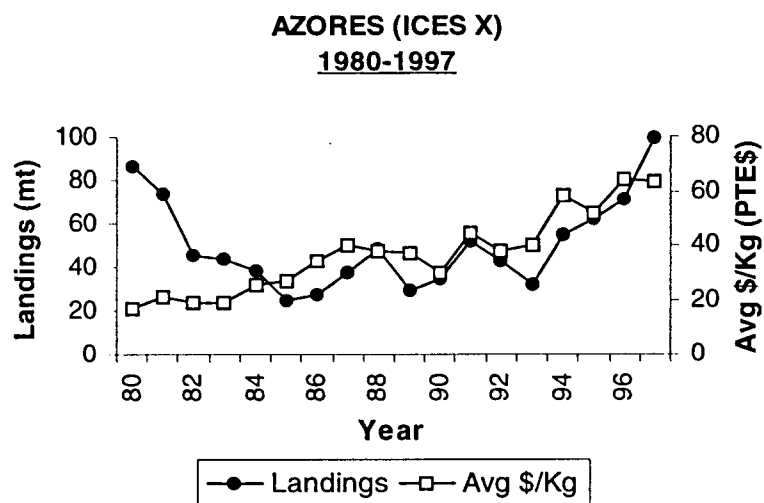


Figure 13.3 Reported commercial landings and average price per Kg of *Raja* sp. in the Azores archipelago (ICES Area X), 1980-1997.

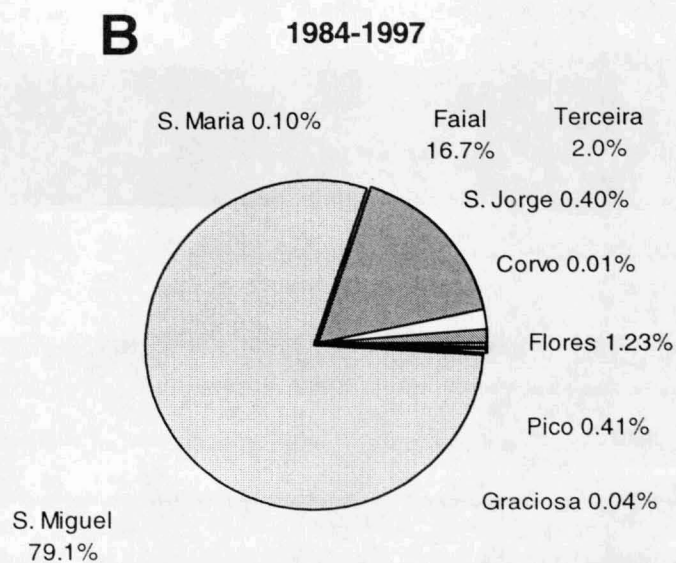
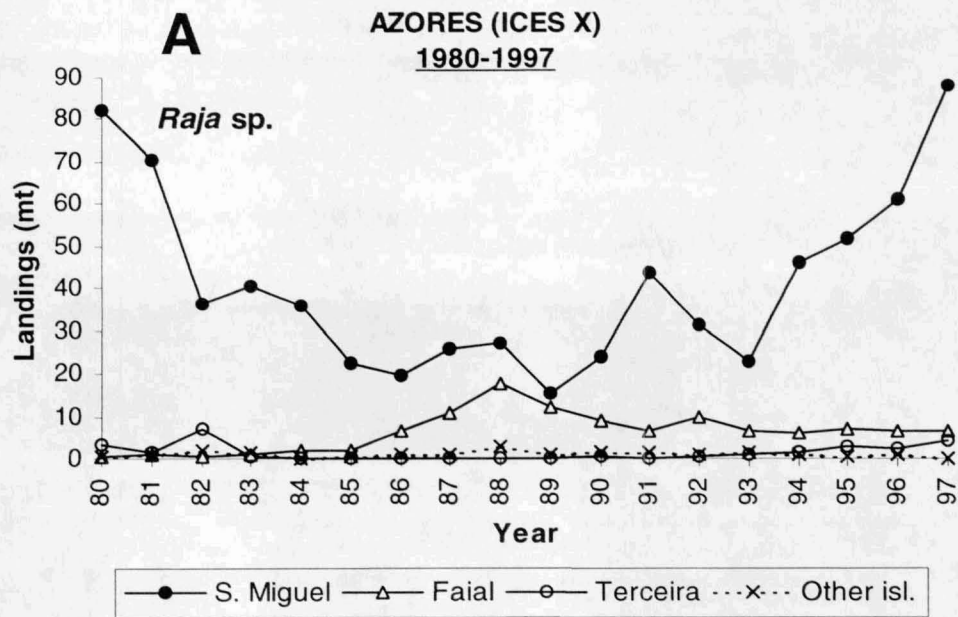


Figure 13.4 Commercial landings (mt) of *Raja* sp. reported for each Azorean island (ICES Area X), 1980-1997. A - Yearly landings per island. B - Landing proportions per island during 1984-1997 (period for which landings were reported for overall archipelago).

AZORES (ICES X)
1977-1997

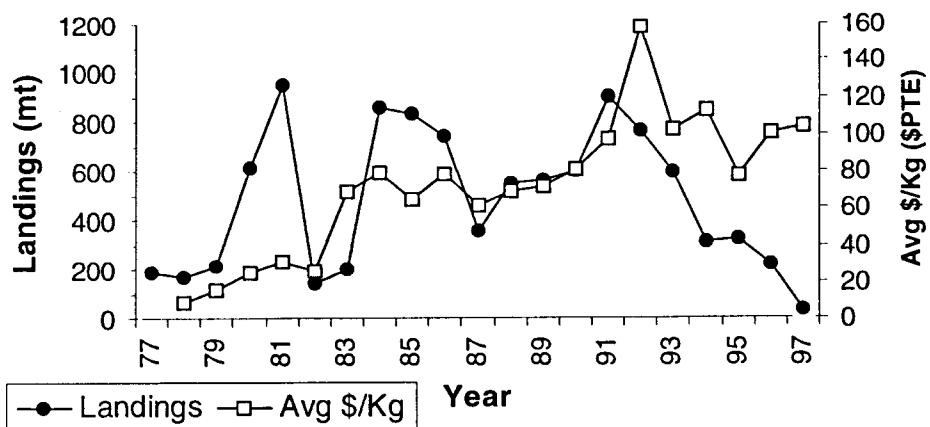


Figure 13.5 Reported commercial landings and average price per Kg of kitefin shark, *Dalatias licha*, in the Azores archipelago (ICES Area X), 1977-1997.

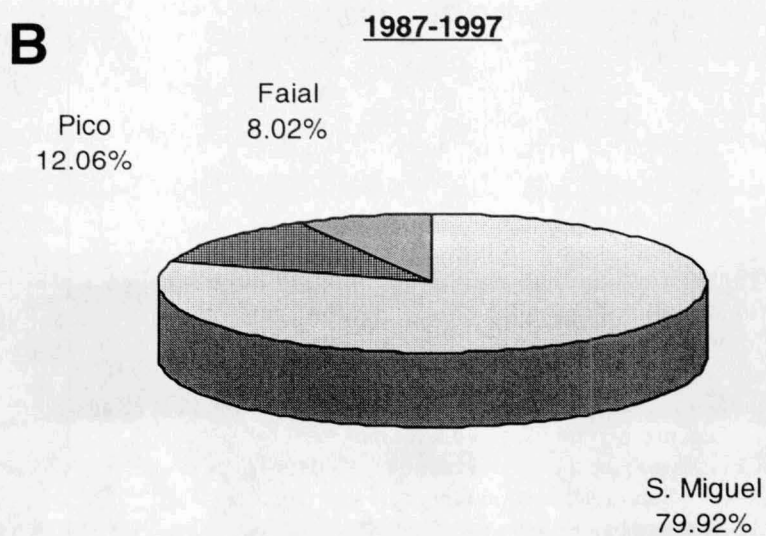
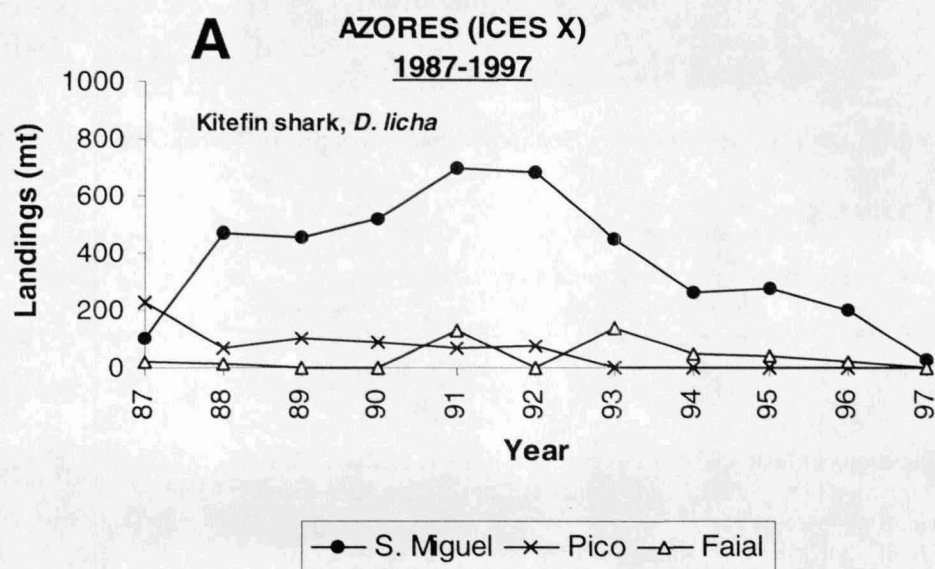


Figure 13.6 Commercial landings (mt) of kitefin shark, *Dalatias licha*, reported for each Azorean island (ICES Area X).
A - Yearly landings per island. B - Landing proportions per island during 1987-1997.

Appendix I

Participants at the FAO Technical Working Group on Sharks meeting in Tokyo 23-27 April 1998.

Experts Invited by the FAO:

David W. Au, NMFS Southwest Fisheries Science Center, USA
Ramon Bonfil Sanders, University of British Columbia, Canada
Jose Castillo Geniz, Instituto Nacional de la Perca, Mexico
Gustavo Chiaramonte, Museo Argentino de Ciencias Naturales, Argentina
Jeremy Cliff, Umhlanga, South Africa
Leonard Compagno, South African Museum, South Africa
Malcolm Francis, National Institute of Water and Atmospheric Research, Ltd., New Zealand
Yuichiro Harada, Federation of Japan Tuna Fisheries Cooperative Associations, Japan
Kok Kuang Hooi, Singapore
Gary Matlock, NMFS Office of Sustainable Fisheries, USA
Jaime Mejuto Garcia, Instituto Espanol de Oceanografia, Spain
Joel Nageon de Lestang, Seychelles Fisheries Agency, Seychelles
Hideki Nakano, National Research Institute of Far Seas Fisheries, Japan
Mike Pawson, Western Demersal Stock Assessment Team, CEFAS, UK
Glen Sant, Traffic Oceania, Australia
Bernard Seret, Museum National d'Histoire Naturelle, France
John Stevens, CSIRO Marine Laboratories, Australia
Miwako Takase, Far Seas Fisheries Division, Japan
Carolus Vooren, Universidade de Rio Grande, Brazil
Terence Walker, Marine and Freshwater Resources Institute, Australia

Observers Invited by the FAO:

David Ardill, Indian Ocean Tuna Commission
Jacques Bastink, European Commission
Che-Tsung Chen, National Taiwan Ocean University
Martin Hall, Inter-American Tropical Tuna Commission
Hank Jenkins, Convention on International Trade in Endangered Species of Wild Fauna and Flora
Carlos Mazal, Latin American Organization for Fishery Development
Peter Miyake, International Commission for the Conservation of Atlantic Tunas
Joji Morishita, Commission for the Conservation of Southern Bluefin Tuna
Paddy Walker, Netherlands Institute for Sea Research
Peter Williams, Pacific Community

Secretariat

FAO: Ulf Wijkstrom; Erhard Ruckes
Advisor: Ross Shotten
U.S. Dean Swanson; Prudence Fox
Advisor: Andy Oliver
Japan: Masayuki Komatsu; Toshiyuki Kubodera

Appendix II

USA-ATLANTIC SHARKS FISHERY MANAGEMENT (the following information was supplied by Margo Schulze and Rebecca Lent of NOAA)

1. Background and objectives

History

On June 30, 1989, 5 Fishery Management Councils asked the Secretary of Commerce to develop a Shark Fisheries Management Plan (FMP).

Major concerns were:

- Late maturity & low fecundity of sharks.
- Increasing fishing mortality.
- Possible overfishing of the resource.

Councils requested:

- Cap on commercial fishery.
- Establish recreational bag limit.
- Prohibit "Finning".
- Begin a data collection system.

Fisheries Management Plan development

First Draft -- October, 1989

Second Draft -- April, 1991

Third Draft -- October, 1991

Final FMP/FEIS -- Preliminary approval December, 1992

Final FMP implemented -- April, 1993

Objectives

Prevent overfishing of shark resources.
Encourage management of stocks throughout ranges.
Establish data collection, research & monitoring.
Increase benefits to US while reducing waste.

2. Fisheries Management Plan measures and long-term goal

Fisheries Management Plan measures

1. Manages 39 species in 3 groups

Large Coastal (22 species)	Overfished
Pelagic (10 species)	Fully Fished
Small Coastal (7 species)	Fully Fished.

2. Requires annual permits for commercial shark fishing vessels fishing in the US EEZ.
3. Requires data reports from owners/operators of permitted vessels.
4. Requires data reports from persons conducting shark fishing tournaments.
5. Requires permitted vessels to accommodate NMFS approved observers.
6. Establishes a fishing year of January 1 through December 31.

7. Two semi-annual commercial quota periods.
8. Prohibits "finning".
9. Requires sharks not retained to be released in a manner assuring maximum probability of survival.
10. Establishes recreational bag limits for sharks.

Small Coastal = 5 per person per day

Large Coastal & Pelagic Combined = 4 per vessel per trip.

11. Establishes annual and semi-annual quotas for landings of large coastal and pelagic species groups

Large Coastal Annual Quota = 2,570 mt

Pelagic Annual Quota = 580 mt.

12. Provides for commercial closures when the species group quotas are reached.
13. Limits the sale of sharks harvested from the EEZ to those caught from permitted vessels.
14. Authorizes the AA (Assistant Administrator) to implement or adjust certain management measures in accordance with a specified framework regulatory adjustment procedure.
15. Reduces the TALFF (Total Allowable Level of Foreign Fishing) in the EEZ for managed species to zero.

Following implementation of the Fisheries Management Plan, derby fishing became a major problem in the large coastal shark fishery. To address this problem, a commercial trip limit of 4000 lb. for permitted vessels for large coastal sharks was implemented on 12/28/93 and a control date for the Atlantic sharks fishery was established on 02/22/94. A final rule to implement additional measures authorized by the FMP was published as 59 FR 52453 on 10/18/94. These rules:

1. Clarify operation of vessels with a Federal commercial permit;
2. Establish the fishing year;
3. Consolidate the regulations for drift gillnets;
4. Require dealers to obtain a permit to purchase sharks;
5. Require dealer reports;
6. Establish recreational bag limits;
7. Establish quotas for commercial landings; and
8. Provide for commercial fishery closures when quotas are reached.

The Shark Evaluation Workshop (SEW) conducted March 14-18, 1994 concluded that increases in the quota for large coastal sharks in 1995, as planned in the FMP, could jeopardize stock recovery. A final rule that capped quotas for large coastals and pelagic sharks at the 1994 levels was published on 05/02/95.

Continuing concern and debate over the state of the Atlantic large coastal shark population prompted NMFS to convene a SEW in June, 1996. The report concluded that additional reductions in mortality would improve the probability of stock increases, and their analysis indicated that recovery is more likely to occur with reductions in effective fishing mortality rate of 50% or more. A final rule that reduces quotas and bag limits, establishes a quota for small coastal sharks, prohibits fishing for 5 species of sharks, establishes a catch-and-release only recreational fishery for white sharks, prohibits filleting of sharks at sea, and requires species-specific identification of all sharks landed was published on 4/7/97. NMFS announced that it would prepare a Supplemental Environmental Impact Statement (SEIS) on 5/20/97.

Long-term goal

Establish a Multilateral (with U.S., Canada, Mexico and Caribbean Basin countries) management and monitoring system.

3. Summary of major actions

05/03/91 - Notice of availability of draft FMP
 01/13/92 - Notice of availability of Secretarial FMP
 06/08/92 - Proposed rule to implement FMP
 04/26/93 - Final & interim final implements FMP
 07/28/93 - First Operations Team (OT) meeting
 11/29/93 - Second OT meeting (by teleconference)
 12/28/93 - Interim rule implements 4000 lb. trip limit

02/22/94 - Notice of control date
 03/14/94 - 1994 Shark Evaluation Workshop
 06/27/94 - Third OT meeting
 10/18/94 - Final rule to implement interim final rule of FMP
 04/01/95 - 1995 Shark Evaluation Annual Report
 05/02/95 - Final rule to adjust quotas (capped indefinitely)
 06/08/95 - Forth OT meeting
 12/06/95 - Limited Access Workshop
 03/12/96 - Decision to maintain current quotas/bag limits pending scientific review
 06/04/96 - 1996 Shark Evaluation Workshop
 08/27/96 - Fifth OT meeting
 12/20/96 - Proposed rule to reduce quotas/bag limits, prohibitions
 12/27/96 - Proposed rule to establish limited entry program
 04/02/97 - Final rule reducing quotas/bag limits, etc.
 05/20/97 - Notice of Intent to prepare an SEIS
 05/21/97 - Sixth OT meeting
 08/28/97 - Notice of Intent to prepare an HMS EIS (supersedes SEIS)

4. Species managed

The Fisheries Management Plan affects the following 39 species broken down into three management units.

LARGE COASTAL SPECIES GROUP

Hammerhead sharks--Sphyrnidae

Great hammerhead	<i>Sphyrna mokarran</i>
Scalloped hammerhead	<i>Sphyrna lewini</i>
Smooth hammerhead	<i>Sphyrna zygaena</i>

Nurse sharks--Ginglymostomatidae

Nurse shark	<i>Ginglymostoma cirratum</i>
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Requiem sharks--Carcharhinidae

Bignose shark	<i>Carcharhinus altimus</i>
Blacktip shark	<i>Carcharhinus limbatus</i>
Bull shark	<i>Carcharhinus leucas</i>
Caribbean reek shark	<i>Carcharhinus perezii</i>
Dusky shark	<i>Carcharhinus obscurus</i>
Galapagos shark	<i>Carcharhinus galapagensis</i>
Lemon shark	<i>Negaprion brevirostris</i>
Narrowtooth shark	<i>Carcharhinus brachyurus</i>
Night shark	<i>Carcharhinus signatus</i>
Sandbar shark	<i>Carcharhinus plumbeus</i>
Silky shark	<i>Carcharhinus falciformis</i>
Spinner shark	<i>Carcharhinus brevipinna</i>
Tiger shark	<i>Galeocerdo cuvieri</i>

SMALL COASTAL SPECIES GROUP

Angel sharks--Squatinae

Atlantic angel shark	<i>Squatina dumerili</i>
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Hammerhead sharks--Sphyrnidae

Bonnethead	<i>Sphyrna tiburo</i>
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Requiem sharks--Carcharhinidae

Atlantic sharpnose shark	<i>Rhizoprionodon terraenovae</i>
Blacknose shark	<i>Carcharhinus acronotus</i>

Caribbean sharpnose shark
Finetooth shark
Smalltail shark

Rhizoprionodon porosus
Carcharhinus isodon
Carcharhinus porosus

PELAGIC SPECIES GROUP

Cow sharks--Hexanchidae

Bigeye sixgill shark
Sevengill shark
Sixgill shark

Hexanchus vitulus
Heptranchias perlo
Hexanchus griseus

Mackerel sharks--Lamnidae

Longfin mako
Porbeagle shark
Shortfin mako

Isurus paucus
Lamna nasus
Isurus oxyrinchus

Requiem sharks--Carcharhinidae

Blue shark
Oceanic whitetip shark

Prionace glauca
Carcharhinus longimanus

Thresher sharks--Alopiidae

Bigeye thresher
Thresher shark

Alopias superciliosus
Alopias vulpinus

PROHIBITED SPECIES GROUP

Basking sharks--Cetorhinidae

Basking shark

Cetorhinus maximus

Mackerel sharks--Lamnidae

*White shark

Carcharodon carcharias

Sand tiger sharks--Odontaspidae

Bigeye sand tiger
Sand tiger shark

Odontaspis noronhai
Odontaspis taurus

Whale sharks--Rhincodontidae

Whale shark

Rhincodon typus

* White shark Catch-and-Release Recreational Fishing Allowed

Over thirty additional sharks are not in the management unit but are included for data reporting purposes.

Appendix III

Canada - Canadian Atlantic Pelagic Shark Integrated Fishery Management Plan 1997 - 1999.

1. Executive summary

As a result of the downturn in the traditional groundfish fisheries, there has been a rise in Canadian interest to exploit large pelagic sharks off Canada's East coast. Since sharks are typically slow growing and produce few young per year, their life history characteristics makes them highly susceptible to over-exploitation. Scientific information on the stock status of sharks is limited. This management plan is intended to provide the basis for a Scientific Monitoring Fishery by enabling a minimum number of Canadian exploratory shark fishing licences to direct for shark while providing detailed scientific data on stock abundance and distribution. The information derived from this Scientific Monitoring fishery will be used to determine whether or not a commercial shark fishery is sustainable after 1999 and, if so, under what conditions.

2. Management Objectives/Issues

2.1 Principles and Objectives

Pelagic sharks have been exploited on Canada's east coast since the 1960's. The downturn in the traditional groundfish fisheries has raised recent interest in these resources. First discussions on an Atlantic management plan for pelagic sharks were undertaken in 1994 with an interim plan developed for 1995 (Anon. 1995). This plan was rolled over into 1996, with minor modifications, to provide time for the development of the more comprehensive plan given herein.

This plan is designed to govern the exploitation of the following shark species during 1997 - 1999:

- porbeagle
- blue
- shortfin mako and other sharks, excluding spiny dogfish

The long-term vision of this Plan is the maintenance of a biologically sustainable resource supporting a self-reliant fishery. Conservation will not be compromised and a precautionary approach will guide decision-making. The objectives are:

- To provide for a reasonable scientific basis for management. This implies the collection of information essential to assess the health and potential of shark stocks in Canadian waters and which allow establishment of yield and effort levels for long-term sustainable harvesting.
- To control the commercial and recreational shark fisheries in Atlantic Canada so that they are economically viable in the long-term.
- To foster partnerships with the industry on the scientific study and management of this resource.

The fishery is at the exploratory, commercial and stock assessment stage, in which the emphasis is on determining whether or not the resource can sustain a commercially viable operation and collecting scientific data in order to build a preliminary database on stock assessment and distribution. For the duration of this Plan, fishing licences will remain exploratory.

2.2 Strategies and Performance Indicators

The scientific basis for management is weak and thus it is not possible to provide estimates of biomass and exploitation rates. It is also not possible to provide target or limit reference points for sustainable harvesting. In lieu of this, and based on the available scientific evidence, the following will be used to guide management during 1997 - 99:

- Unless scientific information warrants a change, Canadian catch and effort directed on porbeagle shall not exceed the observed 1995 level. To determine this, the following performance indicators will be applied:
 - * annual number of commercial porbeagle/blue shark licenses compared to those in 1995;
 - * annual total catch compared to that in 1995;
 - * annual fleet-specific effort (hours fished) compared to that in 1995;

- * accurate, detailed logbook information;
- * accurate, detailed observer information.

- Canadian effort on blue shark shall not exceed the observed 1995 level; once better documentation of by-catch in other fisheries is available, the level of effort associated with a sustainable fishery will be assessed. To determine this, the following performance indicators will be applied:

- * annual number of commercial blue shark licenses compared to those in 1995;
- * annual number of recreational shark licenses compared to those in 1995;
- * percent of trips by fleet with processed logbook information;
- * accurate, detailed logbook information;
- * accurate, detailed observer information.

- Shortfin mako and other sharks will be restricted to being incidental by-catch in other fisheries. To determine this, the following performance indicator will be applied:

- * annual percent by-catch of shortfin mako and other sharks by fleet.

2.3 Domestic Consultative Process

The Maritimes Regional Advisory Process (RAP) provides the scientific and technical basis for management. This forum brings together scientists, managers and fishers to develop the resource outlooks. The Stock Status Reports generated by the spring 1996 meeting are given in Section 6 (References). RAP will conduct its next review of porbeagle and blue shark in the spring of 1998. Unless scientific evidence to the contrary, no further reviews are planned for short fin mako or other sharks.

DFO holds consultations with shark industry representatives in an advisory forum known as the Atlantic Large Pelagics Advisory Committee (ALPAC).

Since the majority of large pelagic sharks are fished on the Scotian Shelf and Georges Bank, and are thus landed in the Scotia-Fundy Sector, the Scotia-Fundy Sector Large Pelagics Advisory Committee (SFSLPAC) provides the principle regional forum for dialogue on the Canadian Atlantic Pelagic Shark Management Plan (SMP). Once a consensus plan is agreed to by SFSLPAC and ALPAC, the Department of Fisheries and Oceans Canada will formally approve the Plan.

Amendments to the SMP will be considered on an annual basis by the SFSLPAC. Any technical analyses required will be conducted by RAP. Amendments will be presented to SFSLPAC and ALPAC for consultation.

2.4 International Considerations

The stock area of each of these species extends beyond the Canadian zone. Effective management will require international co-operation.

3. Management Measures

3.1 Licensing

1. All licences are exploratory and are renewable on an annual basis. Receipt of authorisation to participate in the shark fishery in any given year does not constitute guarantee of future authorisation. Current licence holders must re-apply on an annual basis. Renewal will be contingent upon adherence to all conditions of licence.
2. Annual renewal of Exploratory Shark Licences is dependant on the licence holder/operator providing documented proof of landings during the calendar year (a minimum of 2,000 kg round) via purchase slips and log records through DMP, or proof of effort (minimum of at least three fishing trips or a total of ten fishing days) via log records associated with statutory declarations verified by Fishery Officers, or DMP (via hails out and/or hails in).
3. The fishery will be managed via separate licences for the commercial porbeagle/blue fishery, the commercial blue shark fishery and the recreational fishery.
4. Issuance of a replacement licence will not be permitted. Licences must be carried on-board the vessel at all times.
5. There will be no expansion in the number of commercial porbeagle/blue licences beyond the number issued by March 31, 1997.

6. There will be no expansion in the number of commercial blue shark licences beyond the number issued by March 31, 1997.
7. Only one licence per fisherman/company will be issued.
8. There will be no limit on the number of recreational licences issued, as this is a hook and release fishery.
9. DFO will permit the landing of sharks under recreational licence only during an authorized shark derby. Landing during shark derbies must adhere to all DMP provisions. Proceeds from the sale of shark landings must be awarded to a recognized charity.
10. Commercial access for Native groups will be provided in accordance with DFO's Aboriginal Fisheries Strategy.

3.2 Quota/Precautionary Catch Levels

1. Annual quota allocations will be set for the fishery by DFO through public press release.
2. There is no allocation for the recreational fishery.

3.3 By-Catch Restrictions

1. There will be no by-catch of tunas or swordfish allowed. Any such incidental catch shall be live released immediately using methods which will minimise damage to the fish.
2. There will be no directed fishery for shortfin mako or other shark species. Landings of these species can only occur as a bycatch (i.e. less than 50% of the total weight of directed shark species on board).
3. In other large pelagic fisheries, shark by-catch shall not be restricted.
4. Incidental catch of sharks in fisheries other than large pelagics will be limited to the lesser of 10 percent or 500 kg by weight on board the vessel providing the vessel has a condition of licence authorizing bycatch of shark.

3.4 Processing of Caught and/or Landed Shark

1. Porbeagle and shortfin mako sharks are closely related species and are similar in appearance. As a result, these species are at times mis-identified. During the dressing of sharks at sea (removal of internal organs, head and fins), characteristic features that allow accurate discrimination of these species are lost. To assist in the correct identification of these species, all vessels must land all shark catch with the portion of the tail attached to the carcass including the lateral ridge and ensure that the pelvic fins are left intact and also attached to the carcass. This does not apply to vessels operating under QMP.
2. Finning (the practice of removing only the fins from sharks and discarding the remainder of the shark while still at sea) is prohibited.
3. Fins from the commercial fishery may be sold, traded or bartered (as a condition of licence) only in proper proportion to carcasses sold, traded or bartered with a maximum of 5% by weight fins per dressed carcass weight. Fins may not be stored aboard the vessel after associated carcasses are sold, traded or bartered and must be weighed and monitored at the time of landing. This does not apply to vessels operating under QMP.

3.5 Gear Restrictions

1. Directed commercial fishing for shark will be limited to the use of handline, longline or rod and reel only.
2. Recreational fishing will be with rod and reel gear only.

3.6 Fishing Season/Area Restrictions

1. Only those fishermen using registered fishing vessels > 65' LOA may access the shark fisheries on an Atlantic-wide basis. In all other cases, both commercial and recreationally, the Department of Fisheries and Oceans' Sector Management Policy will apply.
2. Shark fishing will be permitted throughout the NAFO Convention Area.
3. The shark fishing season will last from 1 January to 31 December.
4. Should an area be closed to directed shark fishing for conservation reasons (i.e.: by-catches of other large pelagic species), the Department will consult with shark industry representatives to immediately establish operational details and procedures to conduct a test fishery.

3.7 Monitoring of Fishing Activities

1. All shark landings must adhere to the requirements of a DFO authorized Dockside Monitoring Program which includes completion of the Large Pelagic Receiving Tally by the dockside monitor. All costs associated with the provision of this data are the responsibility of the licence holder.
2. Licence holders may be required to carry industry funded fishery observers at the request of the Department.
3. For the commercial fishery, Atlantic swordfish/shark longline monitoring documents must be completed on a set by set basis by the vessel operator and be submitted to the dockside monitor at time of dockside monitoring.
4. For the recreational fishery, a Recreational Shark Fishing Log must be completed on a catch by catch basis by the licence holder and be submitted to DFO within two weeks of the end of the trip or derby.
5. The following conversion factor will apply:

- 1.Round (whole) fresh or frozen 1.0
- 2.Dressed, head off, tail off 1.5
- 3.Dressed, head off, tail on 1.2

Appendix IV

Elasmobranch species coding as adhered to by FAO.

3 – alpha identifier	Species (items)	Species (items)
GAU	Galeus spp	Catsharks
SHO	Galeus melastomus	Blackmouth catshark
SYC	Scyliorhinus canicula	Small-spotted catshark
API	Apristurus spp	Catsharks
PTM	Pseudotriakis microdon	False catshark
SOR	Somniosus rostratus	Little sleeper shark
GUP	Centrophorus granulosus	Gulper shark
CPU	Centrophorus uyato	Little gulper shark
GUQ	Centrophorus squamosus	Leafscale gulper shark
CPL	Centrophorus lusitanicus	Lowfin gulper shark
ETX	Etmopterus spinax	Velvet belly
ETR	Etmopterus princeps	Great lanternshark
ETP	Etmopterus pusillus	Smooth lanternshark
DNA	Deania spp	'Deania' dogfishes
DCA	Deania calcea	Birdbeak dogfish
CYO	Centroscymnus coelolepis	Portuguese dogfish
CYP	Centroscymnus crepidater	Longnose velvet dogfish
CYY	Centroscymnus cryptacanthus	Shortnose velvet dogfish
SYO	Scymnodon obscurus	Smallmouth knifetooth dogfish
SYR	Scymnodon ringens	Knifetooth dogfish
SCK	Dalatias licha	Kitefin shark
CFB	Centroscyllium fabricii	Black dogfish
OXY	Oxynotus centrina	Angular roughshark
OXN	Oxynotus paradoxus	Sailfin roughshark
SHB	Echinorhinus brucus	Bramble shark
RAJ	Rajidae	Rays and skates, nei
RJR	Raja radiata	Starry ray
RJH	Raja brachyura	Blonde ray
RJI	Raja circularis	Sandy ray
RJE	Raja microocellata	Small-eyed ray
RJU	Raja undulata	Undulate ray
RJA	Raja alba	White skate
RJY	Raja fyllae	Round ray
CMO	Chimaera monstrosa	Rabbit fish
HYD	Hydrolagus spp	...A
RHC	Rhinochimaera spp	...A
HAR	Harriotta spp	...A