Living Resources Committee **ICES CM 1999/G:11**
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REPORT OF THE

STUDY GROUP ON ELASMOBRANCH FISHES

Santander, Spain
23–27 March 1999

International Council for the Exploration of the Sea

Conseil International pour l'Exploration de la Mer

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TABLE OF CONTENTS

Section **Page**

1 INTRODUCTION

1.1 Participants

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1.2 Terms of Reference

The Study Group on Elasmobranch Fishes (SGEF) (Chair: Dr. P. Walker, Netherlands) will meet in Santander, Spain from 25-27 March 1999 to:

a) compile the available information on the species-specific catch, distribution, abundance and biology of Northeast and Northwest Atlantic spurdog (*Squalus acanthias*) stocks in order to review and evaluate geographical distribution, life history patterns and compensatory mechanisms;

b) evaluate the effects of exploitation and environmental change on these stocks;

c) obtain peer review of the Study Group report from a member of the Living Resources Committee prior to the 1999 Annual Science Conference;

d) comment on the draft objectives and activities in the Living Resources Committee component of the ICES Five-Year Strategic Plan and specify how the purpose of the Study Group contributes to it.

SGEF will report to the Living Resources Committee at the 1999 Annual Science Conference and to ACFM before its October 1999 meeting.

2 BACKGROUND

In 1998 the Study Group worked by correspondence to address five Terms of Reference. These were to: outline the progress made in recent initiatives in elasmobranch research (e.g. SGASSO, FAO US and Canadian Shark Management Plans); compile biological and catch data on spurdog (*Squalus acanthias*); provide clear guidelines in relation to ICES' need for information; and identify the foundations for the establishment of an Elasmobranch Working Group. The Group was successful in fulfilling all but one of these Terms of Reference, the one dealing with compiling information on spurdog. It was recognised that this would best be dealt with in a future meeting and it was included in the Terms of Reference a) and b) for the 1999 meeting. At that time the Study Group had two choices, to decide to remain an *ad hoc* group, or to find a means of becoming a working group with a remit to carry out assessments. For this reason, it was decided that at the 1999 meeting an assessment of spurdog should be attempted. This is the only species for which information has been recorded at species level for many years and it was hoped that there would be sufficient information available. Moreover, assessments are carried out for spurdog in the NW Atlantic which could serve as an example for the NE Atlantic stock.

The Study Group met in Santander at the end of March. In contrast to previous meetings this meeting in Santander was well-attended. All the participants had been attending an EU sponsored (FAIR CT98-4156) meeting of a Concerted Action Plan which was held immediately prior to the Study Group meeting. This facilitated the presence of a representative number of countries for the ICES area.

At the 1999 meeting three issues outside the Terms of Reference were addressed. These were: species coding, which is still a cause for concern; the progress of an EU sponsored Concerted Action Plan (see Heading 7); and the future work of the Study Group and links with related initiatives.

3 REVIEW OF INFORMATION ON SPURDOG (*SQUALUS ACANTHIAS*)

3.1 Introduction

For this meeting, TOR a) is to compile the available information on the species specific catch, distribution, abundance and biology of Northeast and Northwest Atlantic spurdog (*Squalus acanthias*) stocks in order to review and evaluate geographical distribution, life history patterns and compensatory mechanisms, and TOR b) is to evaluate the effects of exploitation and environmental change on these stocks.

A preliminary account of the available catch and effort data on spurdog from commercial fisheries landings and research vessel surveys is provided in ICES CM 1995/G:3. National data were provided to the SG from 8 countries and from ICES, and comprised landings statistics by ICES division from 1960 onwards, some associated effort data, survey cpue and length distributions for catches from a number of important fleets. These data do not, however, represent the totality of catches of this species in the ICES Area during this period (data for some countries who were not represented at this meeting, e.g. Norway were missing), and it is known that earlier landings data exist for some counties (e.g. Germany, where they are presented by fishing ground rather than by ICES div.). The SG decided that, with the limited time available at this meeting and the opportunity to carry out a more thorough study arising through the proposed project on development of assessment methods for elasmobranchs, it saw no possibility to make sufficient progress at this meeting. Instead, the opportunity was taken to critically evaluate the model used by Rago *et al*. (1998) to investigate the stock dynamics of spurdog in the NW Atlantic and the response to exploitation and, in the light of this, to discuss the data requirements for life history models in order to gain a better understanding of the utility of this approach to estimating biological safe levels of mortality.

3.2 Modelling / a review of the equilibrium model used for *Squalus acanthias* in the NW Atlantic

This is a summary of a paper describing the methods used by the National Marine Fisheries Service (USA) in the assessment of the north west Atlantic spurdog (*Squalus acanthias*) stock (Rago *et al*. 1998). The fishery for spurdog in this area is described in terms of landings since 1960, before which catches were negligible. Foreign vessels fished for the species in the period 1966 to 1977. After the Magnusson-Stevenson Act the fishery was confined to U.S. and Canadian boats. Effort on the part of US boats has increased markedly since 1989.

This work was based on four separate inputs:

1. Survey data, including length frequency and sex information from 1980.
2. Commercial landings data, consisting of total weight and length frequencies by sex since 1982.
3. Discard information based on an observer programme in operation since 1989 (mainly 1993).
4. Estimates of recreational catch from 1979, where sex was not recorded.

Minimum biomass was estimated from spring trawl surveys by the swept area method and smoothed using the LOWESS method.

Estimates of Mortality

Natural mortality of fish > 30 cm was estimated based on an assumption of a probability of 1 % of recruits obtaining an age of 50 years in an unfished stock.

The Change in Ratio (CIR) method was used to estimate instantaneous fishing mortality (F). The relative proportions of males and females at two points in time was computed from survey data. The sex ratio of removals in the intervening period was estimated from landings data.

Life Table Model

The von Bertalanffy model was used to convert from length to age. Parameters for the von Bertalanffy model and for reproductive information were obtained from an age, growth and reproduction study of *Squalus acanthias* in the north west Atlantic (Nammack *et al*., 1985) and from revisions of this work (Silva, 1993).

The authors assumed T max to be equal to 50 years and calculated M as the rate of mortality necessary to reduce the recruited population to 1 % of it's initial value. The value of M (0.092) agreed with published values (Wood et al. 1979).

The probability of pups attaining a length of 30 cm was calculated from life table analysis assuming a finite rate of increase (l), reproductive data and mortalities derived above. The number of pups produced in a given year was estimated as a function of the fraction pregnant females within a given length class. The maturity ogive was computed using a cumulative logistic function. Average litter size was approximated as a step function and ranged from 4 to 9 pups.

Results

There was much variation in the swept-area biomass estimates for all length categories. These estimates did show an increase in stock abundance over the period 1968 to 1989. In addition, Canadian survey based abundance estimates showed a similar trend. The fishable stock biomass increased 6 fold between 1968 and 1989. Since then increased exploitation was thought to be responsible for the recent decreases in abundance estimates observed.

Since 1982 over 95 % of landings sampled were female. Males were considered to be an important proportion of the discards, as the minimum landing size was just below the asymptotic length taken from the literature. The only year for which detailed information for discarding was available was 1993. Rates of F for females have increased 17 fold from 1989 to 1993. The authors conclude that fishing mortality rates for males were negligible.

Comments on the applicability of this approach for assessing the stocks of *Squalus acanthias.*

It was suggested that swept area method may be inappropriate for a species such as *S. acanthias*, which forms dense — and often local - aggregations by size and sex.

The Change in Ratio (CIR) results should be used with caution as the estimation of sex ratio was considered to be uncertain for both the landings and discards. The authors themselves conclude that the sex ratio in the landings was considered unlikely to be reflective of the true population, since females are the subject of the fishery. Without good discard information it may not be possible to accurately assess the true mortality by sex in the fishery.

The increased stock size may change the distribution of that stock. The existing survey area may not match the stock distribution over the assessment period. The observed distributions may be due to the changed behaviour of spurdog, against the background of reduction of other species.

The need to determine if there was an age or sex specific mortality was noted. There is a need to determine the basic biological parameters such as age and length at maturity and fecundity. The reliance on von Bertalanffy parameters from the literature may be a problem in the north-east Atlantic, as the K coefficient and asymptotic L value may have changed for such a variable stock. Also, recent work on validation of age of spurdog (McFarlane and Beamish 1987) suggests that previous studies underestimated age.

Conclusions

Life-table analyses for the assessment of spurdog socks was considered to be an approach worth pursuing. This approach requires estimates of mortality (ideally both F and M), of fecundity and of age at maturity. The estimation of these parameters is not always straightforward and should be subject to a critical review, not only of the values, but of the variability of these estimates.

4 PEER REVIEW OF THE SGEF

In response to Term of Reference *c) obtain peer review of the Study Group report from a member of the Living Resources Committee prior to the 1999 Annual Science Conference* the SG agreed to ask Fred Serchuk (Woods Hole) to peer review the SGEF 1999 report. He has kindly agreed to do this.

5 COMMENTS ON DRAFT OBJECTIVES OF THE LIVING RESOURCES COMMITTEE

This addresses the Term of Reference d) *Comment on the draft objectives and activities of the Living Resources Committee component of the ICES 5-year Strategic Plan and specify how the SGEF contributes to it.*

The SG provided detailed comments on the draft objectives, which are dealt with below, but was concerned that the justifications did not help the understanding of the objective. The use of examples was considered to be misleading rather than enlightening. Concern was voiced that the resolution of the objectives was insufficiently focused, bypassing the problems associated with species and species identification. It is only possible to analyse interactions between species once the species data itself is reliable.

Objective 1.

It is understood that analysis of stomach contents is included in the ´basic biological information´ mentioned and that digestion rates need to be estimated in order to address Objective 4 adequately.

Objective 2.

The objective should concentrate on marine *species*, rather than on marine *populations*.

Objective 3.

Should read "Investigate the biological effects of *discarding* in fisheries on marine populations and the ecosystem"

The SG discussed the interpretation of the terms ´bycatch´, ´target´ and ´non-target´. The preferred termonology was: ´catch´, which could be divided into ´landings´ or ´discards´. Although the meaning can be understood intuitively, the term ´energy flows´ was questioned. It was suggested that the example of sea birds be removed as this puts too much emphasis on a particular issue. It is recognised that the effect of catching 'non-target' species is addressed in Objective 1.

Objective 4.

The sentence "It is, for example important to understand the potential impact of fishing populations at the base of the food chain on higher trophic levels" should be removed. It implies that this is one of the major factors of fishing on ecosystem functioning, while in fact we do not know if this is the case.

Three new objectives were considered to be necessary

Objective A.

Improve species identification and standardise sampling techniques and recording of (species) data.

Justification.

ICES is currently focusing on many more species than those targeted in commercial fisheries. Moreover, multispecies models are being developed. It is essential that these are based on correct species data. [As an aid to improving species data, the Study Group has prepared identification guides in the form of posters for the most commonly caught species (skates and deep-water sharks).]

Objective B.

Investigate faunal community composition.

Justification.

Using detailed species knowledge it is essential to describe community structure, prior to understanding trophic interactions and effects of exploitation.

Objective C.

Investigate the influence of environmental factors (natural variation, temperature, habitat change, pollution) on ecosystems.

Justification.

It is necessary to be able to evaluate to what extent observed changes in the ecosystem are due to environmental factors or to exploitation.

At present the SGEF can make a limited contribution to Objectives 1 and 3. It is expected that in the future the SGEF will be in a better position to contribute to all the objectives of the Living Resources Committee because it is involved in a Concerted Action Plan the aim of which is to submit a proposal to the European Union to fund a project on elasmobranch research. Until such time as there is adequate information and appropriate models to carry out assessments, the SGEF should continue to report to the Living Resources Committee as well as to ACFM.

6 SPECIES CODING

6.1 Coding system

Within the ICES area, species are coded using a numeric 10 digit NODC species code. This is used within the ICES IBTS database and in some other databases (e.g. for the FAIR project on deep-water fishes) for the recording of survey data and stomach content data. Since the existing NODC codes do not include all species, and since NOAA no longer updates the NODC coding system, there is scope for duplication. At the same time ICES uses species codes consisting of 3 letters and a 4 digit number and FAO use a 3 letter code. Confusion is bound to occur when different groups each start to introduce new codes.

It is, therefore, strongly recommended that the ICES Secretariat keeps a complete record of the codes used within ICES Study and or Working Groups and attempt to standardise these codes.

6.2 Classification problems related to elasmobranch fishery statistics

Following recommendations by the SGEF in 1995 for changes and additions to the classification and coding used in fisheries statistics for cartilaginous fishes (particularly in the STATLANT 27A reporting form), the 1997 Report of the SGEF specified such alterations and additions. Beyond the principal need for more species-specific reporting, these were required as a first step to mainly cover species in M. Stehmann's (ISH) field keys to North Atlantic deep-water sharks and skates in northern European shelf waters.

During the implementation of these alterations, questions were raised by ICES and FAO with regard to a generally adopted classification for the entire group Hypotremata, i.e. all rays and skates. Unlike the largely agreed and stabilised classification for Pleurotremata or Selachii (i.e. all sharks), the higher classification of the Hypotremata or batoid fishes is still rather confused and open to discussion.

The only well-based and published classification for all chondrichthyan fishes is that by Nelson in his "Fishes of the World" (3rd ed., 1994). This concept is demonstrated in Table 6.1. It ranks nine orders equally under subclass Elasmobranchii (combining all sharks, rays and skates), of which eight orders cover the various shark species, and just one, Rajiformes, comprises all species of the Hypotremata = Batoidimorpha = Rajiformes: namely, all sawfishes, rays and skates. Further subdivisions of the Rajiformes for statistical purposes are possible by using existing taxonomic units as suborders, superfamilies, families and subfamilies (see Nelson, 1994).

Partly in contrast to Nelson (1994), FAO uses three orders for the Hypotremata in its ISSCAAP system: namely Pristiformes (Sawfishes), Torpediniformes (Electric rays) and Rajiformes for all the rest. This usage by FAO is based on the classification in Eschmeyer´s (1998) "Catalog of Fishes". This, however, is a list of scientific species names, and is not a critical review particularly focusing on classification as is Nelson (1994). Table 6.2 summarises the

uncommented classification used by Eschmeyer (1998), which is partly also in contradiction to expert revisional studies such as that on the entire suborder Myliobatoidei (stingrays, eagle and devil rays) by Nishida (1990).

On behalf of the SGEF, M. Stehmann commented on this somewhat confused situation of classifications being used for the sawfishes, rays and skates in February 1998, when he proposed a solution with particular application to fishery statistics requirements. When the same problems were raised again by ICES in November/December 1998, and commented on by FAO, M. Stehmann again provided a statement to both organisations on behalf of the SGEF. Largely in agreement with the view of FAO, the principal criteria were that:

1. taxonomic nomenclature only considers published and available classification concepts, according to the International Code of Zoological Nomenclature (ICZN);

2. unit names used in fishery statistics must refer to actually existing classification units;

3. new items for statistical purposes must not be created if they do not refer to taxonomic units of available classification concepts;

4. the classification background used in fishery statistics must not necessarily reflect the most up to date status of systematists' discussions and publications on phylogenetic interrelationships reflected in classification concepts and modified accordingly. For statistical needs, consideration of the practical aspects and convenience are important, as is the need for a relatively stable medium term use of taxonomic units.

5. Hence, the present proposal by the SGEF (as previously expressed to ICES and FAO) is to follow the established classification given by Nelson (1994). If the Rajiformes are split further, a subdivision as given in Table 6.3 will serve for statistical needs. The major distinction, at least for European waters, should be made between family Rajidae as the primary fishery targets on the one hand, and the remaining batoid fishes (which can be subdivided further, if required) on the other.

7 CONCERTED ACTION PLAN

In the report of its 1997 meeting (ICES, CM 1997/G:2), the Study Group pointed out that it was not able to make progress with assessments of elasmobranch stocks because of the lack of scientific support at its meetings and the difficulty in accessing appropriate data held by member countries. The SG therefore recommended that a concerted action (funded, if possible, by the EU) should be undertaken to "find out what type of data have been collected and where and, more importantly, what information is required in order to develop an understanding of the population dynamics of the cartilagenous species and the changes in life history parameters in response to exploitation." This concerted action would provide funds for scientists from all interested countries to participate in meetings and develop a proposal for collaborative research with the objective to improve the scientific basis for the management of fisheries taking elasmobranch species.

A Concerted Action entitled "Preparation of a proposal for stock assessment of some elasmobranch fishes in European waters (FAIR CT98-4156) was agreed by the EU. The first of two meetings was held immediately prior to the SG meeting. At this meeting participants from 11 countries began to develop a proposal for a project of 3 years duration in preparation for the call for studies in Support of the Common Fisheries Policy expected in April 1999. The aims of this project are to collate existing data, to instigate the collection of new data and to develop standard assessment methods, using case studies of species representatives of the following groups: pelagic sharks; skates and rays; coastal dogfish and catsharks; and deep-water sharks. These aims may not be satisfied to the same extent for all species.

Within the proposal, it is intended that survey and fisheries data will be used to describe population distributions. Together with genetic, tagging and biometric data, this information will be reviewed to identify the data required to investigate stock separation. Where available, catch and effort series will be used to indicate abundance trends, and length (and possibly age) distributions used to estimate historic and contemporary stock mortality rates. Biological data will be compiled and, in some cases collected, and life history models developed to indicate whether populations are sustainable at current exploitation levels. Considering the role which ICES is expected to play in providing information and advice for management of the respective fisheries, it is important that the chair of the SG (and members who represent areas with fisheries included in the scope of the project) participates in this project.

The output from this project will be a compilation of data and some preliminary assessments for case study species, which will indicate the data requirements and assessment methods which appropriate ICES stock assessment working

groups will need in order to provide management advice for both directed elasmobranch fisheries and those where elasmobranchs are taken as by-catch.

A list of the working documents presented at the Concerted Action Plan meeting is shown in Appendix II.

8 FUTURE WORK OF THE STUDY GROUP AND LINKS WITH RELATED INITIATIVES

The Study Group will not be in a position to offer assessment advice unless the project proposal resulting from the Concerted Action, and to be submitted to the European Union in May 1999, is financed. In this case it will be at least 2-3 years, while data are being assembled and evaluated, before assessments can be attempted and advice on management formulated. Until such time, the SGEF considers that it should remain a Study Group and report to the Living Resources Committee as well as to ACFM. The role of the SGEF in the intervening period should be to monitor the development of the proposed project and any other initiatives in relation to elasmobranch fisheries and assessment. In this regard the progress of the spurdog assessments in the NW Atlantic and the occurrence of specialist workshops, e.g. ageing or genetic techniques should be noted.

Following a preparatory meeting in July 1998, the draft International Plan of Action for the Conservation and Management of Sharks resulting from the FAO Shark Technical Working Group and shown in Appendix III, were presented to the Consultation meeting in Rome, October 1998. This draft Plan of Action was approved by the Consultation. It is still unclear what the implications will be for ICES. Signing this global agreement is voluntary and the EU considers that signing should be a national initiative. European national representatives were present at the preparatory meeting in July and liaised with the EU representative. FAO has to report back within one year who has signed the agreement. The implementation of the Plan of Action requires that States should adopt a national plan of action and that this should be ready by the COFI Session in 2001. Although it is as yet unclear if a global Elasmobranch Working Group will be initiated under the auspices of the FAO, ICES should remain alert to the possibility of seeking representation at this forum. The Study Group should maintain previous links made with ICCAT, especially in relation to pelagic sharks.

9 RECOMMENDATIONS AND TERMS OF REFERENCE

9.1 Recommendations

The SGEF recommends that the ICES secretariat keeps a complete record of the codes used within ICES Study and/or Working Groups.

The SGEF recommends that ICES adopt the species coding as suggested by the Study Group and explained in this report.

It is recommended that the Chair of the SGEF and members who represent areas with fisheries included in the scope of the project participate in the proposed EU project on the development of elasmobranch assessments.

9.2 Proposals for Terms of Reference to be approved at the 1999 ASC meeting

The Study Group on Elasmobranch Fishes (SGEF) (Chair: Dr. P. Walker, Netherlands) will work by correspondence in 2000 to:

a) report to ICES on the progress of the proposed EU project for the development of elasmobranch assessments;

b) report to ICES on the development and progress of other initiatives related to elasmobranch fisheries and assessment, e.g. the FAO Plan of Action;

c) obtain peer review of the Study Group report from a member of the Living Resources Committee prior to the 2000 Annual Science Conference;

SGEF will report to the Living Resources Committee at the 2000 Annual Science Conference and to ACFM before its October 2000 meeting.

10 REFERENCES

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Rago, R. J., K. A. Sosebee, J. K. T. Brodziak, S. A. Murawski, and E. D. Anderson. 1998. Implications of recent increases in catches on the dynamics of Northwest Atlantic spiny dogfish (*Squalus acanthias*). *Fisheries Research* 39 (2):165 - 182.

Silva, H.M. 1993. Population dynamics of Spny Dogfish (*Squalus acanthias*) in the NW Atlantic. Unpublished Ph.D. Thesis. Amhearst, University of Massachusetts, 238 p.

Table 6.1 Higher categories of cartilaginous fishes (after NELSON, 1994)

Class	Subclass	Order
Chondrichthyes	Holocephali	Chimaeriformes
	Elasmobranchii	Rajiformes
		Pristiophoriformes
		Squatiniformes
		Squaliformes
		Hexanchiformes
		Lamniformes
		Carcharhiniformes
		Orectolobiformes
		Heterodontiformes

Table 6.2 Classification as modified by ESCHMEYER (1998) uncommented for cartilaginous fishes in "Catalog of Fishes"

Class	Order
Elasmobranchii	Hexanchiformes
	Heterodontiformes
	Orectolobiformes
	Lamniformes
	Carcharhiniformes
	Squaliformes
	Pristiophoriformes
	Squatiniformes
	Pristiformes
	Torpediniformes
	Rajiformes
Holocephali	Chimaeriformes

Table 6.3 Classification of batoid fishes (Rajiformes) for statistics following NELSON (1994

Order	Suborders	Family	Genus
Rajiformes	Pristoidei	Pristidae	
	Torpedinoidei	2 families	
	Rajoidei	Rhinidae	
		Rhinobatidae	
		Rajidae	e.g. *Raja*
		Family indet.	e.g. *Bathyraja*
	Myliobatoidei	6 families	

APPENDIX I

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APPENDIX II

Working Documents prepared for the Concerted Action meeting, Santander 22-24 March 1999

Clarke, M., 1999. A brief overview of available data on elasmobranchs in Irish waters.

Figueiredo, I. and P. Bordalo Machado, 1999. Working document to be presented at the 1st meeting of the Concerted Action FAIR CT98-4156.

Hareide, N.-R., 1999. Data on elasmobranch fish collected in Norwegian exploratory cruises.

Parker-Humphreys, M., 1999. An inventory of elasmobranch data for England and Wales.

Rodriguez-Cabello, C. and F. Sánchez, 1999. Data overview of the lesser spotted dogfish (*Scyliorhinus canicula*) in the Cantabrian Sea.

Sánchez, F., A. Fernández and I. Olaso, 1999. Elasmobranch abundance on the northern Spanish shelf with special reference to dogfish (*Scyliorhinus canicula*) and thornback ray (*Raja clavata*).

da Silva, A. A., 1999. Overview of elasmobranch fisheries data - Azores (ICES X).

Stehmann, M. 1999. Data and expertise being available at BFAFi-ISH for a planned project.

APPENDIX III

Overview of Draft International Plan of Action for the Management of Sharks - FAO Consultation - Rome, October 1998. Full text is available on the FAO website: http://www.fao.org/waicent/faoinfo/fishery/faocons/css/Reportf.htm

FAO Fisheries Department

Report of the

CONSULTATION ON THE MANAGEMENT OF FISHING CAPACITY, SHARK FISHERIES AND INCIDENTAL CATCH OF SEABIRDS IN LONGLINE FISHERIES

Rome, Italy, 26-30 October 1998

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS ROME, 1998

Preparation of this document:

This is the final version of the report of the Consultation on the Management of Fishing Capacity, Shark Fisheries and Incidental Catch of Seabirds in Longline Fisheries, Rome, Italy, 26-30, October 1998.

Distribution

Participants at the meeting
All FAO Member Nations and Associate Members
Other interested Nations and national and international Organizations
FAO Fisheries Department
FAO Regional Fisheries Officers

FAO

Report of the Consultation on the Management of Fishing Capacity, Shark Fisheries and Incidental Catch of Seabirds in Longline Fisheries. Rome, Italy, 26-30 October 1998. FAO Fisheries Report. No. 593. Rome, FAO. 1998.

ABSTRACT

The Consultation on the Management of Fishing Capacity, Shark Fisheries and Incidental Catch of Seabirds in Longline Fisheries was held at FAO Headquarters in Rome, Italy, from 26 to 30 October 1998. It was attended by delegations from 80 Members of FAO and by observers.

The Consultation approved (i) a draft International Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries; (ii) a draft International Plan of Action for the Conservation and Management of Sharks; and, (iii) a draft International [Guidelines] [Plan of Action] for the Management of Fishing Capacity.

The Consultation discussed at length the need to take urgent action to curb the growing problems of flags of convenience and pirate fishing. Furthermore it recommended that priority be given by FAO Members to consider accepting the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing essels on the High Seas (Compliance agreement).

Appendix F

DRAFT INTERNATIONAL PLAN OF ACTION FOR THE CONSERVATION AND MANAGEMENT OF SHARKS

Introduction

1. For centuries artisanal fishermen have conducted fishing for sharks sustainably in coastal waters, and some still do. However, during recent decades modern technology in combination with access to distant markets have caused an increase in effort and yield of shark catches, as well as an expansion of the areas fished.

2. There is concern over the increase of shark catches and the consequences which this has for the populations of some shark species in several areas of the world's oceans. This is because sharks often have a close stock-recruitment relationship, long recovery times in response to over-fishing (low biological productivity because of late sexual maturity; few off-spring, albeit with low natural mortality) and complex spatial structures (size/sex segregation and seasonal migration).

3. The current state of knowledge of sharks and the practices employed in shark fisheries cause problems in the conservation and management of sharks due to lack of available catch, effort, landings and trade data, as well as limited information on the biological parameters of many species and their identification. In order to improve knowledge on the state of shark stocks and facilitate the collection of the necessary information, adequate funds are required for research and management.

4. The prevailing view is that it is necessary to better manage directed shark catches and certain multispecies fisheries in which sharks constitute a significant bycatch. In some cases the need for management may be urgent.

5. A few countries have specific management plans for their shark catches and their plans include control of access, technical measures including strategies for reduction of shark bycatches and support for full use of sharks. However, given the wide-ranging distribution of sharks, including on the high seas, and the long migration of many species, it is increasingly important to have international cooperation and coordination of shark management plans. At the present time there are few international management mechanisms effectively addressing the capture of sharks.

6. The Inter-American Tropical Tuna Commission, the International Council for the Exploration of the Sea, the International Commission for the Conservation of Atlantic Tunas, the Northwest Atlantic Fisheries Organization, the Sub-regional Fisheries Commission of West African States, the Latin American Organization for Fishery Development, the Indian Ocean Tuna Commission, the Commission for the Conservation of Southern Bluefin Tuna and the Oceanic Fisheries Programme of the Pacific Community have initiated efforts encouraging member countries to collect information about sharks, and in some cases developed regional databases for the purpose of stock assessment.

7. Noting the increased concern about the expanding catches of sharks and their potential negative impacts on shark populations, a proposal was made at the Twenty-second Session of the FAO Committee on Fisheries (COFI) in March 1997 that FAO organize an expert consultation, using extra-budgetary funds, to develop Guidelines leading to a Plan of Action to be submitted at the next Session of the Committee aimed at improved conservation and management of sharks.

8. This International Plan of Action for Conservation and Management of Sharks (IPOA-SHARKS) has been developed through the meeting of the Technical Working Group on the Conservation and Management of Sharks in Tokyo from 23 to 27 April 19984and the Consultation on Management of Fishing Capacity, Shark Fisheries and Incidental Catch of Seabirds in Longline Fisheries held in Rome from 26 to 30 October 1998 and its preparatory meeting held in Rome from 22 to 24 July 19982.

9. The IPOA-SHARKS consists of the nature and scope, principles, objective and procedures for implementation (including attachments) specified in this document.

Nature and Scope

10. The IPOA-SHARKS is voluntary. It has been elaborated within the framework of the Code of Conduct for Responsible Fisheries as envisaged by Article 2 (d). The provisions of Article 3 of the Code of Conduct apply to

the interpretation and application of this document and its relationship with other international instruments. All concerned States3 are encouraged to implement it.

11. For the purposes of this document, the term "shark" is taken to include all species of sharks, skates, rays and chimaeras (Class Chondrichtyes), and the term "shark catch" is taken to include directed, bycatch, commercial, recreational and other forms of taking sharks.

12. The IPOA-SHARKS encompasses both target and non-target catches.

Guiding principles

13. Participation. States that contribute to fishing mortality on a species or stock should participate in its management.

14. Sustaining stocks. Management and conservation strategies should aim to keep total fishing mortality for each stock within sustainable levels by applying the precautionary approach.

15. Nutritional and socio-economic considerations. Management and conservation objectives and strategies should recognize that in some low-income food-deficit regions and/or countries, shark catches are a traditional and important source of food, employment and/or income. Such catches should be managed on a sustainable basis to provide a continued source of food, employment and income to local communities.

Objective

16. The objective of the IPOA-SHARKS is to ensure the conservation and management of sharks and their long-term sustainable use.

Implementation

17. The IPOA-SHARKS applies to States in the waters of which sharks are caught by their own or foreign vessels and to States the vessels of which catch sharks on the high seas.

18. States should adopt a national plan of action for conservation and management of shark stocks (Shark-plan) if their vessels conduct directed fisheries for sharks or if their vessels regularly catch sharks in non-directed fisheries. Suggested contents of the Shark-plan are found in Appendix A. When developing a Shark-plan, experience of subregional and regional fisheries management organizations should be taken into account, as appropriate.

19. Each State is responsible for developing, implementing and monitoring its Shark-plan.

20. States should strive to have a Shark-plan by the COFI Session in 2001.

21. States should carry out a regular assessment of the status of shark stocks subject to fishing so as to determine if there is a need for development of a shark plan. This assessment should be guided by article 6.13 of the Code of Conduct for Responsible Fisheries. The assessment should be reported as a part of each relevant State's Shark-plan. Suggested contents of a shark assessment report are found in Appendix B. The assessment would necessitate consistent collection of data, including inter alia commercial data and data leading to improved species identification and, ultimately, the establishment of abundance indices. Data collected by States should, where appropriate, be made available to, and discussed within the framework of, relevant subregional and regional fisheries organizations and FAO. International collaboration on data collection and data sharing systems for stock assessments is particularly important in relation to transboundary, straddling, highly migratory and high seas shark stocks.

22. The Shark-plan should aim to:

Ensure that shark catches from directed and non-directed fisheries are sustainable;

Assess threats to shark populations, determine and protect critical habitats and implement harvesting strategies consistent with the principles of biological sustainability and rational long-term economic use;

Identify and provide special attention, in particular to vulnerable or threatened shark stocks;

Improve and develop frameworks for establishing and co-ordinating effective consultation involving all stakeholders in research, management and educational initiatives within and between States;

Minimize unutilized incidental catches of sharks;

Contribute to the protection of biodiversity and ecosystem structure and function;

Minimize waste and discards from shark catches in accordance with article 7.2.2.(g) of the Code of Conduct for Responsible Fisheries (for example, requiring the retention of sharks from which fins are removed);

Encourage full use of dead sharks;

Facilitate improved species-specific catch and landings data and monitoring of shark catches;

Facilitate the identification and reporting of species-specific biological and trade data.

23. States which implement the Shark-plan should regularly, at least every four years, assess its implementation for the purpose of identifying cost-effective strategies for increasing its effectiveness.

24. States which determine that a Shark-plan is not necessary should review that decision on a regular basis taking into account changes in their fisheries, but as a minimum, data on catches, landings and trade should be collected.

25. States, within the framework of their respective competencies and consistent with international law, should strive to cooperate through regional and subregional fisheries organizations or arrangements, and other forms of cooperation, with a view to ensuring the sustainability of shark stocks, including, where appropriate, the development of subregional or regional shark plans.

26. Where transboundary, straddling, highly migratory and high seas stocks of sharks are exploited by two or more States, the States concerned should strive to ensure effective conservation and management of the stocks.

27. States should strive to collaborate through FAO and through international arrangements in research, training and the production of information and educational material.

28. States should report on the progress of the assessment, development and implementation of their Shark-plans as part of their biennial reporting to FAO on the Code of Conduct for Responsible Fisheries.

Role of FAO

29. FAO will, as and to the extent directed by its Conference, and as part of its Regular Programme activities, support States in the implementation of the IPOA-SHARKS, including the preparation of Shark-plans.

30. FAO will, as and to the extent directed by its Conference, support development and implementation of Shark-plans through specific, in-country technical assistance projects with Regular Programme funds and by use of extra-budgetary funds made available to the Organization for this purpose. FAO will provide a list of experts and a mechanism of technical assistance to countries in connection with development of Shark-plans.

31. FAO will, through COFI, report biennially on the state of progress in the implementation of the IPOA-SHARKS.

Appendix A

Suggested Contents of a Shark-plan

I Background

When managing fisheries for sharks, it is important to consider that the state of knowledge of sharks and the practices employed in shark catches may cause problems in the conservation and management of sharks, in particular:

Taxonomic problems;
Inadequate available data on catches, effort and landings for sharks;
Difficulties in identifying species after landing;
Insufficient biological and environmental data;
Lack of funds for research and management of sharks;
Little coordination on the collection of information on transboundary, straddling, highly migratory and high seas stocks of sharks;
Difficulty in achieving shark management goals in multispecies fisheries in which sharks are caught.

II Content of the Shark-plan

The Technical Guidelines on the Conservation and Management of Sharks, under development by FAO, provide detailed technical guidance, both on the development and the implementation of the Shark-plan. Guidance will be provided on:

Monitoring
Data collection and analysis
Research
Building of human capacity
Implementation of management measures

The Shark-plan should contain:

A. Description of the prevailing state of:

Shark stocks, populations;
Associated fisheries; and,
Management framework and its enforcement.

B. The objective of the Shark-plan.

C. Strategies for achieving objectives. The following are illustrative examples of what could be included:
Ascertain control over access of fishing vessels to shark stocks
Decrease fishing effort in any shark where catch is unsustainable
Improve the utilization of sharks caught
Improve data collection and monitoring of shark fisheries
Train all concerned in identification of shark species
Facilitate and encourage research on little known shark species
Obtain utilization and trade data on shark species

Appendix B

Suggested contents of a shark assessment report:

A shark assessment report should inter alia contain the following information:

Past and present trends for:

Effort: directed and non-directed fisheries; all types of fisheries;
Yield: physical and economic

Status of stocks
Existing management measures:
Control of access to fishing grounds
Technical measures (including by-catch reduction measures, the existence of sanctuaries and closed seasons)
Others
Monitoring, control and surveillance
Effectiveness of management measures
Possible modifications of management measures

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2. See report: "Preparatory Meeting for the Consultation on the Management of Fishing Capacity, Shark Fisheries and Incidental Catch of Seabirds in Longline Fisheries". Rome, 22-24 July, 1998. FAO Fisheries Report No. 584.
3. In this document the term "State" includes Members and non-members of FAO and applies mutatis mutandis also to "fishing entities" other than States.
4. See: "Report of the FAO Technical Working Group on the Conservation and Management of Sharks". Tokyo, Japan, 23-27 April 1998. FAO Fisheries Report No. 583
5. 5 In this document, the term "regional" incudes sub-regional, as appropriate.

APPENDIX IV

Draft objectives of the Living Resources Committee as commented on by the Study Group on Elasmobranch Fishes.

LIVING RESOURCES COMMITTEE (G)

Objective 1. Develop our knowledge of the life history, stock structure and population dynamics of living resources populations.

Justification. In order to provide advice in the management of marine resources, basic biological information is required on life history, recruitment, growth, maturity and mortality. This information is used to model populations and their response to exploitation. Since populations interact with each other, this basic biology is needed for both target and non-target species.

Objective 2. Co-ordinate national programmes aimed at monitoring the abundance and distribution of marine populations.

Justification. Most living resources in the ICES area are exploited by several countries, each with its own programme of research. Monitoring programmes are an essential element in research on population biology and the provision of management advice. ICES can substantially enhance national programmes by fostering co-operation through co-ordinated work. This reduces duplication of effort and enhances the utility of data collected to the benefit of all participants.

Objective 3. Investigate the biological effects of non-commercial bycatch in fisheries on marine populations and the ecosystem**.**

Justification. Most fisheries take a bycatch of non-target species or an unwanted size component of the target species. Frequently this bycatch is discarded at sea and will have a direct impact in the populations concerned. There will also be other indirect effects on the ecosystem by altering energy flows. Certain sea birds, for example, may benefit from discarded fish. Such efforts on the ecosystem need to be understood and quantified so that the broader effects of fishing can be appropriately managed.

Objective 4. Investigate trophic relationships in marine ecosystems and develop multispecies models suited to management issues.

Justification. The development of an ecosystem approach to fishery management requires an understanding of how ecosystems function and how populations interact. It is, for example, important to understand the potential impact of fishing populations at the base of the food chain on higher trophic levels. ICES will support research on trophic relationships and multispecies modelling to assist the development of an ecosystem approach to management.