INTERNATIONAL COMMISSION
for the
CONSERVATION of ATLANTIC TUNAS

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INTERNATIONAL COMMISSION FOR THE CONSERVATION OF ATLANTIC TUNAS

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(at time of 1998 Commission Meeting)

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ICCAT SECRETARIAT

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FOREWORD

The Chairman of the International Commission for the Conservation of Atlantic Tunas presents his compliments to the Contracting Parties of the International Convention for the Conservation of Atlantic Tunas (signed in Rio de Janeiro, May 14, 1966), as well as to the Delegates and Advisers that represent said Contracting Parties, and has the honor to transmit to them the ***"Report for the Biennial Period, 1998-99, Part I (1998)"***, which describes the activities of the Commission during the first half of said biennial period.

This issue of the Biennial Report contains the reports of the Eleventh Special Meeting of the Commission, held in Santiago de Compostela, Spain, in November, 1998, and the reports of all the meetings of the Panels, Standing Committees and Sub-Committees, as well as some of the Working Groups. It also includes a summary of the activities of the Secretariat and a series of National Reports of the Contracting Parties of the Commission, relative to their activities in tuna and tuna-like fisheries in the Convention Area.

Given that the combined length of these reports, the Report for 1998 has been published in two volumes. ***Volume 1*** includes the Reports of the Secretariat on its activities, the Proceedings of the Commission Meetings and the reports of all the associated meetings, with the exception of the Report of the Standing Committee on Research and Statistics (SCRS). ***Volume 2*** contains the Report of the Standing Committee on Research and Statistics (SCRS) and its appendices, as well as the National Reports mentioned above.

This Report has been prepared, approved and distributed in accordance with Article III, paragraph 9, and Article IV, paragraph 2-d, of the Convention, and Rule 15 of the Rules of Procedure of the Commission. The Report is available in the three official languages of the Commission: English, French and Spanish.

R. Conde de Saro
Commission Chairman

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NATIONAL REPORTS

STANDING COMMITTEE ON RESEARCH AND STATISTICS (SCRS)

(Madrid, Spain - October 19-23, 1998)

1. Opening of the meeting

1.1 The 1998 meeting of the Standing Committee on Research and Statistics (SCRS) was opened on Monday, October 19, at the Hotel Reina Victoria, in Madrid, by Dr. Joseph Powers, Chairman of the Committee, Dr. Powers welcomed all the participants and wished all a successful meeting.

2. Adoption of Agenda and arrangements for the meeting

2.1 The Tentative Agenda was reviewed and adopted by the Committee (attached as **Appendix 1)**.

2.2 The following scientists served as rapporteurs for the species sections (Agenda item 13) of the 1996 SCRS Report:

Tropical tunas: general		P. Pallares
YFT:	yellowfin tuna	P. Mace
BET:	Bigeye tuna	N. Miyabe
SKJ:	Skipjack tuna	J. Ariz
ALB:	Albacore	J. Santiago
BFT:	Bluefin tuna	J. Powers, L. Kell
BIL:	Billfishes	E. Prince
SWO:	Swordfish	J. Porter
SBF:	Southern bluefin tuna	Y. Takeuchi
SMT:	Small tunas	L. Gouveia

2.3 Dr. P. Miyake, ICCAT Secretariat, served as rapporteur for all the other SCRS Agenda items.

3. Introduction of Contracting Party delegations

3.1 Each delegation introduced its members. The List of Participants is attached as **Appendix 2**. The Chairman noted that, with the adherence of the European Community as a Contracting Party to ICCAT, scientists of the EC Member States now comprise the EC scientific delegation to the SCRS.

4. Introduction and admission of observers

4.1 Delegations from 17 ICCAT Contracting Parties participated in the 1998 SCRS Meeting. In addition, representatives from Namibia, Panama, Turkey, Chinese Taipei, CARICOM, and IATTC participated in the meeting in an observer capacity. The observer delegations (see **Appendix 2,** List of Participants) introduced themselves and were admitted.

5. Admission of scientific documents

5.1 The Committee noted that 177 papers (at the time of opening) had been submitted to this year's meeting, all of which met the criteria for the admission of documents. The List of Documents is given in **Appendix 3**.

6. Review of national fisheries and research programs

6.1 BRAZIL

In 1997 the total number of Brazilian longline vessels was 48, showing a slight decrease (4%), in relation to 1996. However, there was a marked increase of 34.8% in the number of genuinely national vessels. This increase is explained by changes in domestic policy, which stimulated new investment in tuna fisheries. The Brazilian baitboat fleet consisted of 45 vessels. In relation to 1996, this fleet showed a decrease of 11.8% in the number of vessels.

Total Brazilian catch of tuna and tuna-like species (including sharks) in 1997 was 44,551 MT, showing a slight increase of 8.8% in relation to 1996. Until 1995 sharks have been the dominant species in the catches of the longline fishery. However, since 1993 the percentage of shark catches has showed a decreasing trend, while swordfish catches have showed

a gradual and continuous increase. In 1997, swordfish catches accounted for 43.7% of the total catch of the longline fishery, and this species became dominant in this fishery with sharks appearing as the second most important species (22.8%), followed by bigeye (13.2%). As for the baitboat fishery, the total catch in 1997 was 27,475 MT, which represents an increase of 8.7% over the 1996 catch. The 1997 catch of skipjack (25573 MT) was the peak catch recorded in this fishery being slightly higher than the previous record of 25051 MT observed in 1985, during the phase of expansion of the fishery.

In 1997, a successful experiment of directed swordfish fishing was conducted by small vessels from the artisanal fishery, in the northeast region of Brasil. As a result, a number of small vessels, ranging from 9 to 13 meters long entered into the swordfish fishery based at Natal (Rio G. do Norte state).

The collection of catch and effort statistics and sampling for size frequency of the main tuna species has been continued in 1997. In addition, data on individual weight of landed swordfish are being collected to be used to estimate the fish length. In relation to sharks, sampling activities for shark fin identification from landings of the longline fishery have been conducted, to estimate weight and species composition of shark caught and discarded at sea. The compilation of Task I and Task II data on catch and catch/effort for 1997 for the main tuna fisheries has been finalized and have been submitted to ICCAT, together with the major part of length frequency data collected.

From April 1997 to April 1998 three scientific observer trips were carried out on board of longliners targeting swordfish, whose main objective was the collection of data on size measurements, estimation of discards, and identification and quantification of fish and non-fish species caught incidentally in the longline fishery.

In response to ICCAT regulatory recommendations Brazil has been promoting adaptations in domestic fishery legislation and issuing new fishery regulations. In 1998, the regulation on minimum size and weight for swordfish, was revised, amended and reissued, to make possible its effective implementation. In relation to shark fisheries, a regulatory measure was issued including provisions for prohibition of finning sharks, establishing a maximum size length for pelagic driftnets and making mandatory the submission of data on the weight of fins landed.

6.2 CANADA

In 1997, bluefin tuna and swordfish regulations, consistent with ICCAT regulatory regulations, were in effect in Canada. The Canadian nominal landings of swordfish were 1089.5 MT, taken mainly by longline. Bluefin tuna nominal landings were 504.5 MT. For both fisheries, 40-50 MT of the allowable quota were left uncaught, due primarily to the complex nature of the domestic allocation system, rather than to an inability to catch fish. Other tuna, white marlin and shark landings are also monitored, and Task I and Task II data submitted for 1997. In addition, at-sea observers estimated approximately 6 MT of dead bluefin discards and 5 MT of dead swordfish discards from the swordfish longline test fishery and the directed fishery for other tunas (SCRS/98/41).

Research responsibility for both swordfish and tuna resides at the Biological Station, St. Andrews, New Brunswick. In 1997, tagging studies and biological sampling continued. In addition, improvements were made to the swordfish and bluefin CPUE analyses. In 1997, a collaborative (Canada/USA/Industry) high tech satellite tagging project was initiated, with tagging commencing in 1998.

6.3 CHINA

China started its tuna fishery in the Atlantic Ocean in the early 1990. In 1997, there were four long line fishing vessels flying the Chinese flag exploiting tuna and tuna-like species in the Atlantic. The total catch in 1997 was 617 MT, representing a 27% decrease compared to the 1996 figure of 870 MT. Bigeye tuna was the main species caught by the Chinese longliners, catching 378 MT in 1997, 18% less than in 1996. The catches of yellowfin (74 MT) and bluefin tuna (42 MT) also decreased by 33% and 47% respectively and swordfish catches decreased by 70%. However, there was a slight increase in the catches of other tuna species.

China has only recently started to carry out research on tuna fisheries biology and stock assessment. The Chinese fisheries authorities has ordered all Chinese fishing vessels to report the catch statistics in accordance with the ICCAT format.

6.4 COTE D'IVOIRE

Even though Côte d'Ivoire did not have tuna vessels until 1984, she has always played a very important role, through the port of Abidjan, in the exploitation of tuna resources in the eastern central Atlantic. On average, 17,000 MT of tuna are landed or transhipped annually at the port of Abidjan. Beside these tuna landings made by the industrial fleets, artisanal operations are carried out, catching other species of large fish such as the billfish and sharks, as well as tunas. One of the main activities of the Oceanographic Research Center of Abidjan is to monitor, in collaboration with ORSTOM, all the fisheries by means of regular surveys aimed at collecting precise data in order to improve knowledge on the various species exploited.

The daily landings of tunas at the port of Abidjan are made by three international industrial fleets, which are the French, Spanish and NEI purse seiners which operate in the Côte d'Ivoire EEZ, catching an average of 7,000 MT of tunas from 1995-1996. In 1997, 134 landing surveys and 4,781 other surveys were carried out by the CRO technicians on 24 FIS and NEI boats which regularly land tunas at the port of Abidjan. A total of 50,334 MT of tunas were landed as compared with 78,929 in 1996, a decrease of 36.23%. The tunas landed at the Port of Abidjan by the industrial fleets fall into three categories:

-- Large sized undamaged fish which are sent directly to the local factories for processing (PECHE-FROID and SCODI).

-- Fish which are too small, too damaged, or too salty and as a result are rejected by the factories and the freighters, commonly called "false fish" and which are sold cheaply for local consumption.

-- The "*ravils*" which mainly comprise small tunas (Auxis, thazard, little tuna) and represent a large part of the false fish which come mainly from coastal fisheries and fisheries using floating objects.

In 1997, the total quantity of false fish landed by the French, Ghanian and Spanish fleets was 9,389 MT.

In 1997, the canoe fishery landed, as well as some tuna, billfish of which 2,262 (in number) were sailfish (*Istiophorus nigricans)*, 669 swordfish (*Xiphias gladius)*, 936 blue marlin (*Makaira nigricans*), 66 white marlin (*Tetrapturus albidus)*, and 2097 were sharks.

In the field of research, CRO is participating in the PICOLO program initiated and financed by ORSTOM, and based at CRO. The aim of this program is to gain knowledge about the reasons for concentrations of tunas in an area of the Atlantic at a time of the year known to be biologically poor. The major activities of this program involve: physiology, primary and secondary catches, the dynamics of the tuna fishery, nutrition of tunas, and the nutrition and reproduction of the *Vinciguerria nimbaria*, a mesopelagic fish known to be a potential prey to tunas.

The CRO proposes to continue to monitor tuna landings at the Port of Abidjan by applying the new sampling scheme developed by their ORSTOM partners. As regards other large pelagics such as billfish, it is proposed to maintain, improve and extend to the main fishing areas along the coast, monitoring of landings by measuring and weighing fish. A special emphasis will be laid on bigeye within the framework of the BETYP.

6.5 CROATIA

During the last few years, the Croatian bluefin tuna fishery has remained stabilized as in previous years, as regards catches, gears and vessels. Thus, the annual catches are at a level of more than 1000 MT, mostly produced by purse seiners. Besides, in recent years, bluefin tuna farming has been developed, especially influenced by Japanese market demands. It is urgent that daily bluefin tuna increases in captivity be determined by scientific methods since the Bluefin Tuna Statistical Documents usually contain information on total weights. This can cause some misunderstanding in future analyses because the official statistics, which are usually reported to the ICCAT Secretariat, show weight of fish caught, not be farmed weight.

The Croatian tuna processing industry was previously a major consumer of bluefin resources, but this is no longer the case as those fish taken are caged for ranching.

According to that agreed upon at the 1997 SCRS meeting, Dr. Peter M. Miyake visited Croatia from June 30 to July 6, 1998, to investigate the substantial changes in historical catches done by the Croatian fishing fleet. The results of the investigation have been submitted in document SCRS/98/45.

Two another documents (SCRS/98/46 and SCRS/98/47) have been also prepared for the joint GFCM/ICCAT meeting and the ICCAT Bluefin Tuna Stock Assessment Session by the Croatian scientist.

Since January, 1988, Croatian administrators have been involved in a large process of registration of all the fishing boats and their gears according to a new law on the sea fishery. Croatia is also using this process of registration to reduce the number of licenses for tuna pursers and longliners. This is in preparation for the implementation of the bluefin tuna quotas since Croatia has to reduce the previous number of vessels with licenses and in such way provided sufficient quantities for the operating boats. In the other case, each quota could destroy the entire tuna fishing sector because the fishermen would not have satisfied quota for economic survival. The number of tuna fishing licenses will be reduced to almost half of the previous number.

Unfortunately, up to now, Croatia has no organized monitoring of the sea fishery or the statistical system regarding landings. Thus, it is not always possible to provide all the data to the ICCAT Secretariat. However, for each data request, it is absolutely necessary to conduct a survey on that particular question or demand. Despite these difficulties, Croatia is making every effort to provide at least catch data. This work in currently in process and will be continued and expanded until the statistical scheme is fully implemented. Good cooperation has been achieved with the Croatian fishermen for the collection of data, as well as for the implementation of the essential conservation measures.

6.6 EUROPEAN COMMUNITY (EC)

The European Community fleets fish for all ICCAT -regulated species in the Atlantic and the Mediterranean. Total catches in 1997 were 222,000 MT (provisional data), which represents 36.5% of the total ICCAT catches.

Since 1991, a decreasing trend has been observed in Community catches, the catch in 1997 being almost 80,000 MT lower than that of 1991.

By species, the EC catches are: Skipjack 59,300 MT; yellowfin 55,300 MT; bluefin 27,354 MT; albacore 25,138 MT and bigeye 24,900 MT.

Details of the fisheries can be found below in the individual reports of each E.C. member state.

A number of research projects are being carried out by EC Member States, many of them being joint programs involving two or more Member States. Many of these programs are co-funded by the European Community.

6.7 EC-FRANCE

French catches of tunas in 1997 amounted to 73,700 MT. The estimates of bluefin tuna catches in the Mediterranean (8,200 MT in 1997) comprise a scientific estimate based on sampling that is as detailed as possible, but which could be under-estimated. A review of the catches of the last five years has been done. Catches of albacore in the Atlantic reached 4,600 MT. Fishing for tropical tunas remained active in 1997 and these catches amounted to 60,600 MT, which shows a decline of more than 15% as compared to 1996. This appreciable decline is largely due to the moratorium on fishing with objects which was voluntarily adopted by the purse seiners.

French research on temperate tunas is carried out by IFREMER, while tropical tuna research is carried out by ORSTOM, in close cooperation with Côte d'Ivoire and Senegal. The major objectives of research on temperate tunas is the monitoring of the fisheries, analysis of the state of the stocks, particularly on bluefin tuna, and the relationship of tunas and their environment.

6.8 EC-GREECE

Fishing activities in Greece on large pelagics started at the beginning of the last decade. Considerable development of the fisheries (especially that for bluefin tuna) was noted by 1992. The fishing fleet increased in size and expanded its activities both in terms of fishing gears and fishing periods.

There were two significant reasons for this increase: (1) the high demand for bluefin tuna on the Japanese market and (2) the seasonal closure established for the swordfish fishery.

The statistics for bluefin tuna were under-estimated. A paper was prepared in which catch data over an eleven-year period (1987-1997) were revised, with the collaboration of Dr. P. Miyake during his short visit to Athens. This work was presented to the SCRS (document SCRS/98/90) and has been accepted.

Research activities concerning large pelagics are carried out by the Institute of Marine Biology of Crete (since 1986) and by the University of Athens.

6.9 EC-IRELAND

In 1997 the catch of Albacore (*Thunnus alalunga*) was 1,914 MT, taken mainly in an area bounded by latitudes 46-50 North and longitudes 11-15 West, and in an area bounded by 46-47 North and 5-6 West. In addition, a small catch was taken in waters to the west and northwest of Ireland. The catch was by driftnet and approximately 20 vessels took part in the fishery between July and October. There was a by-catch of 3 MT of bluefin tuna (*Thunnus thynnus*). A scientific monitoring program was not in place in 1997 and only some 200 fish were measured. A full scientific monitoring program including on board observers was put in place for 1998 and the results of this will be reported in due course.

6.10 EC-ITALY

The Italian fleet continues to carry out the bluefin tuna fishery in the Mediterranean using purse seines, tuna traps, longlines, and other minor gears. The swordfish fishery is carried out by longliners, driftnets and harpoons, while other tuna species are caught by a variety of artisanal gears.

The catch statistics have been revised for the period 1990-1997, after very difficult work, and then submitted to the SCRS during the Genoa meeting.

As concerns research, several projects are currently being carried out by various institutes and other projects have been completed recently. A large part of the research, mostly funded by the Italian Government, concerns statistics, landings and catch and effort studies, as well as size frequencies, biology and genetics.

Two research projects are currently being carried out with observers on-board longline vessels. The objectives is to better define this fishery, including the by-catches. A satellite pop-up tagging project is being carried out by an Italian institute in cooperation with other European institutes, to study bluefin tuna movements.

6.11 EC-PORTUGAL

Portuguese catches of tuna and tuna-like-species amounted to 13,501 MT in 1997 which represents a decrease of 25.8% over the catch of 1996 and 46.5% over the catch of 1995. This decreasing trend is mainly due to the decline in baitboat fisheries in recent years.

The Portuguese tuna fishery takes place mainly in the Azores and Madeira islands, where local baitboat fleets target different species of tuna, depending on the season and the local abundance of each species. In 1997, these baitboat fleets caught 6,779 MT in Azores and 4,182 MT in Madeira, which included 5,357 MT of bigeye tuna, 4,389 MT of skipjack, 448 MT of bluefin tuna and 393 MT of albacore.

A longline fleet based at mainland Portugal targets mainly swordfish and operates in the north and south Atlantic. The catch by this fleet amounted to 1,126 MT of swordfish, with 685 MT caught in the northeast Atlantic and 441 MT in the south Atlantic. The longliners based in the Azores caught 278 MT during 1997.

Since 1990, a fleet of three longliners based in Madeira has been operating in the eastern Atlantic and in the Mediterranean, catching an average of 300 MT of bluefin tuna per year. A total of 282 MT of bluefin was caught during 1997.

One trap has been operating in the south of Portugal since 1995, targeting bluefin tuna. In 1997, the bluefin catch taken by this trap was 19 MT.

Research programs on tuna are mainly carried out by the Azores University, the Fisheries Research Laboratory of Madeira and the IPIMAR in Portugal mainland. The collection of tuna statistics and sample size frequencies have been routinely reported to the ICCAT Secretariat and the results of the scientific research have also been submitted to the regular meetings and inter-sessional workshops of the SCRS.

6.12 EC-SPAIN

Spanish catches of tuna and tuna-like species in 1997 amounted to 116,055 MT, comprised as follows: 24,155 MT yellowfin; 12,671 MT bigeye; 37,715 MT skipjack; 17,366 MT albacore; 14,862 MT swordfish; 8,047 MT bluefin tuna; and 1,239 MT of other species. For all species combined, size sampling was carried out on more than 400,000 fish in 1997 (39,463 yellowfin; 63,042 skipjack; 19,080 bigeye; 48,720 albacore; 29,121 bluefin; 192,560 swordfish; and 10,294 various species). Detailed monitoring of the different fisheries for temperate and tropical tunas was also carried out.

During 1996, a joint Spanish-French project was initiated, financed by the EU, to study the statistical data processing scheme of this purse seine fishery for tropical tunas. In 1997 a joint Spanish-French research project, financed by the EU, was started to analyze the causes for the increase in the bigeye catches by this fleet. In 1997, monitoring continued of the

fishing with objects in the Canary Islands area, by means of periodic sampling at the port of Arrecife (Lanzarote Island) and the implementation of a fishing logbook system.

Some 400 bluefin tuna spines were analyzed by reading the fin rays spines of the first dorsal fin, from fish taken in the Cantabrian fishery. In the Mediterranean in 1997, the development of the Research Program DG-XIV 95/10 continued on juvenile bluefin tuna to compile information on recruitment areas, growth, stock structure and the impact of fishing on the catch of juveniles below the minimum size recommended by ICCAT. In response to an ICCAT recommendation, a live weight-belly meat relationship was presented to the 1997 SCRS. The activity was initiated of placing observers on board longliners in the Mediterranean. Sampling was carried out on 29,003 bluefin tuna in the Mediterranean of which 7,840 fish were sexed.

Relative standardized catch rate indices of albacore were developed in number of fish by age group for the Spanish baitboat and troll fisheries. In 1997, two AZTI+IEO research projects concluded. One of these projects dealt with the application of tele-detection techniques to the albacore fishery in the northeast Atlantic. The other research project was on the standardization of daily yields of the Spanish surface fleets and the Portuguese baitboat fleet of the Azores, from fishing Logbooks for the adult component of the stock (SCRS/98/148).

Biological sampling continued on swordfish to obtain size-sex variables by time-area strata and about 11,000 fish were sexed. Two scientific tagging cruises directed at swordfish and associated species were conducted in northeastern Atlantic waters and voluntary tagging by the commercial fleet in the Atlantic and by observers continued to be encouraged. In 1997, the European project concluded that had been initiated in 1994 (IEO+EU DG XIV MED93/013), to study the stock structure of Atlantic and Mediterranean swordfish using mitochondrial DNA. The research project to evaluate the potential use of swordfish parasites as biological markers also concluded. Standardized indices of abundance of Atlantic and Mediterranean swordfish were developed. The DG XIV 97/74 project was carried out to study the incidence of the diverse configurations of surface longline on the catch of juvenile fish.

6.13 JAPAN

Longline is the only gear currently operated by Japan in the Atlantic Ocean. The number of Japanese longline vessels which operated in Atlantic in 1997 was 234 (a decline of 50 vessels from 1996). The average days of fishing per vessel increased consistently from 118 days/vessel to 188 days/vessel in 1997. This implies that the Japanese vessels tend to spend more time now in the Atlantic than before. The provisional 1997 catches of tunas and tuna-like fishes in the Atlantic Ocean and Mediterranean Sea by the Japanese fishery is estimated to be 40,517 MT (11,000 MT or 21% decrease over 1996). Bigeye is the most important species, accounting for about 70% of the total catch. in 1997, there was a general decline of catch for almost all species; bigeye (5,700 MT or 17%), yellowfin (1,700 MT or 32 %), swordfish (900 MT, 24%), southern bluefin (850 MT, 70 %), blue marlin (400 MT or 23 %).

One of the recent changes in longline fishery is the change of material for main and branch lines. The collection of information on the materials used for the main and branch lines started in 1993. The use of nylon lines has become popular over the last few years. Its use was between 30-40% in 1994, but it continuously increased to over 80% in 1997. Though accurate information on the efficiency of that material is not clear, it seems to vary depending on the area, time and target species.

The monitoring of fishing activities, including data collection, submission of fishing data, and the study on the improvement of stock assessment methodology, are important research items, for which the National Research Institute for Far Seas Fisheries (NRIFRSF) has been responsible. This year Japan participated all ICCAT meetings provided routine fisheries statistics (Task I and Task II) as well as catch at size for albacore, bluefin, bigeye, yellowfin, swordfish.

In accordance with the Commission's 1996 recommendation on bigeye and yellowfin tuna, Japan has carried out scientific observer trips on board five Japanese longline vessels in 1997 and 1998. The main objectives of this project are the collection of fishery data, biological information on adult bigeye tuna, including size measurements and the collection of tissue, gonad and hard part samples, and some oceanographic data. The preliminary results of these observations were presented in the documents SCRS/97/56 and SCRS/98/161.

6.14 KOREA

In 1997, Korean tuna fisheries caught 1,924 MT of tunas and tuna-like fishes in the Atlantic Ocean, showing about 30% decrease over the previous year's figure.

The decrease was due to the decreased number of vessels from 16 longliners in 1996 to 12 in 1997. The species caught by the longliners were bigeye, bluefin, yellowfin and other tunas and billfishes, of which the first three species contributed more than 80% to the total catch. The 1997 catches of bigeye, bluefin and yellowfin tuna were 796 MT, 613 MT and 257

MT, respectively, representing 10-36% decrease compared to 1996. The remaining 13% of the total catch includes small quantities of albacore, southern bluefin tuna, swordfish, billfish and others, which have been considered as by-catch species. Routine scientific monitoring work was carried out by the National Fisheries Research and Development Institute (NFRDI). This monitoring covers collections of catch and fishing effort statistics from Korean tuna longliners in the Atlantic to meet data requirements of ICCAT.

6.15 LIBYA

Bluefin and other tuna species form a large part of the Libyan catches of fish. These fish are caught by different fishing methods, mainly fixed traps, purse seiners and long lines. During 1998, four traps were in operation, as well as two purse seiners and six longline vessels, with other vessels operating joint ventures in Libyan waters.

In 1997, the catch of bluefin tuna was 32 MT by purse seine, 72 MT by traps and 448 MT by Libyan longline. 340 MT were also taken by vessels operating in joint ventures. During this time fishing activities were also carried out in the east Atlantic, with catches in 1996 of 576 MT and 477 MT in 1997. In 1998, 511 MT were caught in the east Atlantic; Mediterranean catches have not yet been finalized and will be reported.

Two research projects, one on the biology of bluefin tuna and one on genetic analysis are in preparation, and are scheduled to start by March 1999.

6.16 MOROCCO

Moroccan tuna activities more or less directly target bluefin tuna. In 1997 the production of bluefin tuna was 2603 MT, taken by traps (40%), canoes (30%) and purse seiners.

Swordfish: In 1997, production of swordfish was 5167 MT , mainly taken in the Mediterranean by medium sized drift nets of 1.8 km in length.

Small tunas: In 1997, 6550 MT were caught, mainly by surface gears, with some trap catches.

As regards research, there is at present a special interest in monitoring tunas. The programs undertaken within the framework of the FAO-COPEMED project should be noted, as well as the creation of the new *Centre de Recherche un Mediterranée (*Mediterranean Research Centre) by the INRH, which is responsible for monitoring these fisheries.

6.17 RUSSIA

In 1997 tunas were fished by purse seiners in the exclusive economic zone (EEZ) of Sierra-Leone and in the open central-eastern Atlantic. In the area of Sierra Leone, the fishery was carried out by seven mid-tonnage purse seiners from March-June. The total catch from Sierra Leone zone amounted to 4,124 MT. The bulk of the catch consisted of yellowfin tuna (95.1%), while the proportion of skipjack was 4.9%.

The total catch from the high seas area amounted to 1,349 MT. Catches consisted of yellowfin tuna (26.5%), skipjack (68%), bigeye (2.8%) and frigate tuna (2.7%).

In the first half of 1998, seven purse seiners caught 7,580 MT according to the preliminary data. From December 1997 to May 1998 the material on tuna biology and distribution in the Sierra Leone EEZ and high seas was collected from fishing vessels. An analysis of skipjack tuna biological materials collected from 1959 to 1998 in the eastern Atlantic was carried out.

Data length composition of yellowfin tuna in the Sierra Leone EEZ was studied. The number of young fish varied form 2% to 39%, with an average of 10%. The number of young fish taken on the high seas varied from 48% to 84% of the catch.

6.18 TUNISIA

Tunisian catches of tunas and tuna-like fishes amounted to 3,830 MT in 1997, of which bluefin tuna comprised 50.4% of the catch (2,200 MT). The tuna purse seiners, which number 60, mainly catch this species, and landed more than 90% of the national catches. The remainder of the catch (less than 10%) is taken by trawlers which use hand lines occasionally, and the two traps still in operation.

Swordfish fishing is active, especially to the north of Tunisia, of Tunisia by 40 longliners that landed 350 MT in 1997.

As a result of the adherence of Tunisia to ICCAT, the competent authorities of the General Directorate of Fishing and

Aquiculture given particular attention to the catch data of these species, and to the declarations made by the various participants. Thus, a revision of the catches for recent years has been carried out. A new strategy has been implemented to improve knowledge on the tuna activities relative to these large pelagics.

Tunisian research on tunas is carried out by the National Institute of Marine Sciences and Technology (INSTM) and centers on the monitoring of the bluefin tuna and swordfish fisheries as well as small tunas. The final objective of this work is to contribute to improved knowledge on the biology and fishing of the species that the fishermen in the area catch for commercial purposes.

The means to access this knowledge are based particularly on the analysis of the fisheries as well as specific research work (area breakdown of the catches, some aspects of their biology and their ecology, etc.) that were carried out withing the bilateral or multilateral framework and co-financed by COPEMED.

6.19 UK-BERMUDA

The Bermuda commercial fishing fleet consisted of 194 vessels during 1997 with approximately one-third of these vessels actively fishing for tuna and tuna-like species. Most of this fishing is carried out in the inner 40 km of the Bermuda Exclusive Fishing Zone although longline operations worked considerably farther offshore.

During 1997, the total catch of tuna and tuna-like species was 185.5 metric tonnes with wahoo and yellowfin tuna being the primary components.

Research on the age-growth and reproductive aspects of pelagic species remain on-going. Bermuda is actively involved in the ICCAT Enhanced Program for Billfish Research as well as engaging in several regional research programs directed at pelagic species.

6.20 URUGUAY

In 1997 the Uruguayan tuna fleet operated with seven longliners, catching a total of 988 MT of tunas and related species, and 341 MT of sharks and other by-catch species. Landings were 121MT less than in 1996.

Substantial improvements are currently being made, both in statistics and in research, thanks to the new Programs in effect. The national fleet began to use new fishing logbooks, which shows more details about the catches. The National On-Board Observer Program has begun. Size sampling of the main species, measurements for conversion factors, analyses of discards and obtaining environmental parameters for mesoscale studies are being carried out.

On the other hand, the national management regulations in force have resulted in a limitation on the number of boats in the national fleet and the obtaining of more information on tuna vessels flying foreign flags.

6.21 UNITED STATES

Total (preliminary) reported U.S. catches of tuna and tuna-like fishes (including swordfish, but excluding other billfishes) in 1997 were 29,174 MT. This represents an increase of 1208 MT from 1996. Total Atlantic estimated swordfish catch (including estimated dead discards) decreased from 4320 MT to 3840 MT. Of this total catch, 397 MT of swordfish were landed in the south Atlantic, with 21 MT discarded, while 2976 MT were landed in the north Atlantic, with 446 discarded. U.S. vessels landed an estimated 1334 MT of bluefin in 1997. Discards of bluefin declined again from 73 MT in 1996 to 52 MT in 1997 of which 15 MT were discards from the rod and reel fishery. Estimated landings from the U.S. fishery of yellowfin decreased from 7743 MT in 1996 to 7625 MY in 1997. Estimated skipjack landings decreased from 84 MT to 72 MT, and estimated albacore landings decreased further from 472 MT in 1996 to 343 MT in 1977. Estimated bigeye landings increased from 882 MT to 1095 MT in 1997, a level more comparable to reported 1995 landings of 1208.

U.S. fisheries for Atlantic tuna and tuna-like species are managed through regulations issued under the authority of the Atlantic Tunas Conservation Act (ATCA), which authorizes the Secretary of Commerce to implement regulations as may be necessary to carry out the recommendations of ICCAT. This authority has been delegated from the Secretary to the Assistant Administrator for Fisheries of the U.S. Department of Commerce. No regulation promulgated under ATCA may have the effect of increasing or decreasing any allocation or quota of fish or fishing mortality level that the United States agreed to pursuant to a recommendation of ICCAT. The Magnuson-Stevens Fishery Conservation and Management Act of 1996 (Magnuson-Stevens Act) also guides the management of large pelagic species in the United States (SCRS/98/117).

In addition to monitoring landings and size of swordfish, bluefin tuna, yellowfin tuna, billfish, and other large pelagic species through continued port and tournament sampling, logbook and dealer reporting procedures, and scientific observer sampling of the U.S. fleet, major research activities in 1996 and 1997 focused on several items. Research on development of methodologies to determine the genetic discreetness of large pelagic fishes in the Atlantic was continued. Larval surveys

for bluefin tuna and other large pelagics in the Gulf of Mexico was continued. Research continued on development of new methods for estimating and indexing abundance of various large pelagic species, including application of fishery independent methods, such as aerial surveys, as well as robust estimation techniques for sequential population analyses. Research was also conducted on approaches for characterization of uncertainty in assessments and methods for translating that uncertainty into risk levels associated with alternative management approaches. U.S. also scientists continued to coordinate efforts for the ICCAT Enhanced Research Program for Billfish. Cooperators in the Southeast Fisheries Center's Cooperative Tagging Program tagged and released 3260 billfishes (swordfish, marlins and sailfish) and 3013 tunas in 1997. This represents a decrease of 3.2% from 1996 levels for billfish, and a increase of 24% for tunas.

In response to ICCAT recommendations, randomized observer sampling in the U.S. large pelagic fleet was continued into 1997. Using the fishing vessel performance information provided through the submission of mandatory pelagic logbooks by vessel owners and operators, a list of randomly selected vessels were used to derive a target sampling fraction of 5% of the pelagic longline fleet in the Gulf of Mexico, Caribbean, and Atlantic Ocean since 1992. Observer coverage by the Southeast and Northeast Fisheries Science Centers (SEFSC and NEFSC) successfully recorded effort from 330 observed sets during 1992, 814 sets during 1993, 652 sets during 1994, 699 sets during 1995, 362 sets during 1996, and 459 sets through December of 1997, corresponding to nominal sampling fractions of about 3%, 6%, 5.5%, 5%, 3%, and about 3.5% respectively.

OBSERVERS

6.22 CARICOM

The majority of CARICOM countries have artisanal fisheries which harvest large pelagic resources, with small-scale industrial longline operations also conducted by Trinidad and Tobago, Barbados, Grenada, St. Vincent & the Grenadines, and St. Lucia. These fisheries are developing, by current total landings for individual countries remain significantly less than other tuna harvesting nations of the Atlantic. In 1997, both Barbados and Guyana recorded notable increases in large pelagic landings. Except for swordfish, Grenada noted substantial decreases in the landings of several large pelagic species. Jamaica and Grenada continued to collect biological data for the ICCAT Program for Enhanced Research for Billfish. The CFRAMP tagging study continued, with 813 fish (mostly blackfin tuna) tagged to date, and 11 recaptures (10 blackfin recaptures) reported. Analyses of recent CARICOM fishery statistics are planned for the near future.

6.23 CHINESE TAIPEI

Chinese Taipei caught about 50,000 MT of tuna and tuna-like species in 1997 by 202 longliners, a decrease of about 7,900 MT from 1996. Among which, bigeye catch decreased by about 2,600 MT, yellowfin 2,200 MT, and swordfish 1,000 MT. The catches of southern Atlantic albacore, swordfish and eastern Atlantic and Mediterranean bluefin tuna were all under the catch limits of each species allocated according to the ICCAT management recommendations. Although no agreement was reached on the quota allocation of southern albacore at the Capetown meeting in April 1998, for the conservation of the stock, Chinese Taipei will continue to cooperate with ICCAT and adopt reasonable catch regulation on the species.

Supplements to the statistics system have been made by an observer program, a sampling program, and promotion of vessel monitoring system. The first observer trip to the Atlantic Ocean will start in mid-October of 1998. Sampling trips for collection of catch information on Atlantic sharks have been made during 1998. The development of vessel monitoring system incorporated with the function of logbook transmission was completed in 1996 and successfully used in 11 experimental trips. In the entire ocean, there are 60 vessels with the system setup and about 55 waiting for installation this year.

7. Review of the ICCAT Bluefin Year Program (BYP) - activities, progress and future plans

7.1The BYP East Coordinator, Dr. Bernard Liorzou, and the BYP West Coordinator, Dr. Gerald Scott, reported to the Committee on the research activities carried out in 1997 and through 1998, under the auspices of the BYP. Dr. Julie Porter (Canada) provided supplemental information on the results of recent coordinated efforts using pop-up tags in the western Atlantic. The report of the BYP activities is contained in **Appendix 4**.

7.2 The Executive Secretary informed the Committee that the unused funds from 1997 BYP activities (about 1,379,648 Pesetas) has been carried as the 1998 beginning balance Chapter 8-f (Bluefin Year Program) and added to the amount allocated in the 1998 Budget for the BYP (i.e. (2,725,000 Pts). Of the total funds available for 1998 BYP activities 4,104,648 Pesetas, about 155,101 Pesetas have been spent this year. Thus, there is a current balance of about 3,949,547 Pesetas in the Program. The Executive Secretary notified the Committee that he considered the balance can be carried over to 1999. The representative from Chinese Taipei informed the Committee that Chinese Taipei again intended to make a voluntary contribution of US$ 5,000 towards the BYP in 1999.

7.3 The Committee noted that there has been substantial progress made in the field of stock identification of bluefin tuna, including tagging (convention and electronic), studies on genetics and micro-constituents. The Committee also noted that collection of juvenile samples for various scientific studies are now shared by researchers working in different locations of the world, and in this respect, the BYP is functioning well.

7.4 The Committee recognized that because "seed money" has been budgeted by the Commission since 1997 for the BYP, it was possible to initiate numerous activities on bluefin tuna, which also resulted in more matching funds being made available from national sources. For this reason, expenditures from ICCAT funds were able to be kept to a minimum. Notwithstanding, the seed money budgeted by the Commission has been, is being and will continue to be used, in particular, to improve the coordination network of tag recoveries, as well as for the exchange of samples among researchers. The Committee recognized such work will continue to be one of the major activities for the time being, particularly since this coordination work is still in the initial stage and seems to be functioning effectively. Hence, the SCRS reiterated that the carry-over funds will be well utilized for this purpose.

7.5 The Committee expressed regret that two out of the nine recoveries of archival tags in 1998 have been discarded to the sea by fishermen, particularly since these two recoveries were from transatlantic migrations. The SCRS emphasized the need for close communication among scientists, as well as among scientists and fishermen.

7.6 The Committee then formed a small group to consider the budgetary needs for 1999, as well as to revise the program plan for the future. The small group later presented a report, which is attached as **Appendix 5**. The Committee agreed with the proposal by the small group that instead of spending small amounts of money for many projects, the funds could be used more effectively if they are concentrated in one field, such as sampling for stock identification research, particularly on the eastern side of the Atlantic. The program no includes the establishment of an eastern center to handle all the samples from the east. The Committee supported this proposal and agreed to forward the budget for 1999 to the Commission and request the Commission to provide the funds as proposed.

8. Review of the ICCAT Bigeye Year Program (BETYP), activities, progress and future plans

8.1 The Committee noted that in 1997 the Commission had approved seed money for the BETYP. Accordingly a small Working Group was called to discuss the distribution of seed money and make an immediate plan for 1998 activities with those funds. This group met on 24 and 25 March 1998 at the Secretariat. The report (SCRS/98/10) was presented by Dr. J. Pereira. At this meeting, the Group decided to start a pilot program of bigeye tagging and at the same time requested that further substantial funding be sought, using this seed money.

8.2 The Executive Secretary reported on the follow-up to this meeting (SCRS/98/21). After informing the SCRS about his trips to seek funding and to arrange the pilot tagging program, he pointed out that unless substantial funding is made available, no tagging operation can be started. He reported that out of the 8,700,000 Pesetas in the 1998 budget, 2,490,566 Pesetas has been spent, leaving 6,209,434 Pesetas still available.

8.3 According to the recommendation of this Group, Mr. Kebe of the Secretariat visited Ghana to assist Ghanian scientists in the improvement of their statistics. Mr. Kebe presented his report on this visit (SCRS/98/24)

8.4 The Executive Secretary informed the Committee that the EC was now in the position to allocate substantial funds towards this Program, assuming that the other major countries/entities/fishing entities (i.e. Japan and Chinese Taipei) would commit themselves to a contribution in proportion to their bigeye catches. He also reported that Japan was planning to make an in-kind contribution by sending a research vessel to the Atlantic. Chinese Taipei has been asked to make a special contribution to the Program.

8.5 The EC confirmed its readiness to contribute up to 35% of the cost of the BETYP , on the condition that the other major fisheries make contributions corresponding to their catch percentages.

8.6 A Japanese scientist informed the Committee that his country is planning to send a 2,000 GRT research vessel in the year 2000 the Atlantic as a contribution to the BETYP. The question was raised as to whether such a large vessel was needed for tagging operations within the scope of the program, but it was pointed out that a highly equipped research vessel would be useful for other types of research, particularly on ecology of those fish taken under floating objects. The Committee was also informed that Japan was hoping to contribute an additional US$ 100,000, but due to domestic Japanese regulations on procedures, this can only be done through a Japanese contractee .

8.7 It was reported that Chinese Taipei would contribute US$ 10,000 towards the BETYP , as had been done last year. Further discussion of additional contributions could take place during the Commission meeting.

8.8 As the program is expected to last a few years, it was agreed that the E.C. funding could be used to initiate the

program in the first year, if other contributions could not become available immediately.

8.9 The Committee reiterated the urgent need to obtain the necessary funds to implement the BETYP as adopted in 1997 (see **Appendix 5**).

8.10 The Committee urged all Parties/Entities and Fishing Entities actively fishing for bigeye tuna to specify the amount of funds to be made available for this Program, as well as the timing and modalities of these contributions.

8.11 Given the complexity of the Program and the importance of good and complete planning of its activities (particularly the tagging experiments), the Committee proposed that a detailed plan of the tagging experiments be prepared as soon as possible, using the BETYP funds already available for 1998.

8.12 The Committee mandated the three Coordinators of the BETYP to take all necessary decisions to implement the Program, in conjunction with the Executive Secretary and the Chairman of the SCRS. These decisions may include duly justified re-allocation of funds and changes in priorities, always within the limits of the budget adopted.

9. Review of the ICCAT Program of Enhanced Research for Billfish

9.1 Dr. Eric Prince, West Atlantic Coordinator, presented a progress report on the Enhanced Billfish Research Program which summarized the research on west Atlantic and east Atlantic activities. Dr. Prince also reported on the financial aspects of the Billfish Research Program in 1998. His summary showing contributions and expenditures relative to the Billfish Program in 1997 is attached as **Appendix 6**.

9.2 The Billfish Program Plan for 1999 was also presented by Dr. Prince, the West Atlantic Coordinator. The Committee reviewed the plan and approved it. It was noted that substantial funding was allocated by the Commission for 1998 for the first time although the contributions from the private sector were still an important component of the funds for billfish research. Interest in this program is keen and research has advanced considerably. As billfishes are species under ICCAT mandate, the Committee hopes that the Commission and the Contracting Parties give due attention to research on these species and continue to provide the funding at least at a level similar to that of 1998. Chinese Taipei has again committed US$ 5,000 towards the Billfish Program in 1999. The 1998 Program Plan is attached as **Appendix 7.**

10. Reports of SCRS inter-sessional meetings

10.1 **ICCAT Meeting for the Development of Standardized Methods for Estimating Swordfish Catch-at-age by Sex** (Hamilton, Bermuda - January 21 to 27, 1998). This inter-sessional meeting was held at the invitation of the Bermuda Government. The report (**SCRS/98/18)** was presented by Dr. Julie Porter, the swordfish rapporteur, and who convened this meeting. The Group reviewed the methodology to create sex specific catch at size for swordfish. The follow-up work has been done and the results were reviewed at the Swordfish Species Group at this SCRS and these will be fully utilized for the swordfish stock assessments scheduled in 1999.

10.2 **Preparatory Meeting for the ICCAT Bigeye Year Program** (Madrid, Spain - March 24 and 25, 1998) (See Agenda item 8.)

10.3 The **ICCAT Working Group on Tropical Tuna Abundance Indices** (Miami, Florida USA - May 11 to 15, 1998). This Workshop was held at the invitation of NOAA Southeast Fisheries Science Center. The meeting was convened by the yellowfin rapporteur, Dr. Pamela Mace, who presented the report (SCRS/98/19) to the SCRS. Tropical fleet catch and effort data were examined closely and the methodology to standardize the CPUE was studied. The participation of scientists from the South Pacific Commission (SPC) and the Inter-American Tropical Tuna Commission (IATTC) was very much appreciated by the Group.

10.4 **Fourth Ad Hoc GFCM/ICCAT Joint Working Group on Stocks of Large Pelagic Fisheries in the Mediterranean** (Genoa, Italy - September 7 to 12, 1998). The Fourth Ad Hoc GFCM/ICCAT Joint Working Group meeting was held in Genoa, at the invitation of the Italian Government and was sponsored by the Aquarium of Genoa. The report (SCRS/98/11 bis) was presented by Drs. Antonio Di Natale and Julie Porter. The Joint Working Group reviewed the Mediterranean bluefin and swordfish statistics. In addition, some updating of previous Mediterranean swordfish stock assessments was carried out.

10.5 **SCRS Bluefin Tuna Stock Assessment Session** (Genoa, Italy - September 14 to 23, 1998). This session, held immediately following the GFCM/ICCAT joint meeting, was also held in Genoa. The meeting was convened by the SCRS Chairman, Dr. Joseph Powers, who reported to the SCRS. A stock assessment was conducted on both the east and the west stocks. The Bluefin Detailed Report was written and the Executive Summary was also drafted. Dr. Powers reiterated the Committee's appreciation for the wide participation by many scientists from both the east and the west.

11. Reports of scientific meetings where ICCAT participated

11.1 Dr. Peter Miyake, Assistant Executive Secretary of ICCAT, reported on ICCAT's participation in a series of meetings proposed and held by the FAO Committee on Fisheries (COFI), in relation to the FAO Code of Conduct for Responsible Fishing. The objectives were to provide the Consultation, scheduled to be held in October, 1999, with draft plans of action for sharks, on the reduction of incidental catches of sea birds, and the management of fishing capacity, and to finalize the plans of action for the next COFI meeting.

11.2 **Technical Working Group on Management of Fishing Capacity** (La Jolla, California, USA - April 14 to 18, 1998). Dr. P. Miyake, an invited expert of this meeting reported on the meeting (SCRS/98/14). He reported that the fleet statistics is the important subject which ICCAT might have to consider.

11.3 **Technical Working Group on Sharks** (Tokyo, Japan - April 23 to 27, 1998). Dr. P. Miyake, who participated in the meeting representing ICCAT, presented his report (SCRS/98/12). He mentioned that the role of the Regional Agencies are asked to play a very important role and particularly ICCAT has been considered as a model case.

11.4 **Technical Working Group on Seabirds** (Tokyo, Japan - March 25 to 27, 1998). Mr. Y. Uozumi attended this meeting representing ICCAT. His report (SCRS/98/13) was presented by Dr. H. Nakano. He reported that this group had drafted the Plan of Action and recommended states and regional agencies to implement appropriate mitigation measures in longline fisheries.

11.5 **Preparatory Meeting for Consultation on Plans of Actions on Management of Fishing Capacity, Sharks and Seabirds** (FAO Headquarters, Rome - on July 22 to 24, 1998). All the Technical Working Groups referred above tried to draft Plan of Actions, but in reality only provided FAO with various technical points to be included in the Plan of Actions. Accordingly, FAO organized another meeting. Dr. P. Miyake attended the meeting representing ICCAT. The report is presented as SCRS/98/15. The Consultation is scheduled on October 26-30 in FAO, Rome for finalizing draft Plans of Action.

11.6. Dr. Matsunaga (Japan) attended the **Animal Committee of CITES** in representation of ICCAT and his report is presented as SCRS/98/29 by Dr. H. Nakano. He noted that the next CITES meeting is scheduled in 2000 most likely in Sweden.

11.7 ICCAT was represented by Dr. Miyake at two GFCM meetings in 1998 (the **GFCM Consultation on Statistics and Economics** and the **GFCM Commission Meeting**), both held at the FAO Headquarters. In his report to the SCRS (Document SCRS/98/11) Dr. Miyake noted that a new agreement was drafted for GFCM and which is still pending entry into effect. He commented that a new Scientific Advisory Committee was established in GFCM, which may function similar to the ICCAT SCRS.

11.8 At a meeting of **Cooperation of Western Mediterranean Fisheries (COPEMED)**, held in Tunisia on May 4-6, 1998, Mr. Papa Kebe, ICCAT Systems Analyst, represented ICCAT. Mr. Kebe presented his report to the Committee (SCRS/98/23). At the meeting discussed were held on the collection of statistics on bluefin tuna and swordfish in the west Mediterranean Sea.

11.9 Mr. Javier Ariz (EC-Spain) attended the **IATTC Annual Meeting** in representation of ICCAT. His presented his report on this meeting as SCRS/98/28.

11.10 Dr. Miyake informed the **Committee on the Expert Consultation and Regional Meeting on Guidelines for the Routine Collection of Capture Fishery Data**, held by FAO on May 9 to 29, 1998, in Bangkok. He presented the report (SCRS/98/25) and noted that the results of this Consultation will published very soon by FAO and will serve for countries which are a establishing statistical system.

12. Consideration of precautionary approach

12.1 Dr. Victor Restrepo, the Convener of the ICCAT Working Group on Precautionary Approach reported about the meeting of the Working Group held in Miami, in May, 1998, when the tropical group on abundance indices met. The report is available as SCRS/98/20. He reported that the group had drafted a questionnaire which is to be filled in by each species group. The Group intends to utilize the information from these questionnaires in analyzing and establishing biological reference points. A five-day Group of Experts is scheduled in early 1999, prior to the FAO Consultation, of which one day will be for the Group members to consider and summarize the results of the questionnaire surveys, while the remainder of the period will be open for participants interested in this subject. At any rate, the Group of Experts will prepare a report for the 1999 SCRS and the Commission, and will propose the approach that ICCAT should take and the reference points to be established.

12.2 Dr. Restrepo also reported on the development of organizing the FAO Consultation on Precautionary Approach of Highly Migratory Species. Dr. Restrepo recently resigned as a member of the Steering Committee of this Consultation, since the scientific function of the Steering Committee's work has been fairly completed . He has been replaced by Dr. Miyake, since the Steering Committee is now focusing on aspects of organization and financing of the Consultation. The ICCAT Group of Experts was originally planned with the assumption that FAO Consultation will be held in late 1999. At any rate, it was confirmed that ICCAT will work independently and in parallel with the Consultation.

12.3 There were some exchange of opinions, particularly concerning the ICES approach of using the best biological estimates as the reference points, but the applications of the management plans to be precautional was favorably accepted, against estimation of reference points with precaution. It was agreed that the date and venue of the proposed inter-sessional meeting will be decided later by the SCRS, when we heard all the proposed inter-sessional meetings by other groups.

12.4 The Committee noted that two papers had been submitted to the SCRS relative to the precautionary approach. One document (SCRS/98/124) identifies various approaches taken by different regional agencies on this subject and provides the background on the concepts of the precautionary approach (e.g. Code of Conduct, FAO Compliance Agreement, etc.). The other document (SCRS/98/125) introduces technical background relative to the precautionary approach and explains the concept and evolution of various biological reference points and procedures to calculate reference points.

12.5 The Committee thanked Dr. Pamela Mace for compiling this valuable information for the Committee in the above-mentioned two papers, and considered that these papers should serve for future reference, when this subject is considered.

13. EXECUTIVE SUMMARIES ON SPECIES:

YFT - YELLOWFIN TUNA

YFT-1. Biology

Yellowfin tuna is a cosmopolitan species distributed mainly in the tropical and subtropical oceanic waters of the three oceans, where they form large schools. The sizes exploited range from 30 cm to 170 cm FL. Smaller fish (juveniles) form mixed schools with skipjack and juvenile bigeye and are mainly limited to surface waters, while larger fish are found in surface and sub-surface waters. Since the inception of the yellowfin tagging program which has been carried out in the North American sport fishery since 1985, individuals of this species have often been recovered in the west Atlantic, but the majority of the long-term recoveries are made in the eastern Atlantic where several recaptures are recorded each year. Taking into account this east-west transatlantic migration, as well as other information (e.g. time-area size frequency distributions and locations of fishing grounds), a single stock for the entire Atlantic is assumed (Atlantic Yellowfin Working Group; Tenerife, 1993). The main spawning ground is the equatorial zone of the Gulf of Guinea, with spawning occurring from January to April. From there the juveniles move towards more coastal waters off Africa. When they reach the pre-adult stage (60-80 cm: fish from age 1.5 - 2), it is presumed that the majority migrate west towards the American coasts, to return to the east Atlantic fishing grounds for spawning when they reach about 110 cm. A 40-year time series of longline catch data shows that yellowfin are distributed continuously throughout the entire tropical Atlantic ocean. Growth patterns are variable with size, being relatively slow initially, and increasing at the time the fish leave the nursery grounds. Males are predominant in the catches of larger sized fish. Natural mortality is assumed to be 0.8 for ages 0 and 1, and 0.6 for age 2 and older.

YFT-2 Description of the fisheries

The distribution of yellowfin tuna catches in the Atlantic is shown in **YFT-Figure 1**. Yellowfin tuna are caught between 45ºN and 40ºS by surface gears (purse seine, baitboat, troll and handline) and with sub-surface gears (longline). Troll and handline, although used in artisanal fisheries, have never been a large component of the yellowfin fisheries. The baitboat fisheries in equatorial areas have always targeted juveniles in coastal waters, together with skipjack, young bigeye and other small tunas. Baitboat fisheries are still active i n waters of Mauritania and Senegal, Ghana (Tema), the Canary Islands, Cape Verde, Madeira, Venezuela and Brazil. In the 1980's, the fleets which operate in the areas off Senegal, Mauritania and the Canary Islands developed a new fishing method in which the baitboat acts as a floating object to attract bigeye, but also yellowfin and skipjack. Since the early 1990's, Ghanian baitboats have fished on artificial floating objects.

Purse seine fisheries began operating in the east Atlantic in the 1960's, and developed rapidly in the 1970's. Beginning in 1975, the fishing area was extended from coastal waters to the high seas, especially at the equator, where large sized yellowfin are caught during the spawning season. In coastal areas, purse seiners catch juveniles in mixed schools. This gear is very efficient as it catches a wide range of sizes (40 to 160 cm), although catches in the east include very few intermediate sized fish (70 to 100 cm). Venezuelan purse seiners operating mostly in coastal areas of the west Atlantic mainly catch fish of intermediate sizes.

Particularly, since 1991, the purse seine fleets which operate in the east Atlantic have developed a fishery which targets schools associated with artificial floating objects. This translates into an important increase in catches of skipjack, juvenile bigeye and, to a lesser extent, increases in catches of young yellowfin and by-catch, extending the fishing grounds westward to 30ºW and south of the equator.

Large yellowfin are caught by purse seiners and longliners. However, deep longlines, which began being used in the early 1980's, mainly target other species (bigeye, swordfish, and bluefin) and therefore the proportion of yellowfin caught by longliners in the Atlantic is becoming less important (in 1997, it amounted to 11% of the total). Amounts caught by this gear are similar between the east and west Atlantic.

Yellowfin catches in the Atlantic as a whole reached an historical high in 1990 (183,700 MT), but have since declined by almost 30% to 130,800 MT in 1997 **(YFT-Table 1)**. However, the relative contributions of the various gear types have remained similar **(YFT-Figure 2)**. In the east Atlantic, landings reached a high of 138,000 MT in 1981 and 1982, then declined to a low of 77,000 MT in 1984, gradually increasing to a new record of 157,000 MT in 1990, and subsequently fluctuating between 99,000 MT and 124,000 MT An average of 80% of the total catches in the eastern Atlantic are taken by purse seiners. In the west Atlantic, total catches have exhibited relatively little fluctuation over the past 15 years,

averaging about 33,000 MT, of which about 40% is taken by purse seiners (although purse seine catches have fluctuated widely, ranging from 6,000 MT to 25,700 MT), 15% is taken by baitboats and 30% by longliners.

Effective effort for the eastern tropical Atlantic purse seine fishery is estimated by first standardizing to French class 5 purse seiners, and then further adjusting based on the assumption of an estimated annual increase of 3-5% in fishing power since 1981. The need to adjust for increases in efficiency results from the many improvements in the purse seine fishery, including the use of floating objects, bird radar, sonar, and satellite imagery, and is supported by data analysis (See Yellowfin Tuna Detailed Report). These calculations indicate that effective effort for the purse seine fishery has declined from a high of 45,500 standard fishing days in 1983 to an average of 35,200 standard fishing days for the period 1991-97.

Trends in catch at age are shown in **YFT-Figure 3**. The variability in overall catch at age is primarily due to variability in catches of ages 0 and 1 (but note that the catch of age 0 in 1997 is an over-estimate due to substitution problems). Catches of ages 2-5 have been relatively stable over time. Catches have been similar in magnitude for ages 2-4, but there is a substantial reduction in catch from age 4 to age 5+.

YFT-3. State of the stock

A full assessment was conducted for yellowfin tuna this year using various production models and several types of VPAs.

The MSY estimated from production model analyses (PRODFIT) based on the assumption of a 3% annual increase in purse seine fishing efficiency (which translates into an overall increase of 66% since 1981) was 155,800 MT, and the corresponding effort was 61,300 standard days **(YFT-Figure 4)**. The MSY obtained using a 5% increase in efficiency (an overall increase of 134% since 1981) was 147,500 MT, and the corresponding effort was 56,600 standard days. The most important difference between the two scenarios is the relationship of catch and effort in recent years to the equilibrium MSY and effort levels. Both estimates of MSY are higher than the preliminary 1997 landings of 130,800 MT. However, for the 3% scenario, current effort is somewhat below the MSY level, whereas for the 5% scenario, it is somewhat above the MSY level. A non-equilibrium production model (ASPIC) using the same CPUE index with a 3% annual increase in efficiency resulted in an estimate of MSY of 151,700 MT (a level between the two estimates of MSY from the PRODFIT model) and a 1997 biomass of 117% (range 92% to 135%) of B_{MSY} . The corresponding fishing mortality rate was 73% of F_{MSY}. The effects of higher rates of increase in efficiency were not tested; however, in general, higher assumed annual rates of increase in efficiency will result in higher fishing mortality ratios and lower biomass ratios. Thus, if an annual rate of increase in efficiency of 5% were to have been assumed, both the fishing mortality ratio and the biomass ratio are likely to have been closer to, or beyond, equilibrium MSY levels.

VPA analyses were also based on the purse seine index assuming a 3% annual increase in efficiency, although sensitivity analyses using indices from other fisheries were also considered. Results are compared in **YFT-Figure 5** for four alternative scenarios, based on three models which differed in terms of methods of tuning and treatment of the plus group. Although absolute numbers vary, the four scenarios show very consistent relative trends. These analyses indicated that recruitment has fluctuated without trend, while spawning biomass decreased in the early to mid 1980's due to increasing fishing mortality rate s, had recovered by 1990 due to reduced fishing mortality rates and somewhat higher recruitment , but has subsequently declined back to levels similar to those of the mid-1980s. Fishing mortalities estimated by the alternative VPA models appear to have been high in the early to mid 1980's. Trends in fishing mortalities in recent years are less reliable due to estimation problems common to all of the methods used (and are therefore not shown in the figures). In particular, the ratio of fishing mortality of the oldest age compared to that of a younger reference age and had a large influence on the VPA results.

In summary, the production model (PRODFIT) analyses imply that although catches are slightly lower than equilibrium MSY levels, effort may be either above or below the MSY level, depending on the assumption made about the rate of increase in the efficiency of purse seiners. VPA analyses indicate that fishing mortalities on juvenile yellowfin tuna exhibited a pronounced increasing trend in the late 1980s and early 1990's, but estimates for recent years are uncertain. Preliminary deterministic projections from two of the VPA runs indicated that current catches are sustainable if recruitment continues at or above the average magnitude observed over the last decade. Yield-per-recruit analyses indicate that current (1997) fishing mortality may be close to the level of F_{max} (above or below depending on the model used), and than an increase in effort is likely to decrease the yield per recruit, while reductions in fishing mortality on fish less than 3.2 kg could result in substantial gains in yield per recruit and modest gains in spawning biomass per recruit **(YFT-Figure 6)**.

YFT-4. Outlook

Since reported yellowfin landings appear to be close to the MSY level and fishing effort and fishing mortality may be in excess of the levels associated with MSY, it is important to ensure that effective effort does not increase further. Thus the possibility that the fishing power of the purse seiners and other fleets may further increase, even if total carrying capacity were to remain constant, is also cause for concern.

YFT-5. Effects of current regulations

In 1973, the Commission recommended a minimum size of 3.2 kg for yellowfin tuna, with a tolerance level of 15% by number of fish. Based on the newly-revised catch species composition and catch at size data arising from improved analyses of the European purse seine data and other revisions of the database, it now appears that overall catches by purse seiners averaged 41.8% undersized yellowfin tuna over the period 1991-96. In the same period, baitboat fisheries landed 79.6% undersized fish. In 1997, the calculated proportions of undersized yellowfin were 66.1% for the purse seine fleet and 76.1% for the baitboat fleets. Overall percentages of undersized yellowfin considering all gears were estimated to be 60.8% in 1996 and 65.7% in 1997. However, the Tropical Tuna Species Group identified substitution problems in constructing the catch at size in 1997 that could result in overestimates of undersized catches for that year. Even so, the overall percentages are almost certainly considerably higher than the 15% tolerance level. Almost all undersized yellowfin tuna are caught in eastern Atlantic waters, since intermediate sizes dominate in the western Atlantic. Unfortunately, it may be difficult to realize substantial reductions in catches of undersized fish in the eastern Atlantic because small yellowfin are mostly associated with skipjack, especially when fishing occurs on floating objects; thus it is difficult to avoid catching small yellowfin when catching skipjack, the latter being an important component of eastern Atlantic purse seine fleet catches. The Committee recommends that further analysis of the advantages and disadvantages of the 3.2 kg minimum size be conducted.

In 1993, the Commission recommended "that there be no increase in the level of effective fishing effort exerted on Atlantic yellowfin tuna, over the level observed in 1992". Although it is evident that total carrying capacity has declined somewhat in recent years, at least for the eastern Atlantic surface fleets (from 51,500 MT in 1992 to 43,900 MT in 1997), the direction and amount of change in effective fishing effort depends on assumptions made about annual rates of increase in efficiency.

YFT-6. Management recommendations

Estimated catches of yellowfin tuna have averaged 135,000 MT over the past three years. This estimate is somewhat lower than estimates of MSY fro m production model analyses. However, depending on the assumption about annual rates of increase in efficiency, recent levels of fishing effort and fishing mortality may be somewhat above or below the levels associated with equilibrium MSY catches. Therefore the Committee reaffirms its previous recommendation that measures to reduce overall effort, or at least to freeze it at current levels, should be initiated immediately. Due to the difficulties of defining and estimating “effective effort”, the Committee recognizes the difficulty of implementing the 1993 recommendation , and therefore recommends setting a limit on total catch instead. Catches of the order of 135,000 MT (the average for the three-year period 1995-97) to 156,000 MT (the highest estimate of MSY) may be sustainable. However, if the Commission wishes to avoid further increases in fishing mortality, catches of the order of 135,000 MT will more likely achieve this objective. When making decisions based on the results of this assessment, the Commission should be aware that there are many sources of uncertainty (which are discussed fully in the Yellowfin Tuna Detailed Report).

The Committee also continues to recommend that effective measures be found to reduce fishing mortality of small yellowfin, based on results of yield per recruit analysis. Although there are insufficient data to fully evaluate the effects of the voluntary moratorium on fishing on floating objects (and other measures to reduce catches of small fish) begun in late 1997, in general the approach shows promise as a means of reducing fishing mortality on juvenile yellowfin tuna. The Committee recommends continuation of this program at least until such time that its effectiveness can be measured. The Committee stresses that unless all fleets fishing on floating objects participate in the program, its effectiveness will be diminished.

ATLANTIC YELLOWFIN TUNA SUMMARY (yields in 1,000 MT)

Results of 1998 SCRS:

ATLANTIC YELLOWFIN TUNA SUMMARY (yields in 1,000 MT)

	Results of 1998 SCRS:
Maximum Sustainable Yield (MS Y)[1]	147.5 - 155.8
Current (1997) Yield	130.8
Current (1998) Replacement Yield	May be close to current yield
Relative Biomass B_{1997}/ B_{MSY}[2]	92-135%
Relative Fishing Mortality: F_{1997}/F_{MSY}	variable between models; probably exceeds 1
Management Measures in Effect	3.2 kg minimum size Effective fishing effort not to exceed 1992 level

[1] 147.5-155.8 for the PRODFIT model and 151.7 for the ASPIC model.
[2] Result from ASPIC model.

EX-YFT- Nominal landings of yellowfin tuna (MT) by flag

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
TOTAL	124796	124960	131013	134044	127517	130912	154524	163653	162377	113191	150538	134628	137449	128454	155796	183710	156376	149685	153395	163061	144605	129759	130804
E.ATL	108330	111020	117541	119246	114158	117798	138114	138214	125067	76639	111829	106933	110484	99173	123240	157114	123908	116704	117106	116957	110492	99228	100458
SURFACE	*92755*	*98183*	*101879*	*107956*	*107381*	*105290*	*130128*	*128255*	*118913*	*67961*	*104212*	*102922*	*105823*	*91669*	*116853*	*149470*	*116670*	*112088*	*112442*	*108235*	*102075*	*90076*	*94105*
Baitboat	9658	12794	10943	8980	13715	7690	9788	13211	11507	14694	16120	15301	16750	16020	12168	19560	17783	15082	18444	15801	13605	13883	13681
Purse seine	83013	85260	90552	98098	92291	97026	114993	111820	103502	50860	86576	85325	86141	73117	102200	127673	96839	95241	92484	90769	87101	74860	79117
Other surface	84	129	384	878	1375	574	5347	3224	3904	2407	1516	2296	2932	2532	2485	2237	2048	1765	1514	1665	1369	1333	1307
LONGLINE	*15575*	*12837*	*15662*	*11290*	*6777*	*12508*	*7986*	*9959*	*6154*	*8678*	*7617*	*4011*	*4661*	*7504*	*6387*	*7642*	*5503*	*3872*	*4097*	*8482*	*7932*	*8539*	*5648*
UNC GEAR	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*3*	*1735*	*744*	*567*	*240*	*485*	*613*	*705*
ANGOLA	55	1005	2085	2296	904	558	959	1467	788	237	350	59	51	246	67	292	510	441	211	137	216	78	11
BENIN	0	0	0	0	48	95	100	113	49	65	60	19	3	2	7	1	1	1	1	1	1	1	0
BZ-SH-OB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3
CANADA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CAP VERT	360	115	104	470	581	864	5281	3500	4341	2820	1901	3326	2675	2468	2870	2136	1932	1426	1536	1727	1781	1448	1448
CAYMAN I	0	0	0	0	0	602	1460	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CHI.TAIP	1469	678	208	203	190	71	432	203	452	87	146	254	193	207	96	2244	2163	1554	1301	3851	2681	3985	2675
CHINA.PR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	74
CONGO	0	0	0	0	0	140	50	0	0	0	11	20	15	15	21	22	17	18	17	14	13	12	0
CUBA	2000	2400	3000	2339	3168	5128	2945	2251	1916	1467	1585	1332	1295	1694	703	798	658	653	541	238	212	257	269
E.GUINEA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
EC-ESPAÑA	24713	33423	35525	33636	40083	38759	51428	54164	51946	40049	66874	61878	66093	50160	61651	68605	53386	49644	40513	40624	38133	34780	25301
EC-FRANCE	46669	51624	49948	55192	47776	54372	55085	45717	40470	7946	12304	17756	17491	21323	30807	45684	34588	33902	36264	34935	29536	33857	29828
EC-PORTUG	1	3	0	125	185	77	208	981	1333	1527	36	295	278	188	181	179	328	195	128	126	231	288	176
ESTONIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	234	0	0	0	0	0	0
GABON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	88	218	225	225
GAMBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	16	15	0	0	0	0	0
GEORGIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	22	10	0	0	0	0
GHANA	763	945	621	546	1426	1974	5510	9797	7689	9039	12550	11821	10830	8555	7035	11988	9254	9331	13283	9984	9268	11374	18377
HO-SH-OB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	3	4
JAPAN	3021	5238	2647	1722	1241	2217	2863	4815	3062	4344	5765	3634	4521	5808	5882	5887	4467	2961	2627	4194	4770	4246	2775
KOREA	10304	7636	11060	8625	6449	5349	4288	4010	1629	1917	1668	965	1221	1248	1480	324	259	174	169	436	453	297	101
LATVIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	255	54	16	0	55	151	223
LITUANIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	332	0	0	0	0	0	0
MAROC	1048	1574	2167	3440	2986	3243	4817	4540	2331	614	2270	2266	1529	0	0	0	0	0	0	0	0	0	0
NAMIBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	14	72	44
NORWAY	0	0	0	0	0	0	0	0	0	0	0	813	418	493	1787	1790	0	0	0	0	0	0	0
POLAND	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RUSSIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3200	1862	2160	1503	2936	2696	4275
S.AFRICA	18	6	167	281	4595	540	178	49	456	759	382	55	68	137	671	624	52	69	266	486	183	157	116
S.HELENA	52	108	34	37	69	55	59	97	59	80	72	82	93	98	100	92	100	166	171	150	181	151	109
SAO TOME	25	15	45	39	28	31	97	193	194	177	180	180	178	184	198	228	223	229	140	0	0	1	0

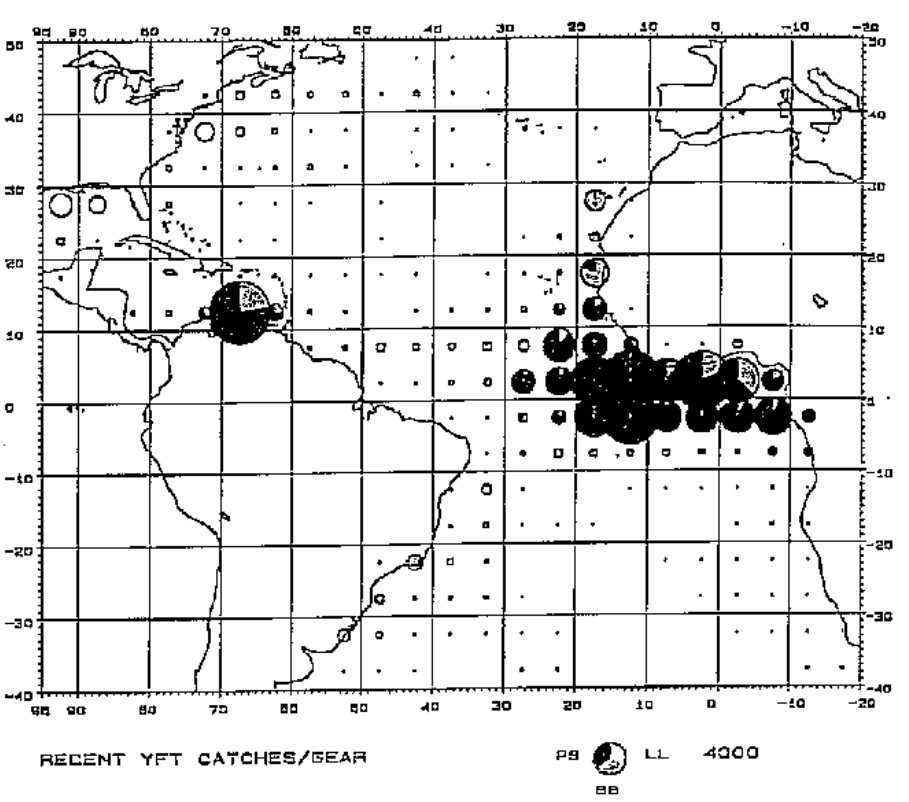
EX-YFT- Nominal landings of yellowfin tuna (MT) by flag

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
SENEGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	90	53	40	6	83	108	68	68
UKRAINE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	215	0	0	0	0	0	0
USA	13960	1706	6400	8131	2884	1614	1472	636	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
USSR	1856	1652	1794	687	806	448	541	1004	1282	2168	3768	1851	1275	3207	4246	3615	0	0	0	0	0	0	0
VENEZUEL	0	0	0	0	0	0	0	0	0	0	634	0	0	0	0	0	0	0	0	0	0	0	0
NEI-1	0	0	0	0	0	0	0	3121	5388	1104	0	0	2077	3140	5436	12513	11640	13947	17734	18285	19496	5081	14355
NEI-28	2016	2892	1736	1477	739	1661	341	1436	1682	2239	1273	327	180	0	0	0	0	0	0	93	0	0	0
W.ATL	**16466**	**13940**	**13472**	**14798**	**13359**	**13114**	**16410**	**25439**	**37310**	**36552**	**38709**	**27695**	**26965**	**29281**	**32556**	**26596**	**32468**	**32981**	**36166**	**45966**	**33936**	**30421**	**30346**
SURFACE	*1995*	*679*	*1457*	*4743*	*3637*	*5664*	*4797*	*15112*	*29402*	*27005*	*26985*	*13658*	*16506*	*13705*	*18438*	*12396*	*21462*	*19160*	*24685*	*32259*	*16265*	*20107*	*20075*
Baitboat	408	0	0	1012	605	392	1917	2970	3603	3698	5478	2421	5468	5822	4834	4718	5359	6276	6383	7094	5297	4407	4837
Purse seine	1577	634	1073	3662	1035	5135	2822	12112	25749	23203	20994	9822	6665	6034	11647	6800	14414	11359	16081	19612	6338	11131	11181
Other surface	10	45	384	69	1997	137	58	30	50	104	513	1415	4373	1849	1957	878	1689	1525	2221	5553	4630	4569	4057
LONGLINE	*14084*	*12774*	*11374*	*9572*	*9277*	*6707*	*11321*	*9861*	*6880*	*8023*	*10659*	*12535*	*9929*	*14509*	*13201*	*13159*	*9534*	*12014*	*9193*	*8954*	*8727*	*8520*	*8709*
UNC GEAR	*387*	*487*	*641*	*483*	*445*	*743*	*292*	*466*	*1028*	*1524*	*1065*	*1502*	*530*	*1067*	*917*	*1041*	*1472*	*1807*	*2288*	*4753*	*8944*	*1794*	*1562*
ARGENTIN	108	57	43	4	0	0	8	7	0	0	44	23	18	66	33	23	34	1	0	0	0	0	0
BARBADOS	79	94	58	67	81	40	30	36	51	90	57	39	57	236	62	89	108	179	161	156	255	160	151
BRASIL	260	715	1302	852	1353	1008	2084	1979	2844	2149	2947	1837	2266	2512	2533	1758	1838	4228	5131	4169	4022	2011	2705
CANADA	0	161	0	318	0	0	0	0	0	0	0	2	40	30	7	7	29	25	71	52	174	155	100
CHI.TAIP	1200	1284	164	181	848	616	435	407	87	559	780	1156	709	1641	762	5221	2009	2974	2895	2809	2017	2668	1791
COLOMBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2404	3418	7172	0	0
CUBA	600	1200	900	661	232	689	1997	1503	793	2538	1906	2081	1062	98	91	53	18	11	1	14	54	40	40
DOMINICA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	12	23	30	31	9	0	0
EC-ESPAÑA	762	0	266	2029	1052	0	0	0	1957	3976	1000	0	0	0	0	0	1451	1290	810	0	0	0	0
EC-FRANCE	440	0	0	0	86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GHANA	0	0	0	0	0	265	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GRENADA	100	100	364	166	148	487	64	59	169	146	170	506	186	215	235	530	620	595	858	385	409	523	302
JAMAICA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	21
JAPAN	2756	3069	1408	1647	1707	1117	2983	3288	1218	1030	2169	2103	1647	2395	3178	1734	1698	1591	469	589	457	1004	790
KOREA	7718	4574	6522	4259	4414	1933	3325	2249	1920	989	1655	853	236	120	1055	484	1	45	11	0	0	84	156
MEXICO	0	0	0	0	0	16	42	128	612	1059	562	658	33	283	345	112	433	742	855	1093	1126	771	1597
NLD.ANT	151	151	151	173	173	173	173	173	173	173	150	150	160	170	170	170	150	160	170	155	140	130	130
ST.LUCIA	54	69	67	67	28	27	25	26	23	56	79	125	76	97	70	58	49	58	92	130	144	110	110
ST.VINCE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	40	48	22	65	16	43	37	35
TRINIDAD	0	0	0	0	0	0	0	0	232	31	0	0	0	1	11	304	543	4	219	0	0	27	0
UK-BERMU	10	11	10	12	26	35	21	22	10	11	42	44	25	23	22	15	17	42	58	44	44	71	51
URUGUAY	0	0	0	0	0	0	67	214	357	368	354	270	109	177	64	18	62	74	20	59	53	171	53
USA	375	546	808	1616	298	504	394	247	226	1252	6259	5774	9059	10268	8350	5406	6853	7158	5199	8093	8131	7745	7625
VENEZUEL	662	626	827	1306	2811	5397	4500	14426	26576	21879	20535	11755	11137	10949	15567	10556	16495	13759	16647	24753	9686	14693	14689
NEI-28	1191	1283	582	1440	102	807	262	675	62	246	0	319	145	0	0	0	0	0	0	0	0	0	0

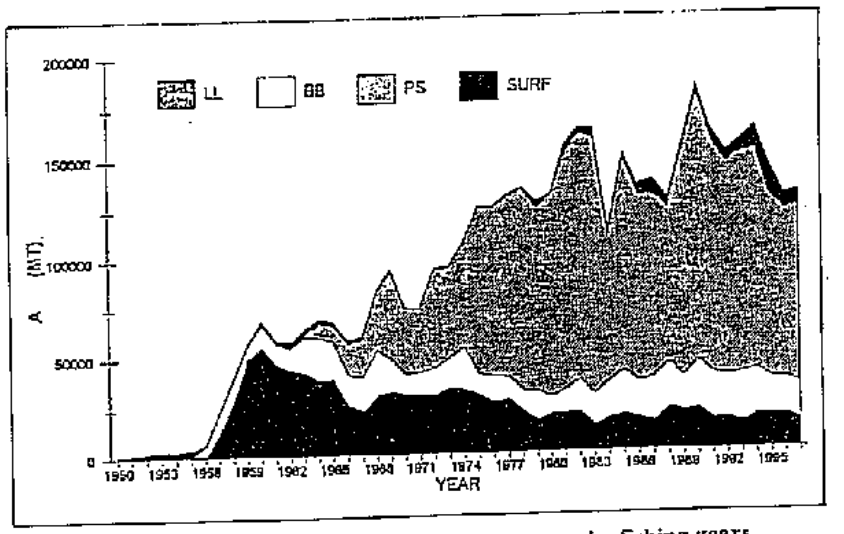
EX-YFT- Nominal landings of yellowfin tuna (MT) by flag

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
UNC. AREA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	123	138	177	110	0
LONGLINE	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
UNC GR	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*123*	*138*	*177*	*110*	*0*
CHI.TAIP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CHINA.PR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	123	138	177	110	0

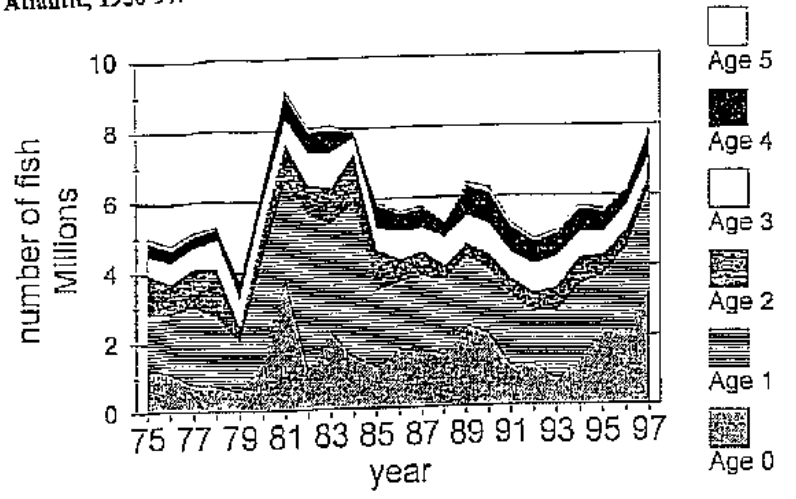
The following new data/revisions were received too late to be included in the stock assessment and are therefore not inlcuded in the table:
Purse seine catch for Ghana 1996 and 1997 changed to 4081 and 5754 MT respectively, Namibia baitboat 1997 = 69 MT, Brazil baitboat 1996=1956 MT and Brazil LL 1996 = 778



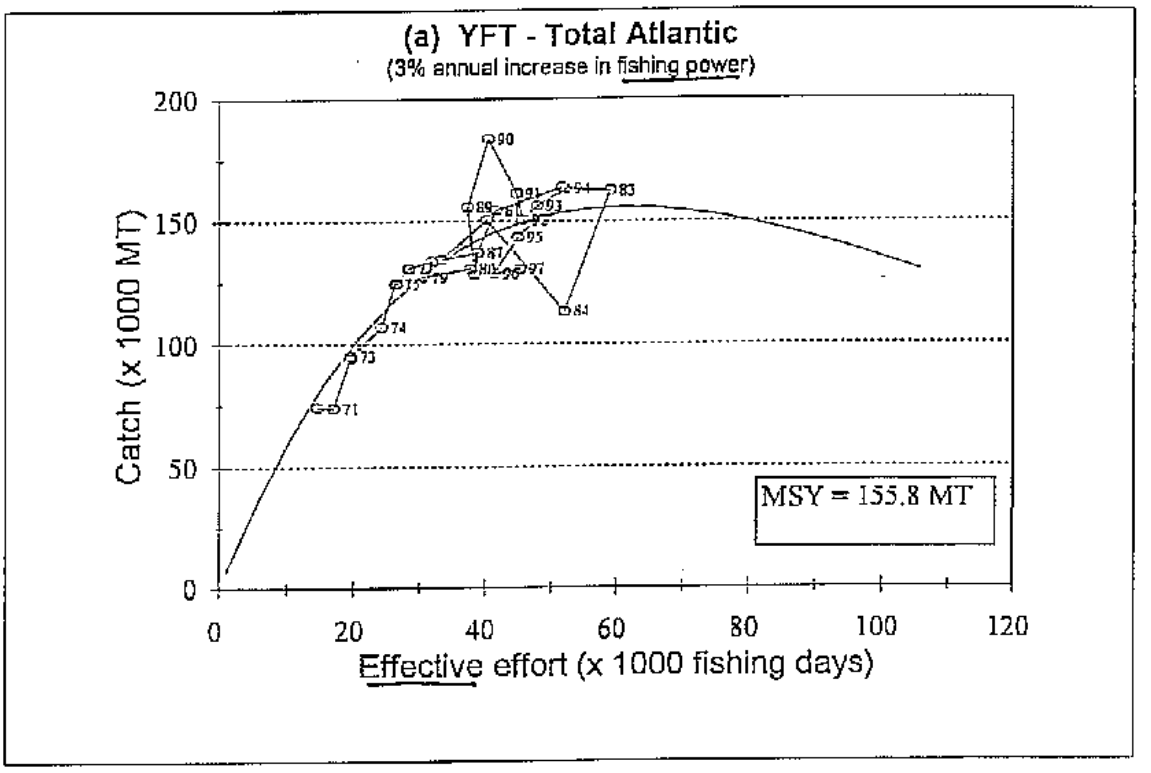
YFT-Fig. 1. Distribution of yellowfin tuna catches by gear and area.

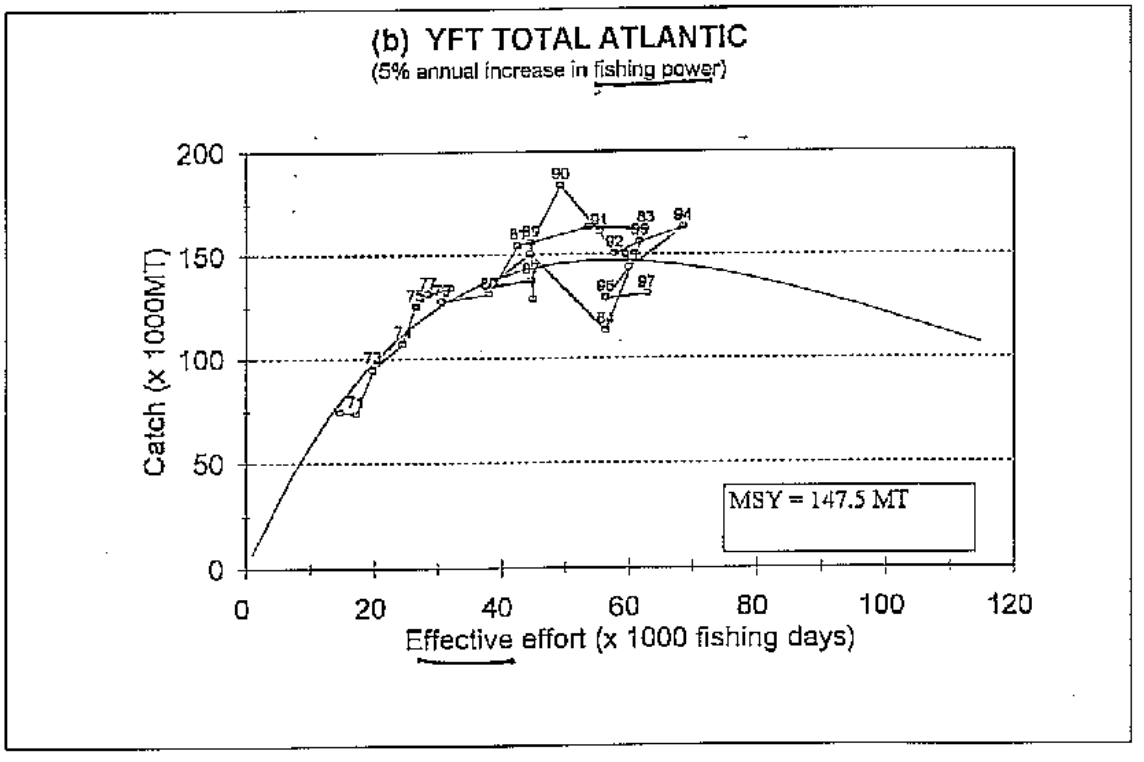


YFT-Fig. 2. Reported landings (in MT) of yellowfin tuna, by fishing gears in the Atlantic, 1950-97.

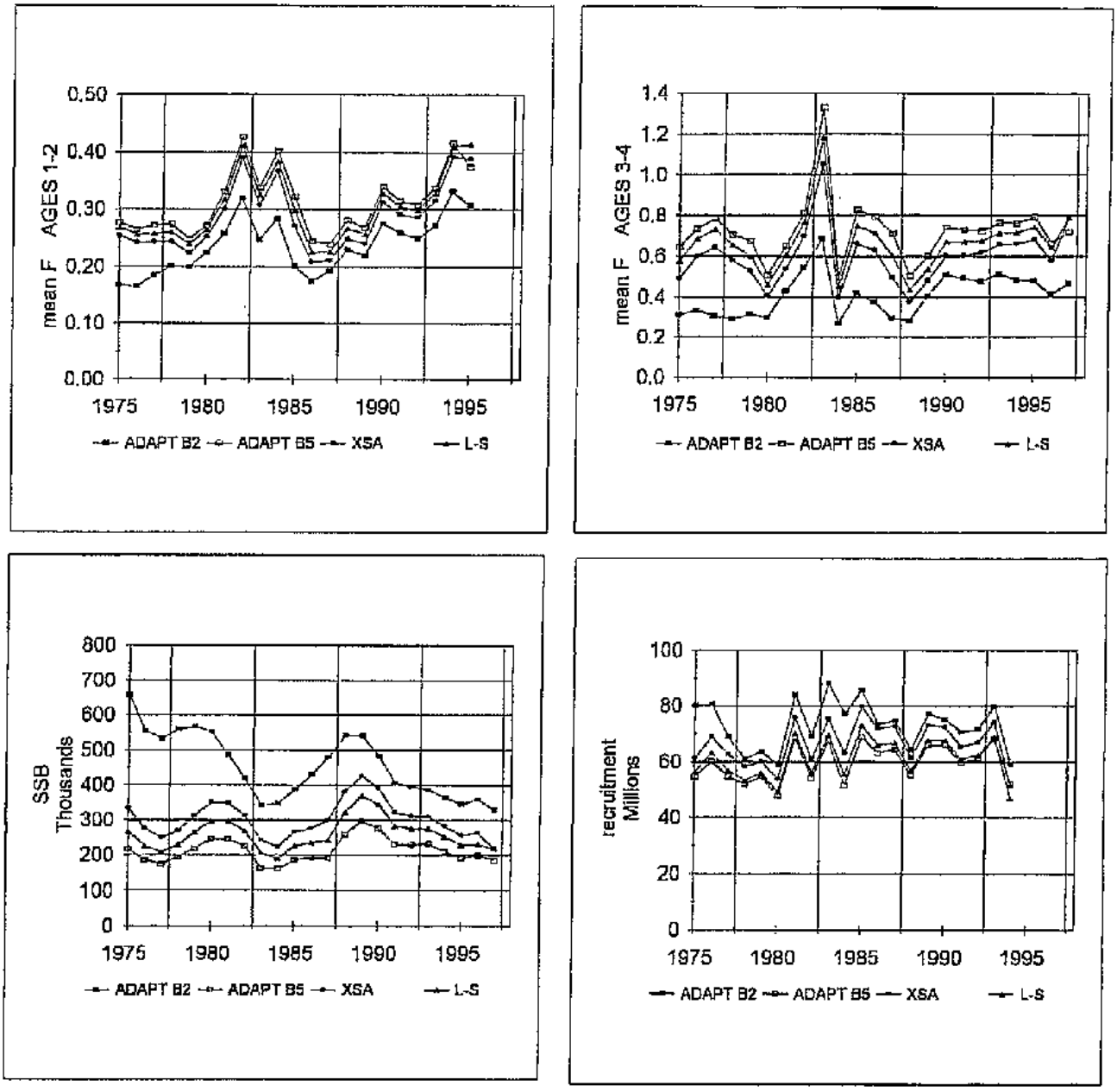


YFT-Fig. 3. Catch at age for 1975-1997. (1997 catches for age 0 are over-estimated due to substitution problems.)

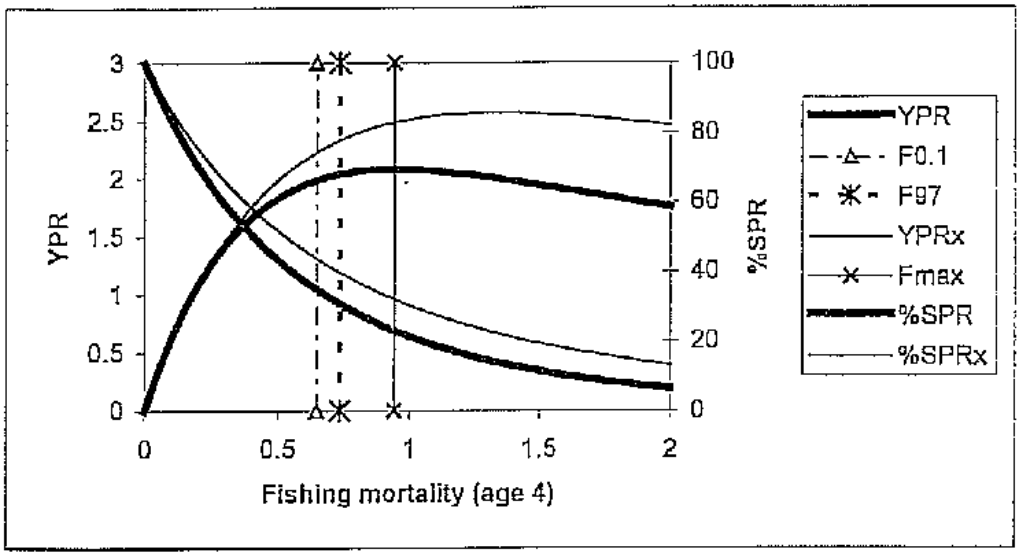


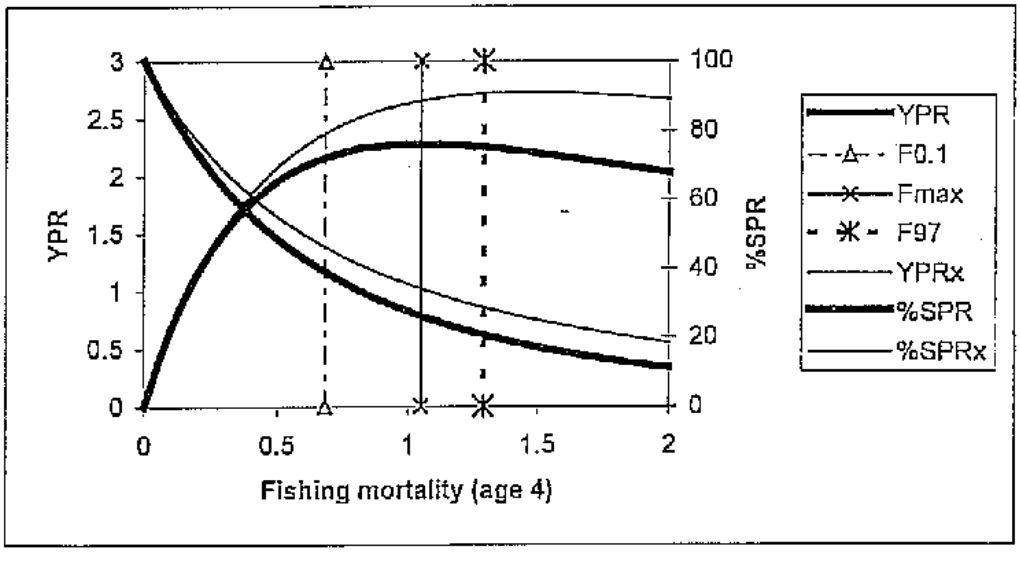


YFT-Fig. 4 Production model (PRODFIT; M=1, K=4) results assuming an annual increase of (a) 3% and (b) 5% in purse seine fishing power since 1981.



YFT-Fig. 5. Summary of VPA results for four alternative scenarios, based on three different models. (The last three years of recruitment and the last two years of fishing mortality for ages 1 and 2 are not shown because they are uncertain.)





YFT-Fig. 6 Yield-per-recruit analysis for ADAPT B2 run (top) and XSA run (bottom). Thick lines assume current selectivities while thin lines assume no fishing mortality on undersized fish. Estimates of F0.1, Fmax, and F97 correspond to the think lines only.

BET - B I G E Y E T U N A

No new assessment was conducted for bigeye as the Tropical Tuna Species Group centered its effort on yellowfin this year. Except for the description of fisheries, the text remained almost unchanged from the last year's report.

BET-1. Biology

Compared to other tuna species, bigeye has received less attention with respect to research on basic biological characteristics, in spite of the importance of this species for the Atlantic fisheries that are currently exploiting it. The lack of reasonable estimates of some biological parameters considerably hindered the stock assessment process, and sometimes led to unrealistic results. Given recent changes in the fishery, more intense research should be devoted to this species.

The geographical distribution of bigeye tuna is very wide and covers almost the entire Atlantic Ocean between 50ºN and 45ºS. This species dwells in deeper water than the other tuna species and indicates extensive vertical movement. Spawning takes place in inter-tropical waters when the environment is favorable. From the spawning area fish tend to migrate into temperate waters as they grow larger. Catch information from the surface gears indicates that the Gulf of Guinea is a major nursery ground for this species. Various prey organisms such as fish, mollusks, and crustaceans are found in stomach contents. Bigeye exhibits relatively fast growth. They reach about 100 cm in fork length at the beginning of their fourth year, and this is when they become mature. Young fish form schools near the sea surface mostly mixed with other tunas such as yellowfin and skipjack tunas. These schools are often associated with drifting objects, whale shark and sea mounts. This association appears to be much less when they become larger.

Circumstantial evidence, such as the time-area distribution of fish and movements of tagged fish, suggests an Atlantic wide single stock for this species, which is currently accepted by the Committee. However, the possibility of other scenarios, such as north and south stocks, should not be disregarded.

BET-2. Description of fisheries

The stock has been exploited by three major gears (longline, baitboat and purse seine fisheries) and by many countries throughout its range of distribution **(BET-Figure 1)**. Longline and baitboat fisheries have a long history that dates back before 1960. Major baitboat fisheries are located in Ghana, Senegal, the Canary Islands, Madeira and Azores. Unlike other Oceans, baitboats catch significant amounts of medium to large size bigeye tuna except in Ghana and Senegal. Japan and Chinese Taipei are the two major longline fisheries whose catch accounted for about 50 % of total catch in 1997. Korea has reduced its activity in the Atlantic considerably since 1990. Tropical purse seine fleets operate in the Gulf of Guinea and off Senegal in the eastern Atlantic and off Venezuela in the western Atlantic. French and Spanish fleets are the major components in the east, and the Venezuelan fleet operates in the west. Bigeye catch by the Venezuelan fleet was very minor. Since 1990, changing flags of convenience have increased recently for the French and Spanish purse seiners. The bigeye catch by reflagged fleets has become significant since 1991 but basic statistics (catch, effort and size) for these fleets are covered by the statistical program of France and Spain.. While bigeye tuna is a primary target species for most of longline and baitboat fisheries, this species has been of secondary important species for purse seine fisheries.

Since about 1991, the purse seine and Ghanaian baitboat fisheries introduced a fishing technique that utilizes artificial fish aggregating devices (FADS). Similarly, baitboat fleets in Senegal and the Canary Islands are developing a new method which makes use of baitboats as floating objects. These new techniques have apparently improved fishing efficiency and contributed to the increase of bigeye catch. The size of fish caught varies among fisheries: medium to large, small to medium and small fish for longline, directed baitboat and purse seine fisheries, respectively. Corresponding average weights are 45-50 kg, 20-30 kg and 5 kg for these three types of fisheries. The economic value of fish is also different. Roughly speaking, the price of longline-caught fish at the unloading site is six times higher than those caught by other fisheries such as purse seine.

This year, improvement and revision of purse seine catch was made, applying the new statistical system which accounted for the recent changes of fishing for this fishery. This new statistical system was developed through the 2-year project, which was funded by the EU and has been completed recently. Total catch from all nations **(BET-Figure 2)** exhibited an increase up to mid 1970's reaching around 60,000 MT. It fluctuated between 45,000 to 74,000 MT over the next 15 years. In 1991 it reached more than 80,000 MT and continued to increase from 1992 to 1994. The 1994 catch was a new record of 115,000 MT for this species. The catch started to decline since then, and the 1997 preliminary figure was 90,000MT.

The increase in catch after 1990 was attributable to all major fisheries (baitboat, purse seine and longline), whereas the decline after 1995 was mostly due to the decline by purse seine fishery. The comparison of average catch between three periods (1990-1992, 1993-1995 and 1996-1997) for baitboat, purse seine and longline fisheries indicated an increase of 5,000 MT (30%), 15,000 MT (100%) and 10,000 MT (20%) between the first and second period, respectively. A decline of 2,000 MT (10%), 9,000 MT (33%) and 2,000 MT (4%) was observed for the same fisheries between the second and third period. It was reported that the intense use of drifting natural log s and FADs was a primary cause of increased catch for purse seiners, although other technological advances such as extensive use of sonar, deeper nets, bird radar, etc, may have contributed as well. The reason for catch decline thereafter was not known but lower abundance of juveniles and/or a decrease of directed effort appeared to be the possible reasons. Voluntary prohibition of fishing on FADs also contributed the decline of catch in 1997. The increase in longline catches is primarily due to a rapid shift of target species from albacore to bigeye by the Chinese Taipei longline fleet, and increased fishing operations both by the Japanese and Chinese Taipei fleets. The baitboat catch in higher latitude tends to vary year to year suggesting possible influence by local oceanographic conditions. The increased catch during 1993-1995 might have resulted from favorable oceanographic condition in higher latitude as well as the new fishing method in some baitboat fisheries which makes use of fishing boats as FADs.

BET-3. State of stocks

Two indices of relative abundance were used in the analysis of stock status: a standardized age-specific index of abundance from the Japanese longline catch and effort data that targets this species and represents roughly 40 % of the total catch; and data from the US longline fishery (not age-specific). These two indices relate to medium and large sized fish **(BET-Figure 3)**. Several different types of production model were run using the Japanese longline index. However, not all models produced biologically reasonable results and were therefore rejected by the Committee as was the case last year. The Committee believes, based on knowledge of the fisheries, the stock and production model estimation procedures, that the likely range of MSY is between 70,000 MT and 90,000 MT. MSY values estimated in later years were somewhat higher, largely due to the addition of high catches, which production models interpret as increased productivity (which may or may not persist in future assessments) **(BET-Figure 4)**.

Several different types of Virtual Population Analyses (VPA) were also conducted using the Japanese and US longline indices of relative abundance . Catch-at-age was estimated from the catch-at-size that was newly created and improved according to the recommendation made in 1996. Trends in spawning stock biomass and fishing mortality rates **(BET-Figure 5)** were generally similar among different VPA analyses. Spawning stock biomass exhibited a slight decreasing trend until 1993 and then declined quickly. Fishing mortality rates increased rapidly especially after 1991. Fishing mortality rates by age for the period 1993-1995 illustrate substantial increases both for juvenile and adult fish **(BET-Figure 6)**. Since longline indices alone were used to tune the VPAs and since these indices relate only to medium to large-size fish, the results of VPA should be interpreted with caution. The strength of cohorts during the most recent years is not well estimated as not all of these cohorts are represented by the indices used. The results of yield-per-recruit analysis and future projections, which are given below, were conditional on VPA results, as some of the input data for those analyses were directly taken from VPA.

The total catch has been larger than the upper boundary of the likely range of MSY since 1993, suggesting that the stock has declined considerably. Results of a production model[1] indicate that the estimated current biomass is below B_{MSY} by 20-40 %, and current F estimates surpass F_{MSY} by 50 to 120 %. Similarly, VPA results showed a sharp increase in estimated fishing mortality rates as well as an accelerated declining trend in spawning stock biomass after 1992. VPA results suggest a likely range of average fishing mortalities over the years 1993-95 of 0.38-0.53 for age 1 fish. Yield-per-recruit analyses **(BET-Figure 7)** indicate that this range corresponds to fishing mortality ratios of 1.09-1.52 relative to $F_{0.1}$ and 0.83-1.16 relative to F_{max}. Thus, while current F is uncertain, it probably exceeds $F_{0.1}$ and is also likely to be higher than F_{max}, indicating that the bigeye stock is already over-exploited. In addition, current spawning stock biomass-per-recruit **(BET-Figure 7**) is lower than 20 % of its maximum, which corresponds to a threshold at which recruitment over-fishing may occur for other fish species. Yield-per-recruit analysis suggests that an increase of yield cannot be expected by intensifying fishing effort of any sector; however, yield-per-recruit can be increased by a reduction of fishing effort in the small-fish fisheries or an increase in the age at first capture **(BET-Figure 8)**.

In VPA and yield-per-recruit analyses, the role of natural mortality (M), particularly for small fish, is very important; i.e., the impact of the small-fish catch on the large-fish fishery is large if M is relatively low, but it will be smaller if M is high. Without precise estimates of M, results could be misleading. Therefore, research designed to estimate M, such as tagging programs, should receive high priority.

1 Non-equilibrium production model

BET-4. Outlook

The outlook for bigeye was examined by yield-per-recruit analysis, as well as preliminary projections **(BET-Figure 9)**. Under the current exploitation pattern and assuming recruitment at recent average levels, yields would be expected to decline in the near future to levels below MSY.

Having obtained the above results, however, the outlook for this species cannot be clearly foreseen. If the productivity of the stock has actually increased in recent years, the stock may enter into a new equilibrium with catches higher than previously estimated MSY levels. On the other hand, if the stock has already been heavily fished as estimated by the various biological reference points presented in this assessment, continuation of catches of the current magnitude may cause recruitment over-fishing which leads to stock collapse, although the probability of stock collapse seems low because of the biological characteristics of this species (e.g. wide distribution, high fecundity and rapid growth). Even with increased productivity, the most plausible scenario is that future catch levels will decline below the current catch level.

BET-5. Effects of current regulations

The bigeye minimum size regulation of 3.2 kg was adopted in 1980 to reinforce the same regulation for yellowfin. It is clear that a large quantity of juvenile bigeye tuna smaller than 3.2 kg continue to be captured mostly from the equatorial surface fleets (baitboat and purse seine). The percentage of fish smaller than the minimum size has increased since 1991 and was 70 % in 1996. According to yield-per-recruit analysis **(BET-Figure 7)**, full implementation of this regulation could result in an increase in yield-per-recruit of almost 25 % at F_{max}. The Committee recommends that further analysis of the advantages and disadvantages of the 3.2 kg minimum size be conducted.

At the 1997 Commission Meeting, the Commissioners requested that the SCRS examine the results of observer program adopted in 1996 for all tropical tuna fleets, including the results of voluntary regulation which sets up a closed area and season of fishing on FADs for purse seine fleet, in order to determine areas and seasons of concentrations of juveniles and spawners. Although the compilation of entire data set is not completely finished and thus not fully analyzed, this voluntary regulation appears very effective in reducing fishing mortality for juvenile bigeye. The preliminary results of those analyses are given under item 19 of the SCRS Report.

BET-6. Management recommendations

Since 1993, the total bigeye catch has been near or greater than 100,000 MT, except in 1997. This high level of catch represents a substantial increase over the 1989-1990 level by more than 30,000 MT due to the increased catch by purse seine, longline and baitboat fisheries. Although MSY levels are not well determined, the recent high catch surpasses estimates from all models considered. It is highly likely that this catch level cannot be sustained in the long term and may result in substantial declines in stock size.

Further increases in the catch of small fish will result in a decrease in catch over the long term as well as an additional reduction in the adult stock size which, as a consequence, increases the likelihood of recruitment over-fishing.

Taking all these factors into consideration, the Committee once again strongly recommends a reduction of overall catch to at least the 1992 level (which was approximately 85,000 MT). Due to the multi-species nature of the surface fisheries, it may be difficult to perfectly implement the minimum size regulation; however, the Committee considers that a catch consisting of 70 % of fish less than 3.2 kg is excessive, results in substantial losses in yield-per-recruit, and may ultimately result in stock depletion. Reduction of the juvenile catch can be accomplished by limiting fishing on schools associated with floating objects by the tropical surface fisheries. Such limitation has already been implemented by Spanish and French purse seine fleets in the east Atlantic on voluntary basis. The Committee appreciates their effort and encourages other fishing sectors to join in. At the same time, the Committee would like the Commission to draw the highest attention to this action and reinforce the need for effective management measures for Atlantic bigeye fisheries.

ATLANTIC BIGEYE TUNA SUMMARY

Maximum Sustainable Yield (likely range)	70,000 - 90,000 MT*

ATLANTIC BIGEYE TUNA SUMMARY

Maximum Sustainable Yield (likely range)		70,000 - 90,000 MT*
Current (1997) Yield		89,600 MT
Current (1997) Replacement Yield**		60,000 - 80,000 MT
Relative Biomass (B_{1997}/B_{MSY})**		0.6 - 0.8
Relative Fishing Mortality	(F_{1996}/F_{MSY})**	1.5 - 2.2
	$F_{1996}/F_{0.1}$***	1.1 - 1.5
	F_{1996}/F_{Max}***	0.8 - 1.2
Management Measures in Effect		3.2 kg minimum size

* This range is representative of MSY ranges predicted by ASPIC and PRODFIT models.
** Non-equilibrium production model (ASPIC).
*** Assumes a range of average fishing mortalities in 1996 of 0.38-0.53 for age 1 fish, based on VPA analyses.

In this table, ranges of point estimates were given for replacement yields and relative ratios

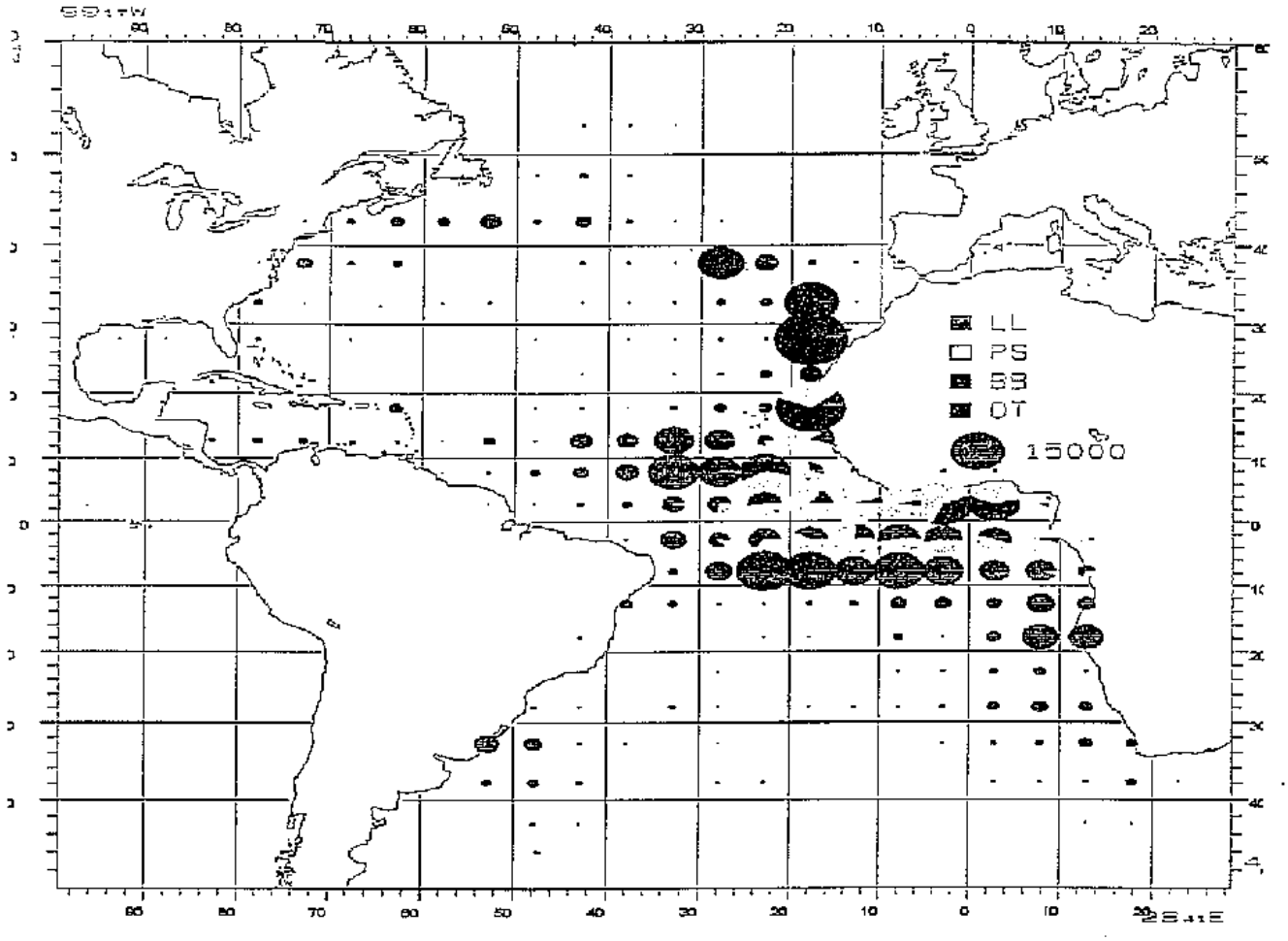
EX-BET- Table 1. Nominal landings (MT) of bigeye tuna by flag

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
TOTAL	61301	45302	54880	52693	45975	63820	68186	73711	59277	69339	74218	59758	49262	59094	69572	73249	80313	84256	101697	115083	110351	102010	89559
SURFACE	*19954*	*17455*	*25349*	*23897*	*18415*	*22142*	*26578*	*21653*	*25585*	*27688*	*25290*	*25233*	*20271*	*17926*	*19401*	*27703*	*33885*	*35243*	*49000*	*53547*	*51773*	*41999*	*38738*
Baitboat	14651	9939	12758	14629	9591	12349	10124	6922	9796	11439	17651	15618	12631	9710	12672	18106	17767	16221	16521	20412	25557	19065	18676
Purse seine	5303	7067	11875	9094	8343	9204	15656	14476	15654	16063	7554	9286	7148	7859	6371	9407	15841	18621	32044	32416	25915	22738	19742
Other surface	0	449	716	174	481	589	798	255	135	186	85	329	492	357	358	190	277	401	435	719	301	196	320
LONGLINE	*41347*	*27847*	*29531*	*28796*	*27560*	*41678*	*41608*	*52026*	*33648*	*41599*	*48810*	*34460*	*28897*	*41111*	*49936*	*45440*	*46286*	*48886*	*52457*	*60946*	*57897*	*59394*	*50664*
UNCL. GEARS	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*32*	*44*	*52*	*118*	*65*	*94*	*57*	*235*	*106*	*142*	*127*	*240*	*590*	*681*	*617*	*157*
ARGENTINA	95	176	84	23	0	0	0	0	0	0	100	41	72	50	17	78	22	0	0	0	0	0	0
BENIN	0	0	0	0	0	0	40	45	0	0	0	15	6	7	8	10	10	7	8	9	9	9	9
BRASIL	181	678	1183	812	782	698	505	776	535	656	419	873	756	946	512	591	350	790	1256	596	1935	1647	1237
BZ-SH-OB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	6
CANADA	0	23	0	0	0	0	0	0	0	0	0	11	144	95	31	10	26	67	124	111	148	144	166
CAP VERT	115	50	47	464	45	27	72	200	293	167	112	86	60	117	100	52	151	105	85	209	66	16	16
CHINA PR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	62	379	421	460	378
CHI-TAIPEI	4464	3701	3364	2970	2486	2561	1887	2147	1623	925	1220	1125	1488	1469	940	5755	13850	11546	13426	19680	18023	21850	19242
CONGO	0	0	0	0	0	5	0	0	0	0	8	19	10	10	14	15	12	12	14	9	9	8	0
CUBA	1900	1300	1800	2300	2300	1385	711	521	421	447	239	171	190	151	87	62	34	56	36	7	7	5	0
E.GUINEA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
EC-ESPAÑA	8882	7436	9736	6849	5419	8430	10010	9332	8794	13617	10340	10884	8875	7984	7660	10355	14854	14869	16652	21987	17937	15262	13386
EC-FRANCE	4901	6485	8970	8985	7308	6283	8020	7074	8124	4254	4615	4266	3905	4161	3261	5023	5802	6980	12656	12385	8489	9228	6050
EC-PORTUGAL	6813	2929	4522	5350	3483	3930	3525	1861	4075	4354	6457	7428	5036	2818	5295	6233	5718	5796	5616	3099	9662	5810	5437
GABON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	87	10	0	0
GHANA	84	170	237	124	238	332	780	791	491	2162	1887	1720	1178	1214	2158	5031	4090	2866	3577	4738	5517	5805	7431
GRENADA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	65	25	20	10	10	0	1
HO-SH-OB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69	31	66
JAPAN	17548	8170	10144	9863	12150	20922	22091	33513	15212	24870	32103	23081	18961	32064	39540	35231	30356	34722	35053	38503	35477	33172	27427
KOREA	10493	6923	8090	9716	8022	10235	12274	10809	9383	8989	10704	6084	4438	4919	7896	2690	802	866	377	386	423	1250	796
LIBERIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	206	16	13	42	65	53	57	57	57
LIBYA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	508	1085	500	400	400	400
MAROC	15	170	324	394	414	387	622	625	552	120	30	0	8	0	0	0	0	0	0	0	0	0	0
MEXICO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0	6
NAMIBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	29	7	45
NORWAY	0	0	0	0	0	0	0	0	0	0	0	0	0	60	0	0	0	0	0	0	0	0	0
POLAND	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RUSSIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	38
S.AFRICA	0	0	0	0	19	422	381	137	187	60	102	168	200	553	367	296	72	43	88	76	27	7	10
SENEGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	4	126	177	135	135
ST.LUCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
ST.VINCENT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0	0	4	2
STA HELENA	0	0	5	22	8	9	14	23	14	19	0	0	5	1	1	3	3	10	6	6	10	10	12
TOGO	0	0	0	0	0	0	0	0	14	52	18	24	22	7	12	12	6	2	86	23	6	33	33

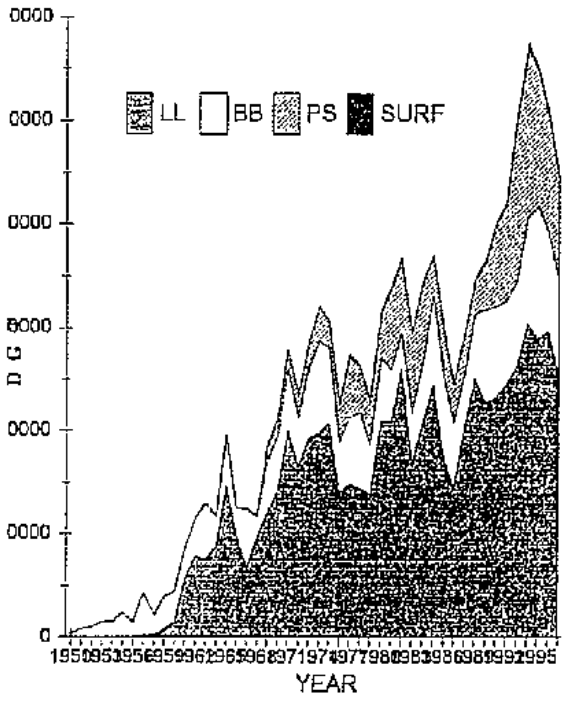
EX-BET- Table 1. Nominal landings (MT) of bigeye tuna by flag

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
TRINIDAD & T	0	0	0	0	0	0	0	0	191	41	22	0	0	1	19	57	263	0	258	0	0	17	17
URUGUAY	0	0	0	0	0	0	86	397	605	714	597	177	204	120	55	38	20	56	48	37	80	124	69
USA	67	28	331	248	212	202	152	377	254	408	353	747	1008	918	761	650	962	751	982	1328	1209	882	1095
USSR	3652	4907	4086	2202	2229	2813	2832	635	352	1233	870	1071	1887	1077	424	95	0	0	0	0	0	0	0
VENEZUELA	0	21	464	244	347	661	1684	999	4284	4142	2918	1136	349	332	115	161	476	270	809	457	457	189	188
NEI-1	0	0	0	0	0	0	0	338	1141	157	0	0	85	20	93	785	2351	3860	9228	10128	9676	5435	5800
NEI-28	2091	2135	1493	2127	513	4518	2500	3107	2732	1952	1104	631	375	0	0	0	0	0	71	143	0	0	0

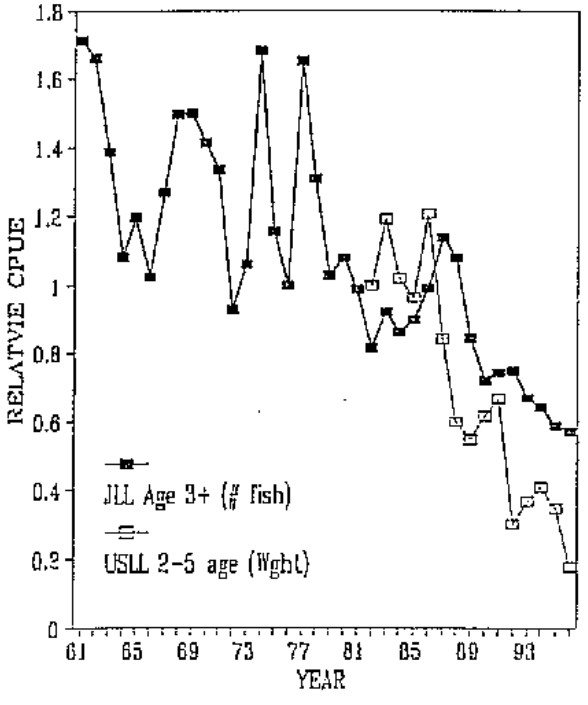
The following chang was received too late to be included in the stock assesment: Brazil LL 1996 = 1706



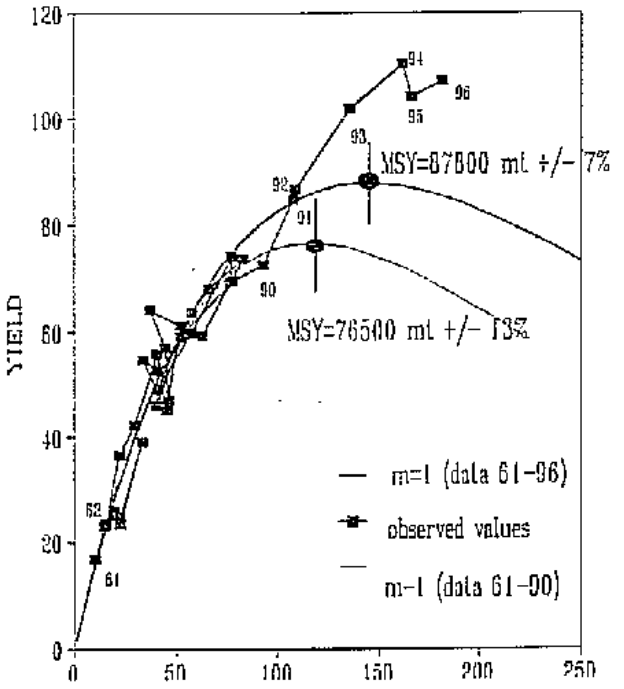
BET-Fig. 1. Geographical distribution of bigeye tuna catch by major tuna fisheries. Dark shaded, light shaded, medium shaded and black areas in circles correspond to catches by longline, purse seine, baitboat and other fisheries, respectively for unknown years.



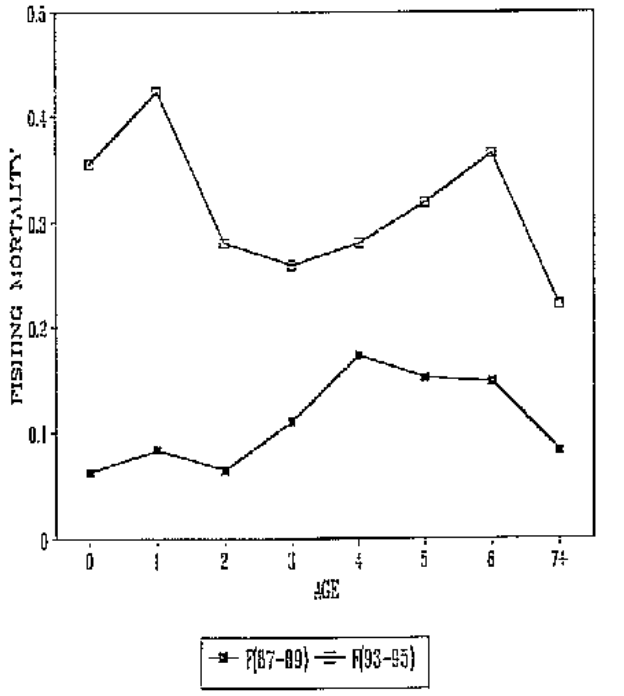
BET-Fig. 2. Accumulative catches (MT) of bigeye tuna in the entire Atlantic by gear categories.



BET-Fig. 3. Abundance indices from the Japanese (in number of fish) and US (in weight) longline fisheries.

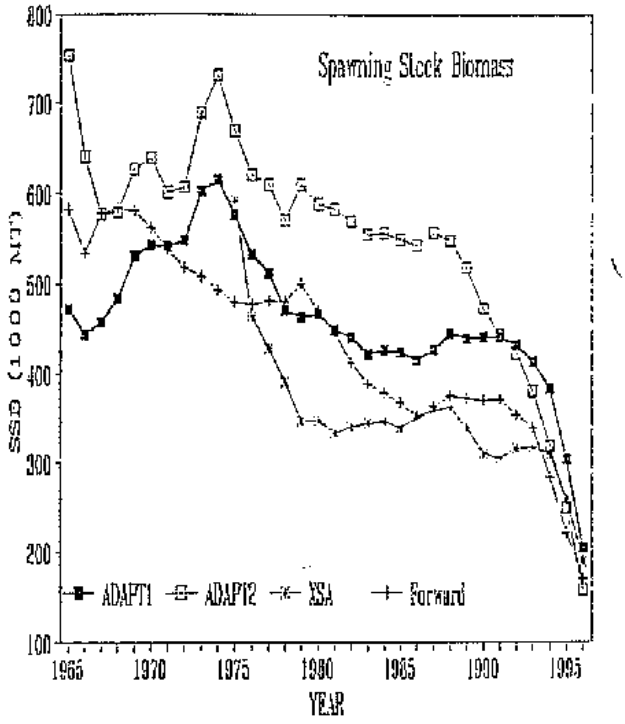


BET-Fig. 4. Production curve (shape parameter = 1.0) estimated by the equilibrium production model plotted with catch and effort series. With abundance index estimated by GM model. Heavy line represents a curve estimated using whole data points, while light line indicates a curve without data points after 1990. (The 1997 catch is about 90,000 MT. Since substantial catch revision was made this year and no assessment was conducted, the appropriate fishing effort can not be calculated correctly. The position of 1997 data point is uncertain).

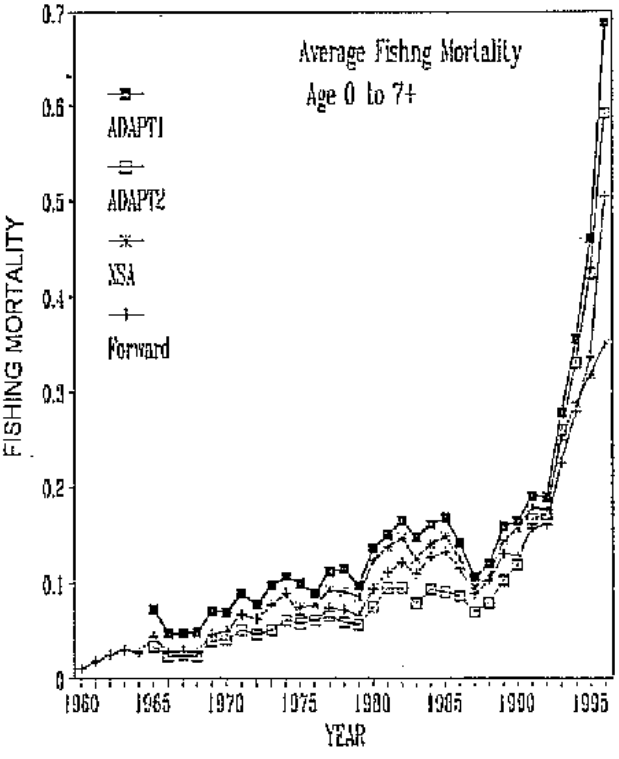


BET-Fig. 6. Fishing mortality rates at age for two periods (1987-1989 and 1993-1995) estimated by VPA.

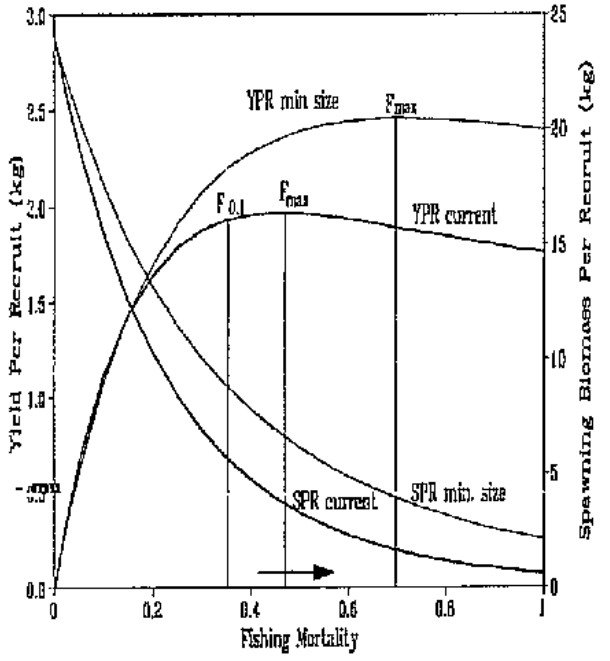
A)



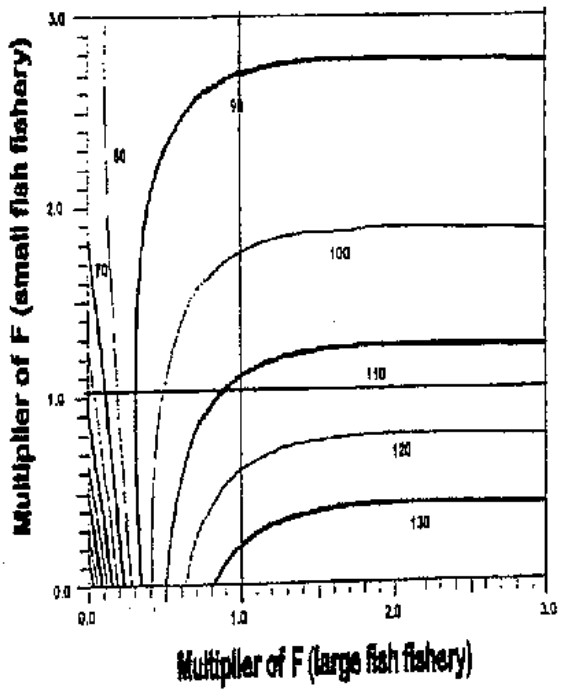
B)



BET-Fig. 5. A) Spawning biomass and B) fishing mortality rates of ages 0 to 7+ estimated from tuned VPA (ADAPT model 1 and 2, XSA) and untuned VPA (forward VPA).

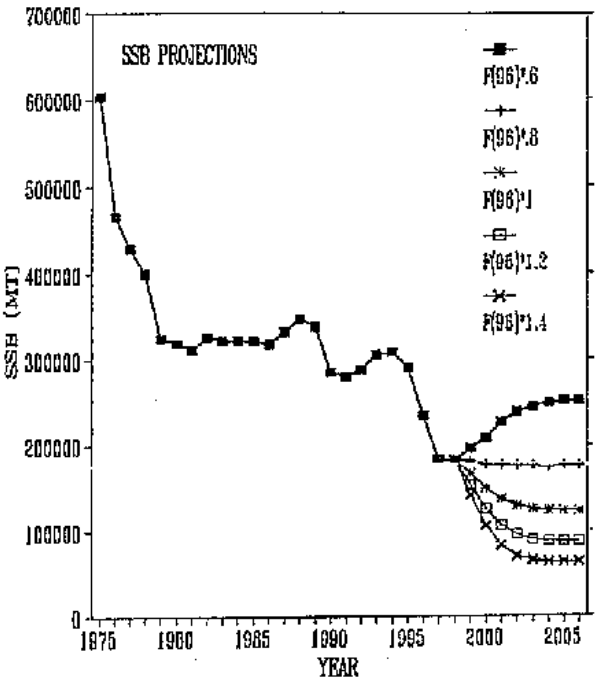


BET-Fig. 7. Yield-per-recruit (YPR) and spawning biomass-per-recruit (SPR) for bigeye tuna assuming current selectivity (heavy line) and selectivity reflective of a 3.2 kg minimum size limit (light line). The arrow indicates the approximate range of recent fishing mortalities.

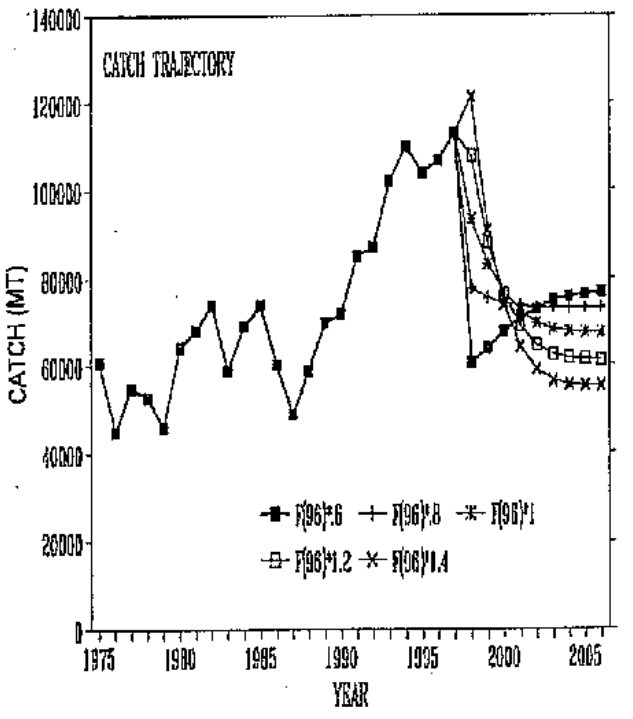


BET-Fig. 8. Results of multi-gear yield-per-recruit analysis. Large fish fishery and small fish fishery correspond to longline plus islands bultboat fisheries and the other fisheries F Vectors used in this study were obtained from VA.

A)



B)



BET-Fig. 9. Short term A) future projection of spawning stock biomass and B) catch trajectories. Starting values for projection are taken from the tuned VPA (XSA), with F in 1996, selectivity averaged for 1994-1996 and future recruitment averaged for 1991-1995. Five different levels of F were projected for 10 years.

SKJ - S K I P J A C K T U N A

SKJ-1. Biology

Skipjack tuna is a cosmopolitan species forming schools in the tropical and subtropical waters of the three oceans. Skipjack spawn opportunistically throughout the year in vast areas of the Atlantic Ocean. The size at first maturity is about 45 cm for males and about 42 cm for females. Skipjack growth is variable and seasonal, and is more rapid for fish from the tropical zone than for fish from the equatorial area. That is, considerable variability is observed in the average rates of annual growth between the two areas. Skipjack are active predators that feed on numerous prey, which defines the opportunistic character of this species.

The stock structure of skipjack in the Atlantic Ocean is not well known. Although there are apparently no ecological barriers preventing an exchange of fish between the fishing areas located on both sides of the Atlantic, two management units are maintained (eastern and western), due to the development of fisheries on both sides of the Atlantic Ocean and to the lack of transatlantic recoveries of tagged skipjack **(SKJ-Figure 1)**. Because of the biology and the fisheries for this species, there is the possibility of establishing smaller management units.

SKJ-2. Description of fisheries

Skipjack are caught almost exclusively by surface gears in the entire Atlantic Ocean, although minor amounts of skipjack are taken by longline as by-catch **(SKJ-Figures 2a and 2b)**. Reported catches are considered to be somewhat under-estimated, due to the discards of small-sized tunas, which include skipjack, by the purse seine fleets fishing under objects, and by some baitboat fleets in the equatorial area of the eastern Atlantic.

Catches in the Atlantic Ocean in 1997 amounted to about 140,000 MT **(SKJ-Table 1)**.

In the eastern Atlantic, the most important fisheries are the purse seine fisheries, particularly those of Spain, France and the NEI fleet (Vanuatu, Malta, Morocco, Belize, Guinea, Netherlands Antilles, Panama, and St. Vincent), followed by the baitboat fisheries of Ghana, Spain, Portugal, and the French fleet. Skipjack fisheries underwent important changes in 1991, a year of exceptional catches (174,000 MT), with the introduction of fishing with artificial floating objects and the expansion of the purse seine fishery towards the west (30ºW), and closer to the Equator, following the drift of the floating objects, which has brought the eastern fishery closer to the western fishery (**SKJ-Figure 1)**. The fleet also developed the live bait fishing method, directed mainly at bigeye tuna, in which the boat acts as an object, fixing and fishing a school during the entire fishing season in waters off Senegal, Mauritania, and the Canary Islands. In 1997, skipjack catches in the eastern Atlantic amounted to 108,300 MT, which represents a slight increase with respect to the 106,300 MT obtained in 1996. Thus, the declining trend in the catches observed since 1993 has been interrupted **(SKJ-Figure 2a)**.

In the western Atlantic, the most important fishery is the Brazilian baitboat fishery, whose only target species is skipjack. In 1997, Venezuelan and Cuban vessels also participated in the fishery. As regards the purse seine fisheries, whose catches are much lower than those of the baitboat fisheries, catches were only taken by the Venezuelan and Brazilian fleets. The 1997 reported catches of 31,400 MT are higher than those of 1996 (27,400 MT). This increase is shown in the purse seine as well as the baitboat catches **(SKJ-Figure 2b)**.

There is no information available on effective fishing effort exerted on skipjack tuna, particularly since the introduction of fishing with artificial floating objects. Considering vessel carrying capacity as a measure of nominal effort in the eastern Atlantic Ocean, the same continuous decline in effort since 1991 can be observed, and in 1997 effort was 23% less than that of 1991 and 8% less than that of 1996 **(SKJ-Figure 3)**. The increase in the efficiency of the fleet due to technological improvements, the development of fishing with objects, etc., as described in the Report of the Working Group on Abundance Indices of the Tropical Surface Fisheries (Miami, 1998), has resulted in an increase, which is not well quantified, in effective effort of the different fleets.

The development of nominal effort of the different Brazilian baitboat fleets, expressed in fishing days, shows a declining trend since 1985, and is currently 18% below that of the aforementioned year, when the second highest catches for this fishery were taken in the western Atlantic.

SKJ-3. State of the stocks

The last detailed skipjack stock assessment for the eastern Atlantic stock was carried out in 1984 by the Working Group

on Juvenile Tropical Tunas. The results of that assessment showed the stock was under-exploited. In observing the development of the vessel carrying capacity **(SKJ-Figure 3)**, it can be noted that when the assessment was carried out (1984), the highest level of this parameter was reached. Vessel carrying capacity in 1983 was 81,800 MT, while it is currently at 43,900 MT, which represents a 54% decline. These situations are not comparable as there have been notable changes in the purse seine fishery in the eastern Atlantic Ocean in recent years. The most noteworthy are the increase in individual fishing power of the purse seiners due to the continuous introduction of technological improvements and, since 1991, the intensive use of floating objects to aggregate tunas. This fishing strategy, besides changing the fishing area to extend towards the southwest, has increased the catchability of skipjack, taking into account that skipjack is the main species in the catches taken under floating objects.

This year exploratory analysis were carried out applying Jones Cohort Analysis and a quarterly VPA on size distributions of skipjack caught in the equatorial area of the Atlantic Ocean (5ºN-5ºS, 30ºW-15ºE) during the 1991-1997 period. Although this area is a small fraction of the area of distribution of the skipjack population in the Atlantic Ocean, about half of the skipjack catches in the Atlantic have been taken here in recent years. Moreover, tagging studies and analysis of size data in the East Atlantic, suggest that the movements of skipjack are limited during the time they are exploited by the fishery. The results of those analyses are uncertain and dependent upon several assumptions, but with further investigation, including alternative models that include spatial components, and additional data (e.g. indices of abundance) these may be improved.

In short, there are still uncertainties about the state of the eastern stock, but given the biological characteristics of this species (short life span, rapid growth, catches predominated by mature fish, few ages present in the fishery, high natural mortality, etc.),it seems unlikely that the whole Atlantic-wide population will be over-exploited.

Nevertheless, there has been a declining catch trend in recent years, despite sustained fishing effort and increases in efficiency associated with fishing objects. Most of the catches have been made in a specific area, the equatorial area, where remarkable decreases have been noted in the sizes and average weights of the fish caught **(SKJ-Figure 4)**. These could be indications of a local over-exploitation of skipjack and that the fishing mortality rate may exceed levels that would maximize the yield per recruit.

No stock assessment has been carried out on western Atlantic skipjack **(SKJ-Figure 2b)**.

The eastern Atlantic CPUEs (using carrying capacity as a measure of effort) have undergone a continuous increase. When days fishing is used as a measure of effort, standardized to French purse seiners and increased (since 1981) with a 3% annual coefficient of efficiency, CPUE fluctuates continuously since 1974. The CPUEs of the different fleets of the western Atlantic have fluctuated without trend **(SKJ-Figures 5a, 5b and 5c)**.

SKJ-4. Outlook

In the current situation, it is difficult to reach a definitive conclusion on the state of the eastern and western Atlantic stock. However, the Committee considered that, in spite of the characteristics of this species, a state of over-exploitation of skipjack seems to have been reached, at least in specific areas. However, the potential sustainable yield for this species might increase if fishing effort were distributed in areas in which the resource is under-exploited. Therefore, given the important changes that have occurred in the eastern Atlantic purse seine fisheries, skipjack should be carefully monitored and an assessment should be carried out before the next SCRS, using adequate, specific methods for this species.

SKJ-5. Effects of current regulations

There are currently no regulations in effect for skipjack. The voluntary application of the Protection Plan for Atlantic tunas, agreed by French and Spanish boat owner associations, carried out between November 1997 and the end of January 1998, and which it is hoped will be repeated in the same area in the last two months of 1998 and January, 1999, should contribute towards decreasing the high fishing mortality rates observed for this species in the equatorial area of the eastern Atlantic.

SKJ-6. Management recommendations

No management recommendations were proposed.

ATLANTIC SKIPJACK SUMMARY *

	East	*West*
Maximum Sustainable Yield (MSY)	not estimated	not estimated
Current (1997) Yield	108,344 MT	31,455 MT
Current (1997) Replacement Yield	Not estimated	not estimated
Relative Biomass (B_{1996}/B_{MSY})	Not estimated	not estimated
Relative Fishing Mortality: F_{1997}/F_{MSY}		
Management Measures in Effect	Not estimated	not estimated
	None	None

* The conclusions of the assessments carried out during the International Skipjack Year Program pointed out some considerations on the problems of assessing this species, which impede the application of production and analytical models:

-- Since skipjack is not the main target species of the purse seine fleets, there are no good indices of skipjack abundance.
-- Skipjack is a short-lived species which stays in the fishery for a short time and is subjected to high natural mortality.

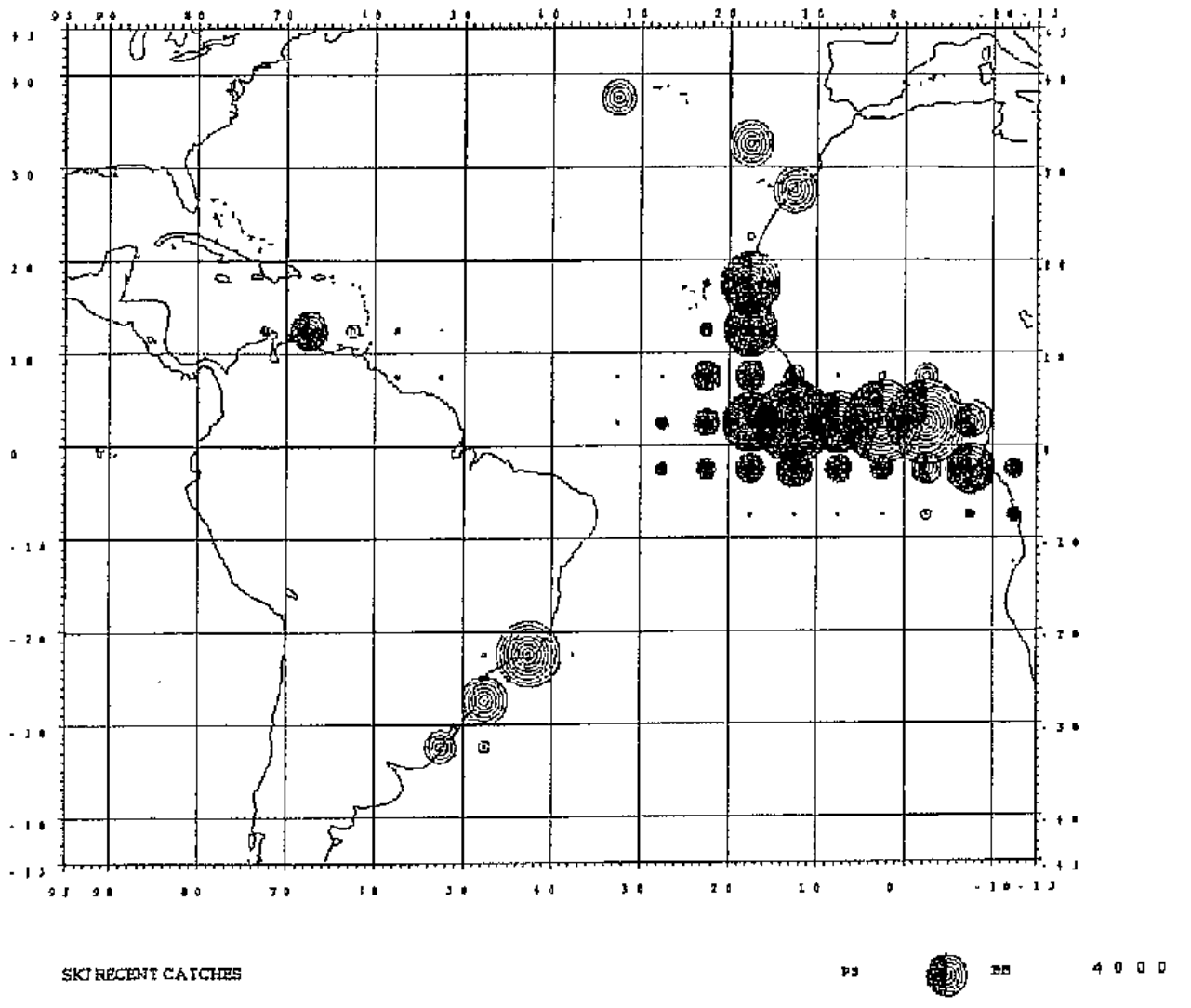
The present situation is different and the conclusions of the International Skipjack Year Program need to be revised.

EX-SKJ- Table 1. Nominal landings of skipjack tuna (MT) by flag 1975-1997

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
TOTAL	56027	69345	110577	108115	89696	111358	130880	155528	134930	126790	118685	122601	114816	140625	116103	138562	208092	157795	192743	173319	161766	133955	140081
E.ATL.SURF	51900	65458	107128	100885	83119	98766	107919	122366	102600	91208	78435	90539	90729	116906	89670	112374	174000	127602	159545	143410	139766	106317	108344
PURSE SEINE	*35387*	*33061*	*57683*	*58680*	*36966*	*56734*	*66473*	*74824*	*65492*	*61795*	*48348*	*58893*	*51134*	*67613*	*47260*	*74802*	*131273*	*90617*	*126816*	*104976*	*105520*	*73631*	*69535*
BAITBOAT	*16448*	*28710*	*42386*	*41365*	*44645*	*38134*	*38918*	*44488*	*34873*	*28085*	*29868*	*30009*	*38555*	*47961*	*41000*	*36569*	*41601*	*35609*	*31701*	*38123*	*33989*	*32202*	*38428*
OTHER SURF	*65*	*3687*	*7059*	*840*	*1508*	*3898*	*2528*	*3054*	*2235*	*1328*	*219*	*1637*	*1040*	*1332*	*1410*	*1003*	*1126*	*1376*	*1028*	*311*	*257*	*484*	*381*
ANGOLA	653	1514	4036	3501	3628	3482	2532	2257	318	46	131	56	80	30	85	69	66	41	13	7	3	15	22
BENIN	0	0	0	0	8	30	60	68	38	10	20	11	5	3	7	2	2	2	2	2	2	2	0
CANADA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CAP VERT	1170	825	748	1284	998	2094	1588	1636	1400	1391	2030	877	2076	1456	971	806	1333	864	860	1007	1314	470	462
CAYMAN I	0	0	0	0	0	289	1800	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CONGO	0	0	0	0	0	1250	200	0	5	10	8	8	8	8	11	12	9	9	10	7	7	6	0
CUBA	300	200	100	200	100	196	198	189	135	310	246	569	81	206	331	86	0	0	7	0	0	0	0
EC-ESPAÑA	17637	16165	22257	25066	18748	26384	35458	38016	28934	46659	35100	41992	33076	47643	35300	47834	79853	53466	63514	50458	51448	38505	38015
EC-PORTUGA	569	2068	4388	4584	3074	1954	2825	5530	1113	3974	2409	5446	8172	14203	7725	3954	8059	7477	5635	7528	4996	8295	4399
FIS	12323	17039	31138	25903	18602	25767	26926	31132	29727	12994	13645	13045	17114	16504	15211	17099	33304	21862	33601	32659	25127	23027	16825
GABON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	11	0	26	0
GHANA	1426	2199	3492	2866	4299	5812	7858	18272	24376	20697	19082	22268	24347	26597	22751	24251	25052	18967	20225	21258	18607	19602	27667
JAPAN	3807	15042	16845	14614	14686	12304	12935	9930	6002	1504	2098	2031	1982	3200	2243	2566	4792	2378	0	0	0	0	0
KOREA	4469	1948	3600	8132	12017	6718	7538	2827	1553	687	153	0	0	0	0	0	0	0	0	0	0	0	0
MAROC	270	538	3851	1891	1863	5001	3017	3956	2532	885	1015	1222	1041	428	295	1197	254	559	312	248	5024	684	4513
NAMIBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	15	0	1
NORWAY	0	0	0	0	0	0	0	0	0	0	0	540	581	738	0	0	0	0	0	0	0	0	0
RUSSIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1175	1110	540	1471	1450	381	1146
S.AFRICA	1	0	40	90	2	48	88	37	44	11	64	87	88	157	96	17	15	7	6	4	4	1	6
S.HELENA	22	19	12	21	76	70	112	271	103	85	62	139	139	158	397	171	24	16	65	55	115	86	294
SAO TOME	30	35	118	100	34	33	90	78	103	18	20	20	20	21	22	25	24	25	15	0	0	0	0
SENEGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47	134	343	260	53	193	293	265	265
USA	7369	1766	5859	6797	2073	2608	2800	79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
USSR	0	3633	6674	2856	1161	2991	1750	3957	1223	1000	1404	1688	547	1822	1915	3635	0	0	0	0	0	0	0
VENEZUELA	0	0	0	0	0	0	0	0	0	0	358	0	0	0	0	0	0	0	0	0	0	0	0
NEI-1	0	0	0	0	0	0	0	1560	3383	927	590	540	1372	3732	2263	10516	19695	20559	34598	28371	31361	14952	14729
NEI-28	1854	2467	3970	2980	1750	1735	144	2541	1611	0	0	0	0	0	0	0	0	0	88	129	0	0	0
W.ATL.SURF	3381	3661	3219	6970	6187	12483	22724	32187	31326	34836	39935	31726	23847	23553	26091	25713	32813	29781	32906	28853	20069	27425	31455
PURSE SEINE	*374*	*700*	*600*	*3461*	*1489*	*3072*	*4654*	*9705*	*11121*	*17958*	*11191*	*5208*	*4964*	*2315*	*2466*	*3241*	*8527*	*8509*	*12794*	*5712*	*2059*	*3380*	*4122*
BAITBOAT	*2836*	*2800*	*2400*	*2812*	*4365*	*9351*	*17999*	*22402*	*20057*	*16771*	*28490*	*25278*	*18675*	*21057*	*23292*	*22246*	*23972*	*20852*	*19697*	*22645*	*17834*	*23814*	*26870*
OTHER SURFACE	*171*	*161*	*219*	*697*	*333*	*60*	*71*	*80*	*148*	*107*	*254*	*1240*	*208*	*181*	*333*	*226*	*314*	*420*	*415*	*496*	*176*	*231*	*463*
ARGENTIN	0	0	33	4	0	17	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BRASIL	0	83	188	633	2064	6070	13913	18322	15944	13567	25101	23155	16283	17316	20750	20130	20548	18533	17762	20582	16620	22519	26564
CANADA	0	181	0	86	0	0	180	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COLOMBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2074	0	0	0	0
CUBA	2300	2800	2400	1800	2000	2255	1086	1134	1700	1248	1632	1277	1101	1631	1449	1443	1596	1638	1017	1268	886	1000	1000
DOMIN R	171	78	41	64	87	59	71	80	106	68	204	600	62	63	117	110	156	135	143	257	146	146	146
EC-ESPAÑA	103	0	266	2031	1052	0	0	0	209	2610	500	0	0	0	0	0	1592	1120	397	0	0	0	0
FIS	75	0	0	0	86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GHANA	0	0	0	0	0	185	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

EX-SKJ- Table 1. Nominal landings of skipjack tuna (MT) by flag 1975-1997

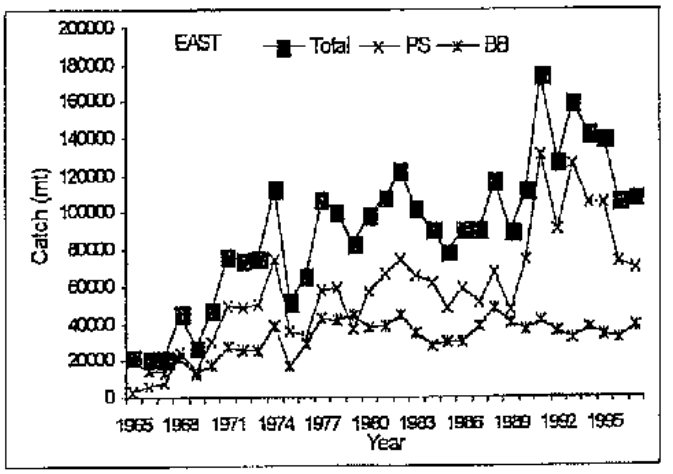
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
GRENADA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0
JAPAN	438	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
USA	196	519	301	1632	737	981	2573	6	589	817	1786	1004	651	34	52	239	783	521	341	49	21	84	69
VENEZUELA	98	0	0	0	0	1890	4900	12645	12778	16526	10712	5690	5750	4509	3723	3791	8138	7834	11172	6697	2387	3676	3676
NEI-28	0	0	0	720	161	1026	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ATL-UNCL	746	226	220	260	390	109	237	975	1004	746	315	336	240	166	342	475	1279	412	292	1056	1931	213	282
LL+TRAW	*214*	*48*	*101*	*56*	*13*	*12*	*78*	*41*	*600*	*47*	*30*	*26*	*11*	*14*	*32*	*23*	*39*	*33*	*22*	*24*	*36*	*26*	*90*
UNCL GRS	*532*	*178*	*119*	*204*	*377*	*97*	*159*	*934*	*404*	*699*	*285*	*310*	*229*	*152*	*310*	*452*	*1240*	*379*	*270*	*1032*	*1895*	*187*	*192*
ARGENTIN	0	0	0	0	0	0	0	137	243	505	101	138	90	7	111	106	272	123	50	1	0	0	0
BARBADOS	0	0	0	0	0	0	78	72	39	48	36	33	21	3	9	11	14	5	6	6	6	5	5
BRASIL	0	0	2	2	1	1	0	0	1	0	0	0	3	0	0	0	0	2	9	6	30	9	9
BULGARIA	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CHI TAIP	17	22	0	12	10	7	9	20	8	13	7	1	2	8	22	0	37	29	11	17	5	15	75
COLOMBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	789	1583	0	0
DOMINICA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	38	41	24	43	33	0	0
EC-ESPAÑA	90	90	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EC-GERMAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
EC-PORTUGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
ESTONIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	102	0	0	0	0	0	0
GABON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	51	0	0
GRENADA	0	0	0	1	4	8	1	1	15	12	7	9	5	22	11	23	25	30	25	11	3	11	15
JAMAICA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	62	0
JAPAN	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KOREA	196	26	9	42	2	4	47	21	530	29	20	11	6	3	6	0	0	0	0	0	0	0	0
LATVIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	92	0	0	0	0	0	0
LITUANIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	221	0	0	0	0	0	0
MEXICO	0	0	0	0	0	1	3	0	25	30	48	11	13	10	14	4	9	8	1	1	0	2	3
NLD ANT	0	0	0	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	45	40	35	30	30
ROUMANIE	0	0	0	0	0	8	0	0	0	0	0	3	0	0	59	142	349	73	0	0	0	0	0
S AFRICA	0	0	0	0	0	0	22	0	60	3	2	14	0	0	0	0	0	0	0	0	0	0	0
ST LUCIA	81	88	100	100	41	40	37	38	35	64	53	76	60	53	38	37	51	39	53	86	72	37	100
ST VINCENT	0	0	0	0	0	0	0	0	0	0	0	0	0	17	28	29	27	20	66	56	53	37	42
TRINIDAD	0	0	0	0	0	0	0	0	1	2	1	0	0	1	0	0	0	0	2	0	0	0	0
USA	2	0	19	63	292	0	0	646	0	0	0	0	0	2	4	1	2	2	0	0	60	0	3
USSR	359	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VENEZUEL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	0	0	0	0	0	0	0
NEI-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



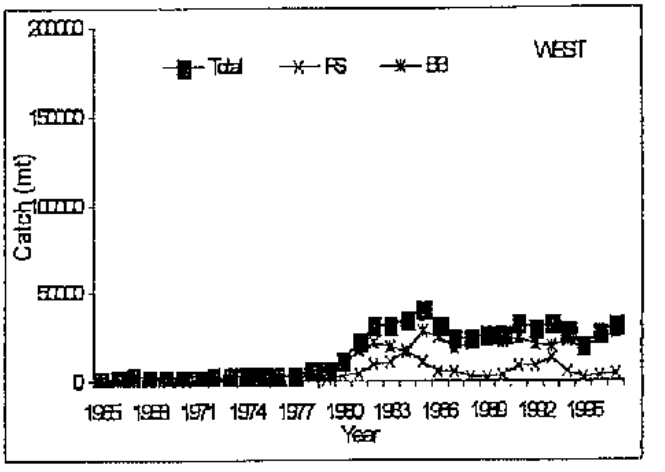
3

SKJ-Fig. 1. Distribution of reported surface skipjack catches by 5x5 area and by gear

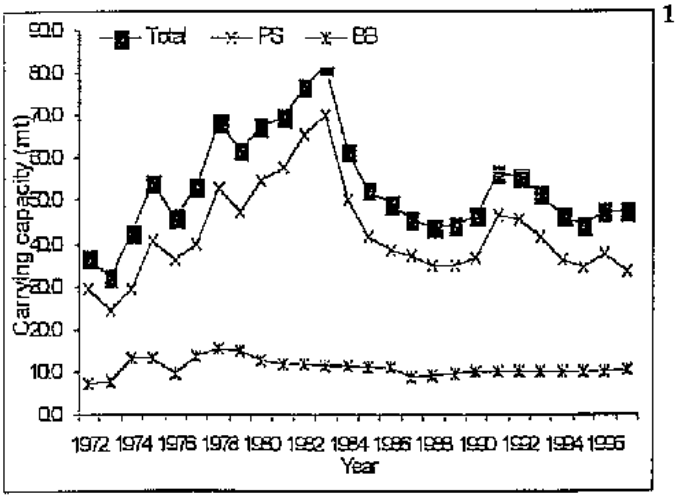
A) East Atlantic



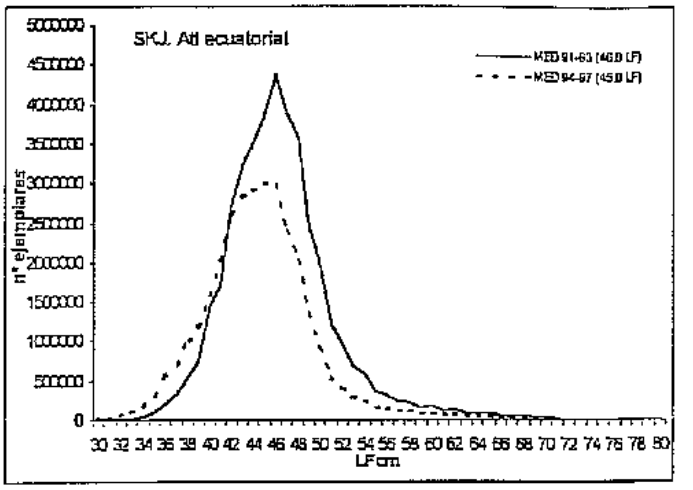
B) West Atlantic



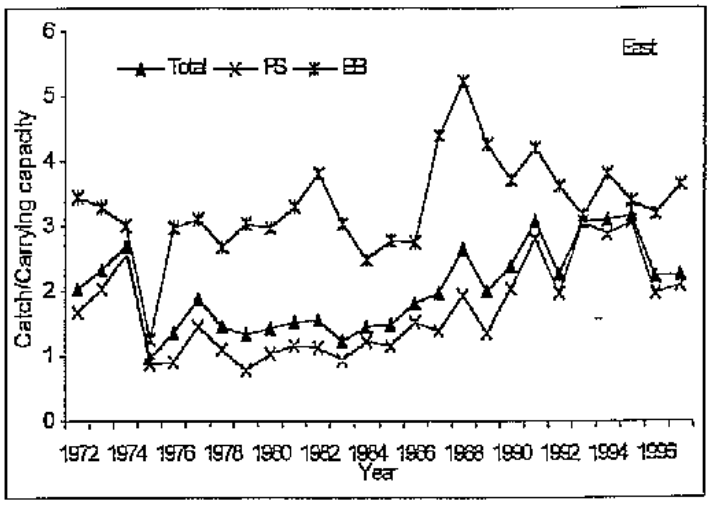
SKJ-Fig. 2 Skipjack catches by gear for east and west Atlantic, 1965-1997.



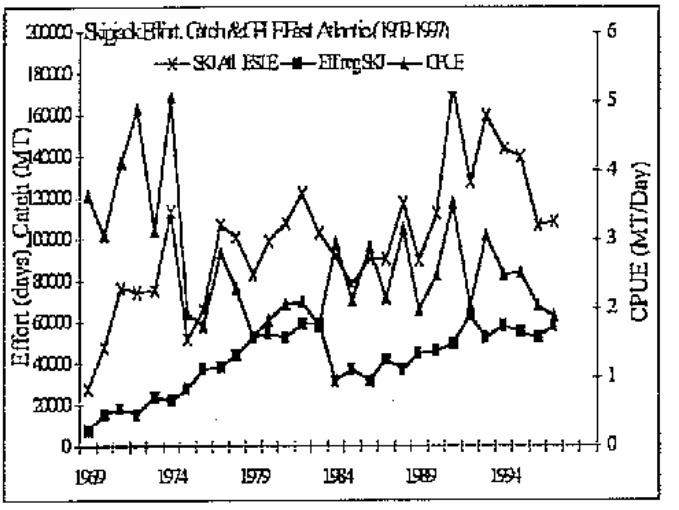
SKJ-Fig. 3 Carrying capacity (in MT) of the east Atlantic skipjack.



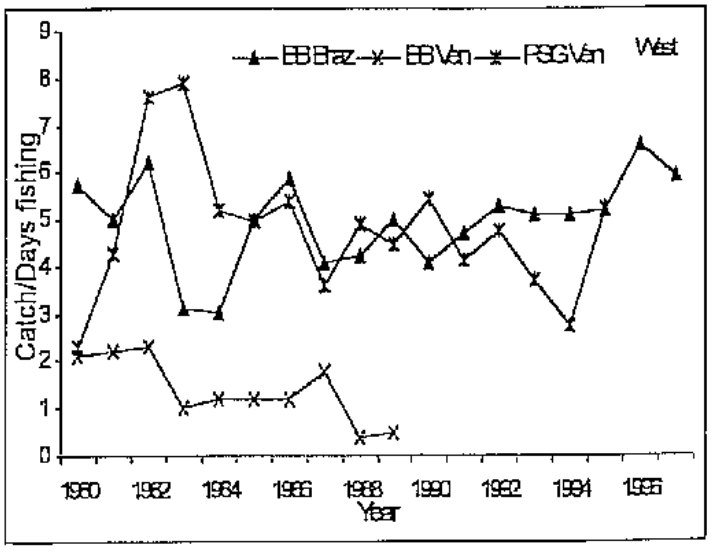
SKJ-Fig. 4. Size distribution of skipjack caught in equatorial area (5°N-5°S, 30°W-15°E) for two periods (1991-1993 and 1994-1997).



SKJ-Fig. 5a. Skipjack catches by carrying capacity of the east Atlantic.



SKJ-Fig 5b. Skipjack catches, effort (total effort estimated from purse seine effort extrapolated to the total catch. Effort is calculated in days fishing of French large purse seiners and assumed 3% annual increase of efficiency) and CPUE for the east Atlaantic.



SKJ-Fig 5c. Scipjack CPUE for different fleets in the west Atlantic.

ALB -- A L B A C O R E

ALB-1. BIOLOGY

Albacore is a temperate tuna widely distributed throughout the Atlantic Ocean and Mediterranean Sea. On the basis of the biological information available, for assessment purposes the existence of three stocks is assumed: northern and southern Atlantic stocks (separated at 5ºN) and a Mediterranean stock (**ALB-Figure 1**).

Albacore spawning areas in the Atlantic are found in subtropical western areas of both hemispheres and throughout the Mediterranean Sea. Spawning takes places during austral and boreal spring-summer. Maturity is considered to occur at about 90cm FL (age 5) in the Atlantic, and somewhat smaller in the Mediterranean. Until this age they are mainly found in surface waters, where they are targeted by surface gears. Some adult albacore are also caught using surface gears but, as a result of their deeper distribution, they are mainly caught using longlines. Young albacore are also caught by longline in temperate waters.

ALB-2. DESCRIPTION OF FISHERIES (**ALB-Figure 2**)

The Northern stock is exploited by surface and longline fisheries. Traditional surface fisheries include Spanish trolling and baitboats, used mainly in the Bay of Biscay and adjacent waters, and some Spanish and Portuguese baitboats around the Azorian Islands. New surface fishing gears, drift-nets and pelagic paired trawls, were introduced in 1987 in the Bay of Biscay and adjacent waters by France. Ireland and the United Kingdom joined the driftnet fishery at the beginning of the 1990's. Very recently Ireland has initiated experimental fishing trials using trolling and pelagic trawling. These surface fisheries mainly target juveniles and sub-adults (50cm to 90cm FL). A longline fleet from Chinese Taipei targets sub-adult and adult albacore (60-120cm) in the central and western North Atlantic. Other fleets make minor catches and in most of the cases albacore constitute a component of the by-catch.

The total catch in the north Atlantic has shown a downward trend since mid 1960's, largely due to reduction of fishing effort by the traditional surface and longline fisheries. In contrast, effort and catch in the new surface fisheries increased markedly since 1987. Market parameters seem to play a key role in the trends of the catches. In 1997 surface and longline catches were similar to those of 1996; it is noted that the autumn baitboat fishery failed again during 1997.

The main surface fleets that target the southern stock correspond to South Africa, Namibia and Portugal. These countries exploit the resource together with Chinese Taipei, Brazilian and Japanese longliners. There are also some minor catches made by the purse seine fleet in the tropical area. The Chinese Taipei fleet target albacore at a fairly high level of effort. There has been an increase of the catches of young albacore in 1994-1996 by this fleet and also by the Namibian baitboats. It is noted that Namibia is conducting experimental trials with purse seining targeting albacore and South Africa initiated tuna directed pelagic longline fishery in 1997.

Surface and longline catches have remained relatively constant at around 7,500 and 19,500 MT respectively during the last three years. In part due to the implementation of management regulations by some countries in response to the 1994 ICCAT resolution.

Reported albacore catches in the Mediterranean, mainly by Italy and Greece, are still minor.

ALB-3. STATE OF THE STOCKS

The Committee assessed the status of the Northern and Southern Atlantic albacore stocks after a deep review of Task I and Task II data available. The Committee recognized the important improvement of the basic data for both stocks although some uncertainties still remain, specially in relation with some elemental biological parameters. As planed, no attempt was made to analyze the status of the Mediterranean stock.

North Atlantic

The Committee analyzed the state of the northern stock using tuned virtual population analysis (VPA) and a more general age-structured method (ASAP). The relative abundance indices and other assumptions made for the base case were essentially the same as those used in previous assessments, based on the recommendations made during the Final Meeting of the Albacore Research Program. Only some modifications were made in the model formulation

The results obtained showed consistency with those from previous assessments. Sensitivity analysis were also conducted to explore the influence of several inputs and assumptions. Among various choices, the effect of considering abundance indices derived from non-target fleets was explored; the analysis showed that the inclusion-exclusion of these indices did not influence significantly the results obtained. The Committee noted the remarkable coherence between different methodologies utilized in the assessment of this stock.

According to the results obtained (**ALB-Figure 3**), the abundance and biomass of adult fish (ages 5+) appears to have declined from mid-1970's to late 1980's, followed by an slight increase 1988-1990. The abundance and biomass of ages 5+ do not show any clear trend since 1990. Abundance of recruits (age 1) and juveniles (ages 2-4) varied from year to year with, perhaps, some declining trend from 1975-1985. The levels since then have been variable. The Committee noted that global environmental factors might explain some proportion of the recruitment variability during the last two decades.

The fishing mortality rate of juveniles (ages 2-4) shows a slight increasing trend during the period analyzed. Fishing mortality rates on adults (ages 5+) increased to a peak in 1986, then declined. Recent rates appear to be relatively high, but not as high as the peak year. The fishing mortality rate on ages 8+ also appears to be increasing, however, the estimation of this is quite variable.

Equilibrium yield per recruit analyses made by the Committee indicate that the northern stock is not growth-over fished (**ALB-Figure 4**). Equilibrium yield analyses, made on the basis of an estimated relationship between stock size and recruitment, indicate that current fishing mortality may be about 25% higher than that which would generate MSY (an alternative assessment model indicated that current F may be as high as 140% of F_{MSY}). However, the Committee noted considerable uncertainties in these estimates of current F relative to F_{MSY}, owing to the difficulty of estimating how recruitment might decline below historical levels of stock biomass. Thus, the Committee concluded that the northern stock is probably fully-exploited, but the possibility that it is over-exploited should not be dismissed.

South Atlantic

The Committee analyzed the status of the southern stock using an ASPM, an ADAPT-tuned VPA, and a more general age-structured method (ASAP). All three methods obtained variable estimates of stock parameters based on the abundance indices and the catch at age information used.

Fishing mortality rate in relation to F_{MSY} showed an increasing trend from mid 1980's to mid 1990's (**ALB-Figure 5**). This ratio peaked in 1994 and decreased since then. This apparent decrease might be a consequence of the adoption of the 1994 ICCAT recommendation. The SSB showed a marked decreasing trend for the series analyzed, with the exception of the two latest years. However the wide confidence intervals of the point estimates do not allow a conclusive perception of the status of the stock.

The ASPM was used to produce base-case assessments of albacore abundance, using CPUE indices for the main fleets exploiting this stock. Sensitivity analyses were conducted to investigate the effect of standardization and choice of abundance indices, growth model and mortality parameters.

The base case results for 1998 were different from those for 1997, the main difference being that the 1998 results indicate a stock at biomass levels above those at MSY, whereas previous results indicated that the stock was below the biomass level at MSY. The point estimates from the base case results indicate that MSY is 28,400 MT, and the current (1998) replacement yield is 28,200 MT. The estimate of the ratio of current biomass to that at which MSY is achieved is 1.28 and the 1997 fishing mortality rate is 74% of that needed to achieve MSY. The variability associated with these point estimates is large, and the differences between previous ASPM estimates and the current one probably result from changes in the estimated trends of several indices of abundance since previous assessments and the revision of recent catch series. Therefore, there is uncertainty in the status of the stock relative to MSY.

Equilibrium yield per recruit and spawning potential ratio analysis made by the 1998 SCRS indicated that the southern stock appears to be not over-exploited (**ALB-Figure 6**). The current levels of F are estimated below F_{MSY} and $_{FAX}$. However,

considering the uncertainties of the analysis, and the results of previous assessments, the Committee concluded that southern stock is probably being exploited at a high level, close to fully-exploited.

ALB-4. OUTLOOK

North Atlantic

The northern albacore stock has mainly been exploited by surface fisheries since the longline fleets shifted their targeting to bigeye tuna. A recent development in this fishery has been the introduction of drift nets and pelagic trawls, which achieve higher catch rates than trolling gear. Furthermore, the baitboat fishery targeting adult albacore has been intensified in some years. VPA assessments indicate that the northern stock is at, or above, full exploitation. Attention therefore needs to be given to implementing effective controls to limit fishing effort at current levels.

South Atlantic

An equilibrium yield analysis indicated that the current level of exploitation appears as sustainable. The Committee did not detect the negative perspective showed in previous assessments. This change in perception can be partly explained by changes in the estimated trends of several indices of abundance during previous assessments. Due to the uncertainties of the analysis conducted this year no definitive conclusion could be reached on the current status and outlook of the southern albacore stock.

ALB-5. EFFECTS OF CURRENT REGULATIONS

North Atlantic and Mediterranean

No ICCAT regulations are currently in effect for the North Atlantic or Mediterranean stocks. It was noted that a European Union regulation restricting the length of driftnets used by EU members to 2.5km was introduced in 1992. Another EU regulation has been adopted in 1998 by which the maximum number of vessels using driftnets will be progressively limited until a total ban from 1st January 2002.

South Atlantic

In 1994 ICCAT recommended that catches of southern albacore by nations targeting this species be limited to not more than 90% of the average catches from 1989 to 1993. This recommendation became effective in October 1995. In 1996 ICCAT accepted a recommendation limiting annual catches of southern albacore for those countries fishing actively southern albacore to 22,000 mt, to be implemented by 1 January 1998.

Most of the countries involved in the fishery have implemented management regulations in response to the ICCAT resolution. As a result, current catches of 26.788 mt represent 90% of the average catch from the reference period (1989-1993).

ALB-6. MANAGEMENT RECOMMENDATIONS

North stock

The Committee concluded that the northern albacore stock appears to be at or above full exploitation. The Committee reiterates the previous recommendation that fishing mortality should not be increased above its current level.

South stock

According to the assessments conducted by the SCRS it is concluded that the albacore southern stock is probably being exploited at a high level, close to fully-exploited. This possibility, together with the results of previous assessments, lead the Committee to recommend that fishing mortality should not be increased above its current level until the Committee had greater certainty of a better status of the stock.

ICCAT adopted a recommendation in 1996 to limit the catches of those parties fishing actively for southern albacore to be set at 22,000 MT for 1998 and 1999, subject to revision at the end of 1998. Present estimates of biomass levels and exploitation patterns imply that this regulation currently in place to be considered as conservative. The Committee reiterated its 1996 recommendation of limiting the catches of southern albacore to not more than 90% of the average catches from 1989 to 1993. This catch level corresponds to current catches.

Mediterranean

There were no management recommendations for the Mediterranean stock.

ATLANTIC AND MEDITERRANEAN SUMMARY (MT)

	North Atlantic	*South Atlantic*	*Mediterranean*
Current (1997) Yield	27,526	26,788	unknown
Maximum Sustainable Yield	32,000 [30,600-33,400]	28,400 [15,800-51,100]	–
Current (1998) Replacement	--	28,200 [17,200-46,300]	--
Relative Biomass			
B_{1997}/B_{MSY}	0.47 [0.34-0.63]	1.28 [0.37-4.3]	--
$R_{1990-94}/R_{75-80}$	0.72	0.98	--
Relative Fishing Mortality			
F_{97}/F_{MSY}	1.39 [uncertain]	0.75 [uncertain]	--
$F_{97}/_{FAX}$	0.91	0.62	--
$F_{97}/F_{0.1}$	1.60	1.80	--
Management measures in effect	none	Limit catches to 90% of 1989-93 levels 22,000 MT[1]	none

[1] In effect since 1 January 1998 for countries/entities/fishing entities actively fishing (more than 1,000 MT) albacore in the South Atlantic.

EX-ALB-Tabl 1 Nominal catches (MT) of albacore by flag 1975-1997

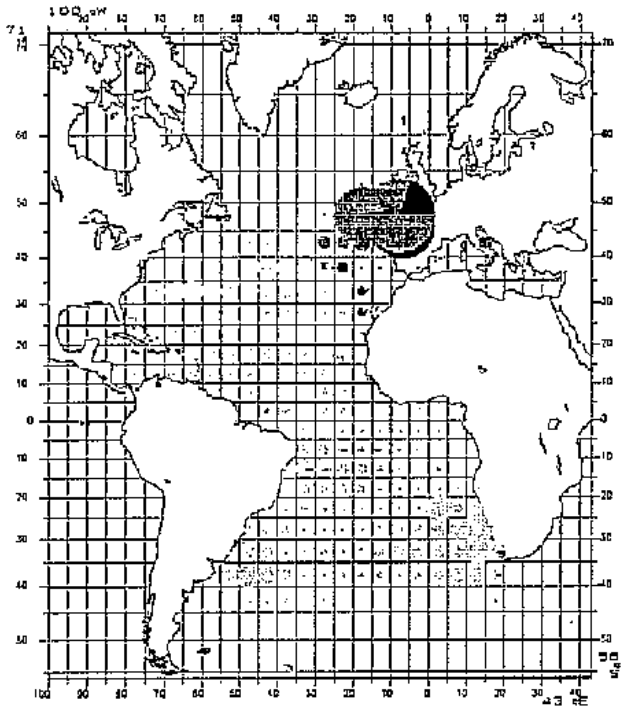
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
TOTAL	**59555**	**77346**	**76099**	**73806**	**74826**	**62134**	**59651**	**72942**	**67314**	**57661**	**75971**	**88465**	**82708**	**67864**	**63357**	**67199**	**56127**	**68526**	**72091**	**69940**	**66884**	**58684**	**56114**
N. ATL.	**41448**	**57326**	**53821**	**50047**	**51365**	**38704**	**34111**	**41998**	**50893**	**39454**	**40427**	**47465**	**38085**	**33694**	**32076**	**36587**	**27935**	**30743**	**38634**	**34898**	**38267**	**28706**	**27526**
LONGLINE	*12710*	*23006*	*20869*	*14157*	*12207*	*9447*	*9819*	*13190*	*16592*	*19510*	*17093*	*21222*	*7289*	*2993*	*2225*	*2683*	*5301*	*3125*	*7632*	*7164*	*4749*	*4549*	*3922*
SURFACE	*28738*	*34320*	*32952*	*35890*	*39158*	*29257*	*24292*	*28808*	*34301*	*19944*	*23334*	*26243*	*30796*	*30701*	*29851*	*33904*	*22634*	*27618*	*31002*	*27734*	*33518*	*24157*	*23604*
CANADA	0	0	0	0	0	0	0	0	0	0	0	1	21	47	22	6	5	1	9	32	12	24	31
CAP VERT	0	0	0	0	0	0	0	0	10	10	0	0	0	0	0	0	0	0	0	0	0	0	0
CHI.TAIPEI	8130	14837	13723	9324	6973	7090	6584	10500	14254	14923	14899	19646	6636	2117	1294	1651	4318	2209	6300	6409	3977	3905	3330
CUBA	87	85	83	89	0	31	48	82	38	69	20	31	15	4	0	2	0	0	0	0	0	0	0
EC-ESPAÑA	22161	26910	25155	25404	29630	25202	20819	25478	29557	15685	20672	24387	28206	27547	25424	25792	17230	18171	18371	16993	20178	16288	17264
EC-FRANCE	5666	6800	7733	10400	9320	3955	2929	2855	2391	2797	1860	1200	1921	2805	4050	3300	4123	6924	6293	5934	5304	4694	4618
EC-IRELAND	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	60	451	1946	2489	918	874	874
EC-PORTUG	911	610	62	85	149	79	442	321	1778	775	657	498	433	184	169	3185	709	1638	3385	974	6470	1634	395
EC-U K	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	59	499	613	196	49	33
GRENADA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	6
JAPAN	1331	1345	825	531	1219	1036	1740	781	1156	576	844	470	494	723	764	737	691	466	485	505	386	453	325
KOREA	2843	5379	5579	3048	2997	797	938	1326	478	967	390	373	18	16	53	34	1	0	8	0	0	2	1
MEXICO	0	0	0	0	0	2	0	0	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NEI-28	226	1227	557	768	425	193	177	494	357	2551	601	525	44	0	0	0	0	0	0	0	0	0	0
STA.LUCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0
TRINIDAD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	247	639	0	0	0	0
UK-BERMUD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
USA	0	0	2	1	0	19	52	24	18	25	17	162	271	114	259	389	484	377	452	671	545	472	339
USSR	0	0	0	0	59	0	51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VENEZUELA	93	133	102	397	593	300	331	137	823	1076	467	172	26	137	41	95	314	199	246	278	278	309	309
S. ATL.	**17607**	**19459**	**21665**	**23169**	**22628**	**22930**	**24040**	**29672**	**14918**	**14599**	**31097**	**37288**	**40630**	**30107**	**27211**	**28714**	**25814**	**35581**	**32598**	**34626**	**26987**	**27753**	**26788**
LONGLINE	*17456*	*19262*	*21194*	*22806*	*21843*	*20671*	*20426*	*25255*	*11941*	*9834*	*22672*	*29815*	*30964*	*21828*	*19407*	*21590*	*21697*	*26392*	*23515*	*24075*	*19516*	*20340*	*19256*
SURFACE & UNC	*151*	*197*	*471*	*363*	*785*	*2259*	*3614*	*4417*	*2977*	*4765*	*8425*	*7473*	*9666*	*8279*	*7804*	*7124*	*4117*	*9189*	*9083*	*10551*	*7471*	*7413*	*7532*
ARGENTINA	97	48	80	8	0	4	2	7	55	209	153	356	469	344	354	151	60	306	0	2	0	0	0
BRAZIL	170	296	688	494	515	476	276	800	731	732	382	520	395	421	435	514	1113	2710	3613	1227	923	858	652
BZ-SH-OB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
CHI-TAPEI	13384	14600	16092	20467	20340	18710	18187	22800	9502	7889	19643	27592	28790	20746	18386	21369	19883	23063	19400	22573	18351	18956	18165
CUBA	13	15	17	11	0	27	53	29	36	67	27	24	10	2	1	2	17	5	3	0	0	0	0
EC-ESPANA	0	0	0	0	0	0	889	106	295	307	155	200	807	185	0	0	389	1691	848	725	217	14	63
EC-PORTUG	0	0	0	0	0	0	0	0	0	741	1357	1029	899	1153	557	732	81	184	483	1185	655	494	256
FIS	0	47	112	40	172	457	912	947	372	7	18	35	100	0	0	0	50	449	564	129	82	190	38
HO-SH-OB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	7
JAPAN	306	73	107	135	105	333	558	569	188	224	623	739	357	405	450	587	654	583	467	651	389	449	430
KOREA	3230	3376	3829	1413	878	803	682	563	599	348	511	321	383	180	54	19	31	5	20	0	0	18	4
MAROC	0	0	0	2	0	0	0	113	0	0	0	0	41	0	0	0	0	0	0	0	0	0	0
NAMIBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	915	950	982	373

EX-ALB-Tabl 1 Nominal catches (MT) of albacore by flag 1975-1997

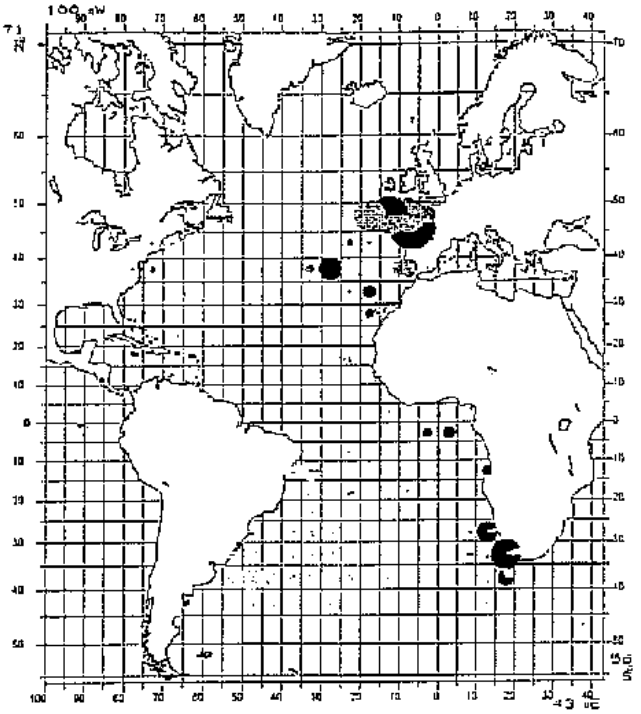
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
S HELENA	0	0	1	12	2	4	7	11	7	9	0	0	2	1	1	1	5	28	38	5	82	47	18
S.AFRICA	150	150	150	150	480	1850	2320	3180	2760	3540	6697	5930	7275	6570	6890	5280	3410	6360	6881	6931	5214	5634	6708
URUGUAY	0	0	0	0	0	0	23	235	373	526	1531	262	178	100	83	55	34	31	28	16	49	75	56
USA	1	0	0	9	11	0	2	102	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5
USSR	0	84	212	74	0	99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NEI_1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	87	166	253	267	71	35	13
NEI-28	256	770	377	354	125	167	129	210	0	0	0	280	924	0	0	0	0	0	0	0	0	0	0
MEDITERRANE	**500**	**561**	**613**	**590**	**833**	**500**	**1500**	**1272**	**1235**	**3414**	**4129**	**3712**	**3993**	**4063**	**4060**	**1896**	**2378**	**2202**	**856**	**242**	**1587**	**2173**	**1800**
LONGLINE	*0*	*41*	*130*	*150*	*0*	*0*	*0*	*0*	*0*	*226*	*375*	*150*	*161*	*168*	*165*	*624*	*523*	*442*	*0*	*3*	*87*	*366*	*348*
SURFACE & UNC	*500*	*520*	*483*	*440*	*833*	*500*	*1500*	*1272*	*1235*	*3188*	*3754*	*3562*	*3832*	*3895*	*3895*	*1272*	*1855*	*1760*	*856*	*239*	*1500*	*1807*	*1452*
EC-ESPAÑA	0	0	0	0	0	0	900	572	535	1331	531	0	0	3	0	84	547	227	290	218	475	404	380
EC-FRANCE	0	0	0	0	0	0	0	0	0	141	250	20	60	31	31	121	140	11	64	23	3	0	5
EC-GREECE	0	0	0	0	0	0	0	0	0	0	0	484	500	500	500	500	500	500	1	1	0	0	0
EC-ITALY	500	560	613	590	833	500	600	700	700	1942	3348	3208	3433	3529	3529	1191	1191	1464	1	0	1109	1769	1414
JAPAN	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MALTA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
YUGOSLAV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NEI_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	0	0	0	0
UNC AREA	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**268**	**194**	**318**	**0**	**0**	**0**	**10**	**2**	**0**	**0**	**3**	**174**	**43**	**52**	**0**
CHINA PR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	8	20	0
EC-ESPAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
SI LEONE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0
ST VINCE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
TRINIDAD	0	0	0	0	0	0	0	0	268	194	318	0	0	0	0	2	0	0	0	0	0	0	0
NEI_1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	160	35	32	0

The following data were received too late to be included in the stock assessment:1996: Brazil BB= 12; Brazil LL=777; Namibia BB=1516. 1997 :Ireland GILL= 1913MT; Namibia BB =1192 MT; Namibia LL=7MT.

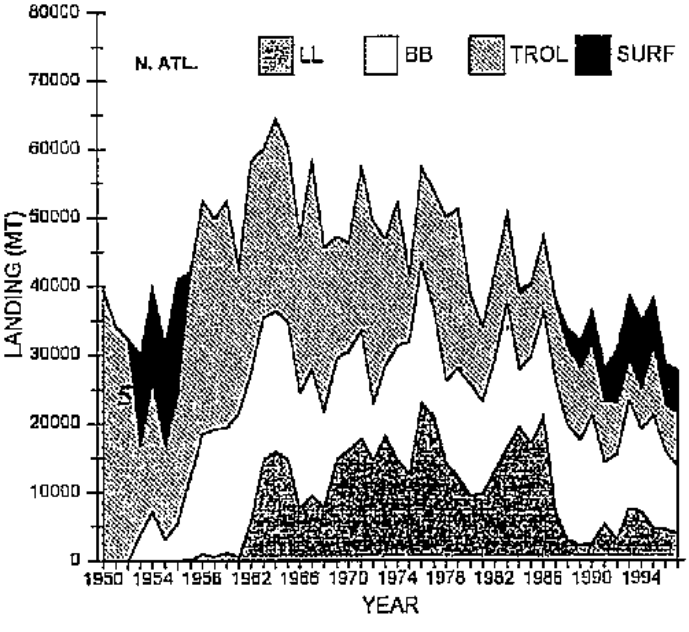
a)

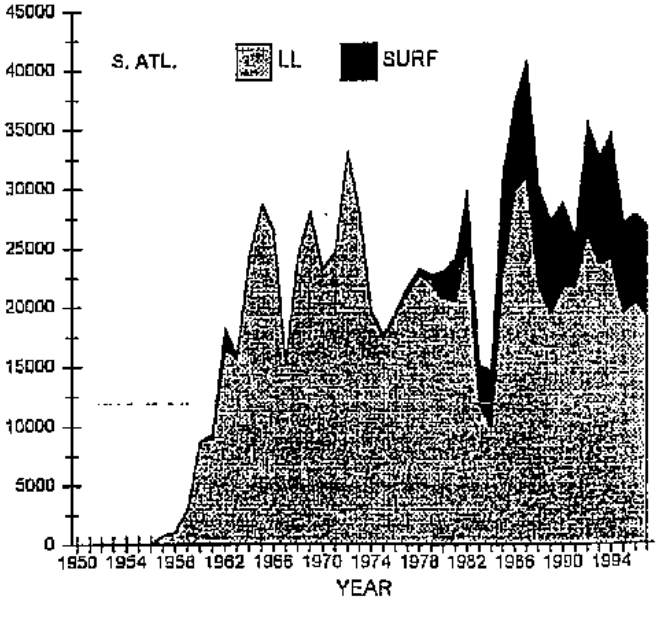


b)

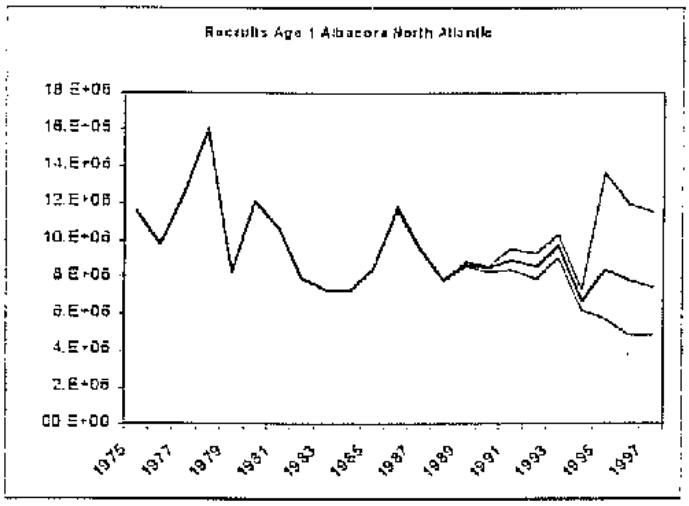


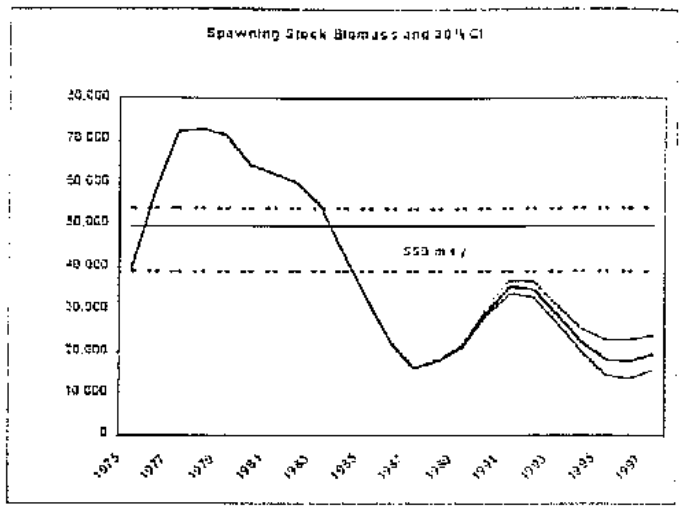
ALB-Fig. 1. Geographical distribution of annual albacore catches in a)1980-1989 and b) 1990-1996. (Very light portions represent longline and darker portions represent various surface gears).

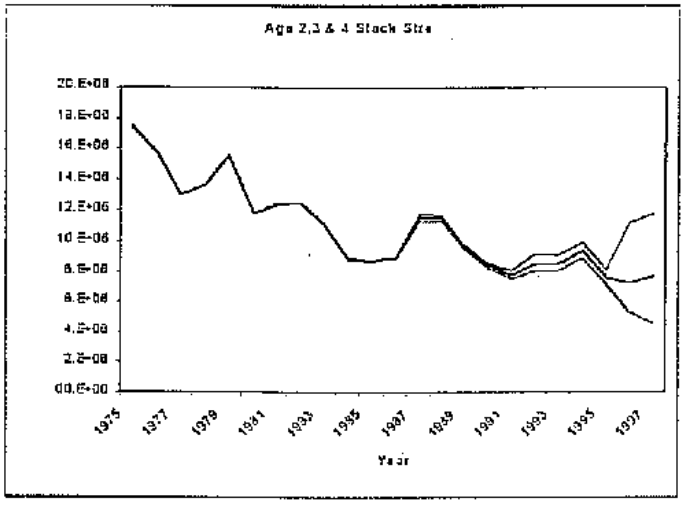


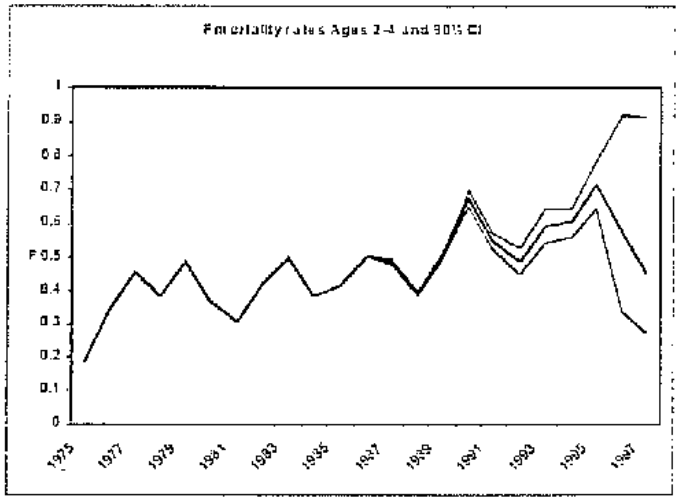


ALB-Fig. 2. Albacore landing (MT) in north and south Atlantic by major gear types, 1950-1997.

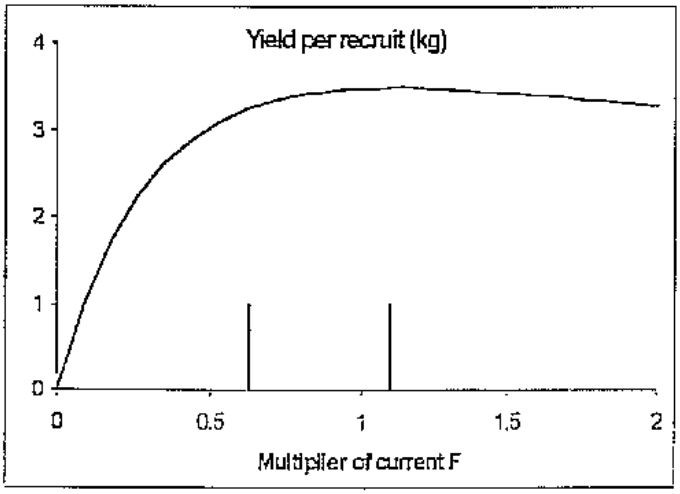


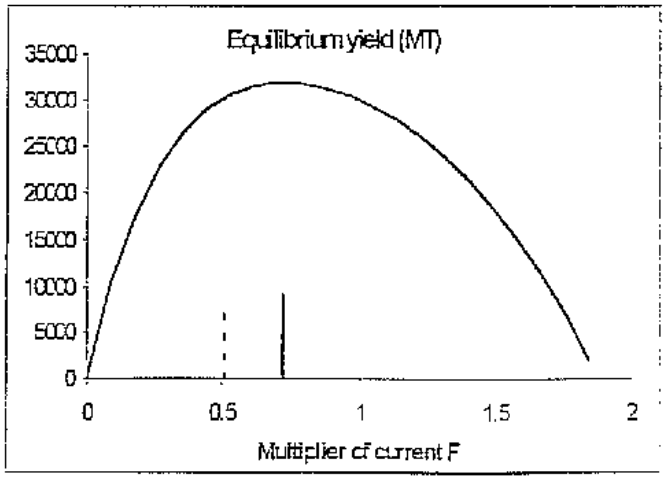




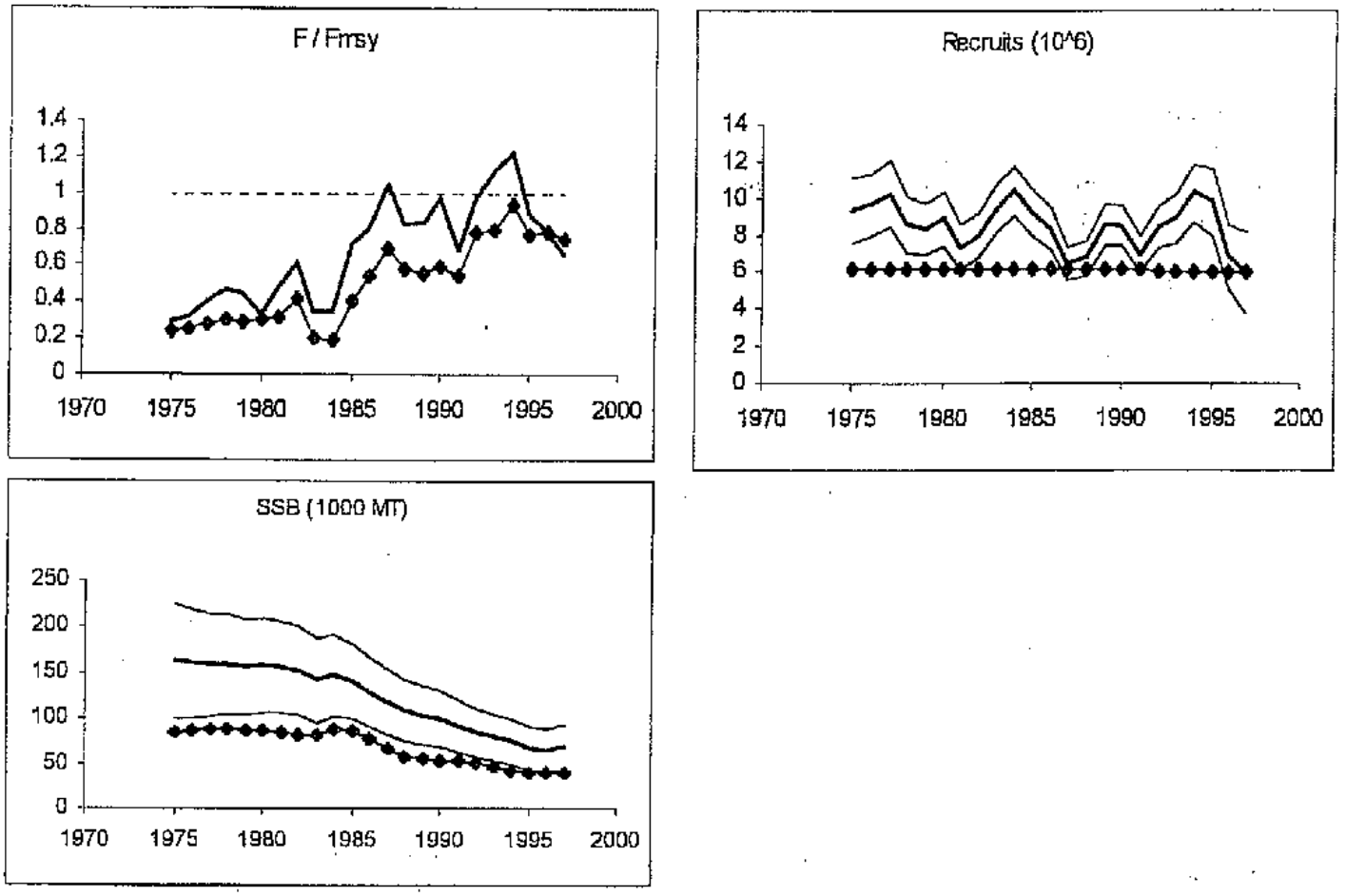


ALB-Fig. 3. Recruitment, spawning stock biomass (SSB_{MSY} also indicated), fishing mortality and numbers at ages 2 to 4 of North Atlantic albacore, as estimated by ADAPT VPA. (The confidence intervals are underestimated as F-ratio has been assumed constant.)

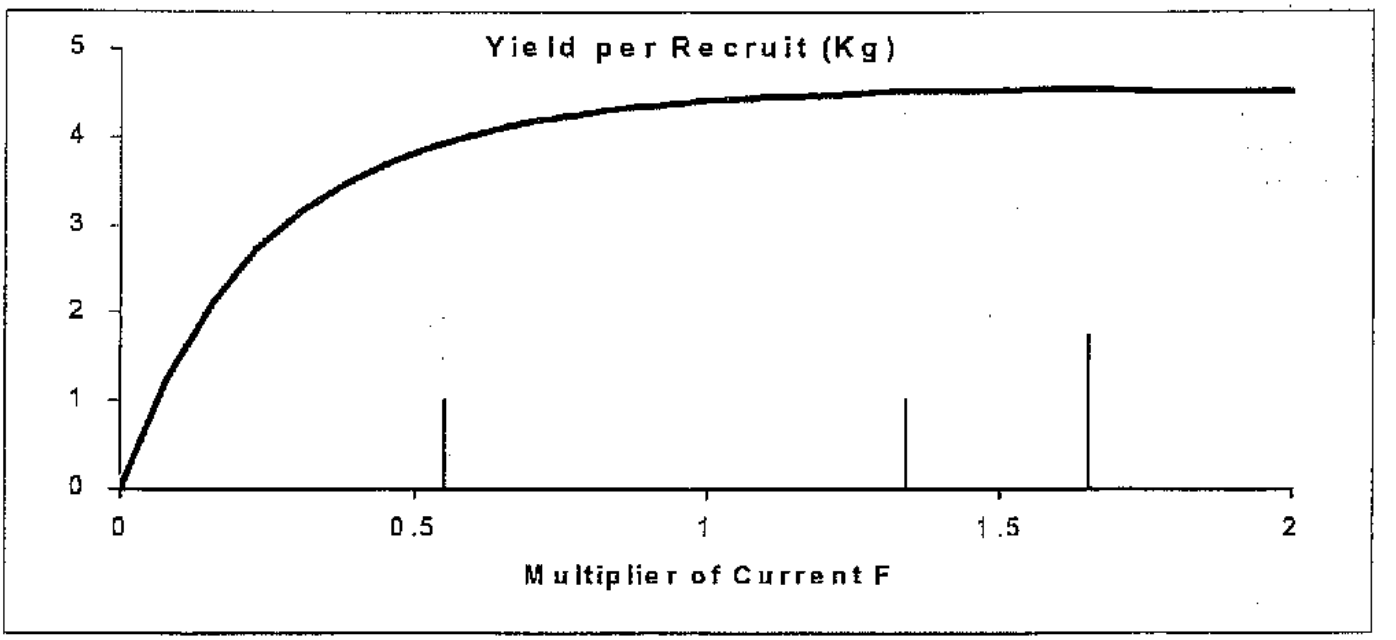




ALB-Fig. 4. Yield per recruit (a) and equilibrium yield (b) for north Atlantic albacore. $F_{0.1}$ and F_{max} as estimated by ADAPT are indicated. And F_{msy} as estimated by two methodologies (ADAPT and ASAP).



ALB-Fig. 5 F/F_{MSY}, recruitment and spawning stock biomass as estimated by ASPM (dots) and ASAP (bold line) for albacore southern stock. Confidence intervals (1 SD) re shown as dashed lines.



ALB-Fig. 6. **Yield per recruit analysis for south albacore stock. $F_{0.1}$ and F_{MSY} as estimated by two age-structured methodologies (ASPM and ASAP) are shown.**

BFT - B L U E F I N T U N A

The SCRS conducts Atlantic bluefin tuna stock assessments based on the assumption of two distinct stocks, west and east Atlantic (including the Mediterranean Sea), although some mixing occurs between the two stocks (**BFT-Figure 1**). Recent tagging information suggests that migratory behavior may be complex. Even minor mixing could, in principle, have a marked effect on stock assessments based on two distinct stock assumptions, due to the difference in population size between the two stocks. Therefore, the SCRS has investigated mixing assuming a variety of migratory behaviors, using sensitivity analyses. Results of these investigations are either more optimistic and more pessimistic, depending upon the model forms assumed. Additionally, one cannot distinguish on the basis of data which model forms are more likely. Thus, mixing models and the available data are not yet considered sufficient to provide reliable prediction. Nevertheless, the Committee believes that assessments assuming no mixing should be reasonably robust, if adequate management approaches are applied to both the eastern and western Atlantic management units.

The reported total catch of Atlantic bluefin in 1996 reached an historical high (revised to 48,514 MT from the previously estimated 42,964 MT, based on revisions to reported catches and estimates of non-reported catches (**BFT-Table 1, BFT-Figure 2**). The 1997 reported catch (43,466 MT) is slightly lower than the estimated 1996 catch, but is still the fourth highest on record. The dramatic increase in total Atlantic bluefin catches from 1994 to 1997 was due to increases in the catch from the East Atlantic and Mediterranean, as the west Atlantic catch has been limited, by quota, to a low level (2,000-2,700 MT) since 1982. The Committee notes that national reviews of catch statistics in the Mediterranean resulted in reported landings that were substantially larger for the period 1991-1995 than were used in the previous assessment.

BFT-1. Biology

Present fisheries for Atlantic bluefin tuna are distributed from the Gulf of Mexico to Newfoundland in the west Atlantic, from roughly the Canary Islands to south of Iceland in the east Atlantic, and throughout the Mediterranean Sea (**BFT-Figure 1**). In 1982, the Commission established a line for separating the east and west Atlantic management units (BFT-Figure 1). A 1994 review of ICCAT tagging data, and more recently the results of satellite tagging studies, have showed that a small number of fished tagged in the east have been recaptured in the west and vice versa.

Atlantic bluefin tuna can grow to over 300 cm and reach 650 kg. The oldest age considered reliable is 20 years, based on an estimated age at tagging of 2 years and about 18 years at liberty, although it is believed that bluefin tuna may live to older ages. Bluefin tuna in the western Atlantic generally reach a larger maximum size, and mature at an older age compared to bluefin caught in the eastern Atlantic. Bluefin in the west are assumed to first successfully spawn at age 8 compared to ages 4 to 5 in the east.

In the west Atlantic, bluefin tuna are thought to spawn from mid-April into June in the Gulf of Mexico and in the Florida Straits. Results of satellite tagging studies have shown bluefin of spawning size which were tagged in the west were present in the central Atlantic during the presumed spawning period, though this should not be considered as conclusive evidence of spawning. Juveniles are thought to occur in the summer over the continental shelf, primarily from about 34ºN to 41ºW and offshore of that area in the winter. In the east Atlantic, bluefin tuna generally spawn from late May to July according to spawning area, primarily in the Mediterranean, with highest concentrations around the Balearic Islands, Tyrrhenian Sea, and central Mediterranean where the sea-surface temperature of the water is about 24ºC. Distribution expands with age; large bluefin are adapted for migration to colder waters. Bluefin tuna are opportunistic feeders, with fish and squid common in their diet.

BLUEFIN TUNA - WEST

BFTW-2. Description of fisheries

The Japanese longline fishery catches in the west Atlantic decreased slightly in 1997 to 329 MT. The Canadian reported landings also decreased in 1997 to 504 MT exclusive of discards. Reported U.S. fisheries catches in 1997 increased slightly to 1,317 MT exclusive of discards. Bermuda reported landings of 2 MT. All nations were within their 1997 quotas. The winter-spring fishery that developed off Cape Hatteras, North Carolina, in 1994 to 1997showed high catch rates relative to the summer-autumn catch rates in the northeastern U.S. rod and reel fishery. Most fish caught in this fishery were tagged and released and in 1996, and some fish were tagged with archival and/or pop-up satellite tags. The Hatteras fishery failed to fully develop in 1998.

The 1997 reported catches for the west Atlantic were 2211 MT. From 1992 through 1997, west Atlantic catches (including reported discards) averaged about 2,200 MT, compared to about 2,500 to 3,000 in the previous five years (1987-1991) **(BFT-Table 1; BFT-Figure 2)**.

BFTW-3. State of stocks

The most recent assessment of western Atlantic bluefin tuna was carried out at the Bluefin Stock Assessment Session, September 13-24 in Genoa, Italy (SCRS/98/22). Several forms of population analysis were used to examine the status of the resource including virtual population analyses (VPA) using a variety of input model forms, and secondarily an age-structured production model (ASPM) with the goal of estimating current stock levels, MSY and spawning stock biomass relative to that which would produce MSY.

Considerable analyses and discussion focused on methods to standardize the basic input abundance indices and to weight these inputs appropriately in the population models. After considerable debate it was felt that given the present level of knowledge, that the best way to characterize the management advice would be to weight all abundance indices equally. By doing this, the Committee is indicating that it cannot say if any one individual index is more likely to measure relative abundance than any other in the analysis. Results of the analyses (VPA's and ASPM's) gave similar relative abundance trends (see **BFT-Figure 3**).

In terms of the historical perspective, the results of this assessment are similar to previous assessments **(BFT-Figure 4)**. Recruitment was generally higher from 1970 to 1976 than it has been since. A trend in recruitment since 1977 cannot be distinguished. The assessment shows the spawning biomass (age 8+) estimated for 1997 to be 14%-17% relative to 1975 level. The abundance of ages 8+ declined steadily until 1992 with a subsequent slight increase until 1995 and 1996. Correspondingly, the fishing mortality rate on large fish increased steadily in the 1970s until the implementation of regulations in 1982 (**Figure 5)**, at which time the fishing mortality rate was reduced considerably. However, fishing mortality began increasing again in the 1980s until it again peaked in 1991. Fishing mortality rates for age 1 remained at a low level from the mid-1980s. Note that estimated abundance and fishing mortality rates in recent years (especially of younger ages) should be judged with caution since such VPA estimates are generally imprecise.

As noted above, the relative weights that are given to the individual abundance indices are important. Alternative forms of weighting produced both more pessimistic and more optimistic results than those indicated in **BFT-Figure 3**. Although these produced similar historical abundance patterns, 1998 absolute abundance levels are important in projections.

BFTW-4. Outlook

Projections were developed using VPA outputs and alternative projection methodologies. Necessarily, projections require a stock-recruitment function form from which predictions of recruitment are made based upon the relationship of spawning stock size to recruitment. In the case of west Atlantic bluefin tuna, two stock-recruitment options were tested. One was based upon a Beverton-Holt[1] stock-recruitment function which indicates higher chances of good recruitment as

1 This model assumes that recruitment will increase with increases in spawning stock biomass.

spawning biomass increased (indeed, one of the reasons to rebuild the spawning stock is to increase the likelihood of better recruitment in the future). An alternative 2-line[2] method was tested in which future recruitment was specified to remain near the levels observed since the mid-1970s. The latter method was similar to that used in the 1996 assessment. When that method was used, projections for the west Atlantic indicate that 2500 MT is sustainable over the next 20 years and that spawning stock will show a net increase **(BFT-Figures 6, 7)**.

Alternatively, projections using a Beverton-Holt model for the west Atlantic (**BFT-Figures 6, 7)** indicate that a catch of 2500 MT cannot be sustained. Projections with that methodology indicate that 2000 MT is sustainable, with the spawning stock showing a net increase over a period of about 20 years to a level about 20% higher than in 1997. In terms of recovering to MSY level within 20 years (i.e. by 2017), median trajectories indicated a need for a catch reduction to between 2000 and 2500 MT for the 2-line stock-recruitment model and to about 0 MT for the Beverton Holt stock-recruitment model.

In both cases transient effects are evident, i.e. biomass increases over the next few years before establishing the more regular long-term trajectory.

When making decisions on these projections, the Commission should note that limited available data make assessments inherently uncertain. The assessment here is no exception. Many additional sources of uncertainty have been considered , including the effect of mixing with the eastern stock of fish (see also the Detailed Report). Another important uncertainty was the choice of alternative weightings of the input abundance index data. Various weighting criteria were favored for scientific reasons by individual members of the Committee. These weightings produced projections that were both more optimistic and more pessimistic than those in **BFT-Figures 6,7**.

BFTW-5. Effects of current regulations

A regulatory recommendation stating that Contracting parties should limit the fishing mortality to recent levels came into force in 1975. Catch reductions have not been sufficient to reduce fishing mortality rates to comply with this regulation **(BFT-Figure 5)**.

A regulatory regime has been adopted for West Atlantic bluefin catches. In general, catch limits have been adhered to. The 1997 overall and country-specific catch levels were well within the quota.

There is a prohibition on taking and landing bluefin less than 30 kg (or 115 cm), with an 8 % tolerance by weight on a national basis. Since 1992, the overall percentage of fish less than 115 cm is less than 8 %, though the USA exceeded the tolerance in both 1993 and 1997 (10%; 1997 data are provisional). By default, the 1975 minimum size limit of 6.4 kg with a 15 % tolerance is adhered to in the West.

BFTW-6. Management recommendations

The most recent assessment of western bluefin showed that the 1997 age 8 and older mid-year biomass was about 14%-17% of the corresponding estimate for 1975. Projections based upon the Beverton-Holt stock recruitment relationship indicate that a catch of 2000 MT is sustainable; also there is more than a 50% chance than an annual catch of 2500 MT cannot be sustained, and there is about a 10% probability of a large reduction by 2005 (assuming it is possible to exert a high enough fishing mortality rate to maintain a constant catch of 2500 MT as the stock declines). On the other hand, if a 2-line stock recruitment relationship is assumed, a catch of 2500 MT is sustainable.

In 1997, the Commission requested development of recovery options aimed at achieving spawning biomass levels which would support MSY within various time periods. For a 20-year period, in terms of Beverton-Holt stock recruitment relationship, this level is likely difficult for the stock to achieve even in the absence of any catches. A 2000 MT constant catch would allow for 1.5 fold recovery in 20 years to about 10% of the level which could support MSYs of about 7,700 MT/year under this assumption. However, for the 2-line relationship, the spawning biomass would double over the next 20 years, reaching a level of about 93% of the biomass which could support MSYs of about 2800 MT/year under this assumption.

2 This model assumes that recruitment will not increase with increases in spawning stock biomass.

The Committee draws attention to the fact that if the Commission is satisfied with a chance of about 50% of having a net increase in 20 years of 20% in spawning stock size, then in terms of the projections based upon the Beverton-Holt stock recruitment relationship, the current catch level would need to be reduced to about 2000 MT. If the Commission wants to be reasonably sure (i.e. have 90% probability) of at least maintaining the status quo, the catch should be reduced to approximately 1500 MT. But if the goal is to move more rapidly (i.e. within 20 years) to levels that produce MSY, the current catches need to be reduced substantially. In contrast, in terms of the 2-line stock recruitment relationship, if the Commission wants to be reasonably sure (i.e. have 90% probability) of at least maintaining the status quo, the catch should be reduced to approximately 2000 MT. In terms of a goal to move with about 50% chance of reaching biomass levels supporting MSY within 20 years, current catches need not be reduced under the 2-line stock-recruitment relationship.

When making decisions based on these projections, the Commission should be aware that there are many sources of uncertainty (which are discussed in the Detailed Report). In particular, (1) the effect of mixing between the stocks cannot be reliably predicted given the available data; (2) assumptions that have to be made about the relationship between stock and recruitment in order to make long-term projections relative to MSY; and (3) the relative weight to be given the input catch rate information are particularly uncertain. Thus, future resource levels could be either higher or lowers than those indicated in the projections. Inherently, the level of constant catch that is sustainable over the long term (more than 20 years) cannot be determined well with the data available to the Committee. Thus the Committee cannot be positive that current (1997) catches are or are not sustainable. If existing levels of catch are maintained, it is unlikely that the status of the stock will change measurably in the short term.

It should also be noted that the condition of the east Atlantic stock and fishery could adversely affect recovery in the west Atlantic because of mixing between two stocks.

BFT - BLUEFIN TUNA -- EAST

BFTE-2. Description of the fisheries

The east Atlantic bluefin fisheries (including the Mediterranean) are characterized by a variety of vessel types and fishing gears with landing sites located in many countries. Therefore, the landing statistics are difficult to obtain, particularly for the east Atlantic and even more so for the Mediterranean. Historical statistics show there were important catches since more than ten centuries ago, with catches of more than 10,000 MT in the past and an average of 30,000 MT in the 1950-65 period. Certain fisheries, such as the traps, go back to ancient times. Other fisheries, such as the Mediterranean purse seine fishery, reached full development in the mid-1970s. Based on estimates of 1997 catches, the most important catches, were from: baitboat, longline, and traps for the east Atlantic; and from purse seine and longline for the Mediterranean ; the purse seine fleet accounts for three-quarters of the Mediterranean catch.

The total catch taken from the preliminary landings for the east Atlantic and the Mediterranean in 1997 amounted to 41,255 MT, which is slightly less than 1996, but the fourth highest catch on record (1996: 46,033, 1995: 44,050, 1994: 42,477; **BFT-Table** 1 and **BFT-Figure 1).**

In the Mediterranean, the total reported catch amounted to 28,121 MT in 1997, as compared to 34,481 MT in 1996, which constituted 18% of reduction since 1994 catch level. It should be noted that both nation-specific reviews of historical catches and critical reviews of unreported catches have reduced the catches previously attributed to the “nowhere else included” (NEI) category (NEI in **BFT-Table 1**). In recent years, the purse seine catches of EU countries in the Mediterranean increased sharply to a peak of 18182 MT in 1994. In 1997, among EU Mediterranean purse seine catches (15941 MT) French catch consisted of 48.1%, followed by Italian catches of 44.3% and Spanish catch of 6.8%. Meteorological conditions, changes in fishing power, and in stock abundance may be determining factors in the success or failure of the fishing season conducted around the Balearic Islands on large fish. Longline activity seems to be continuing, in terms of the number of large longliners with or without flags, and even during the Mediterranean closed seasons, as well as in the development of small vessels (see Report of the Joint GFCM/ICCAT Report, 1998). The high demand for the Japanese market is without a doubt the reason for this development.

East Atlantic catches (excluding the Mediterranean) show an increasing trend in the past three years, with a 30 year historical high in 1997 of 13,134 MT. Catches by the EC fleet (mostly baitboats) in the Bay of Biscay area, in the 1990s have been among the highest reported for this fishery. The large catches of small fish aged 1 to 3 (5 to 25 kg) in the Bay of Biscay by this fleet in 1996 was in part due to a transfer of activity of a portion of albacore fleet redirecting effort towards

bluefin tuna during the months of June and July and might also relate to a relatively strong 1994 year-class observed in the Mediterranean. Since 1994, the Japanese longliners continue to exploit a new fishing zone in the north Atlantic around 60ºN and 20ºW, in addition to the traditional sectors. The east Atlantic (not including Mediterranean) trap catches more than doubled in 1997 from 1996 and recorded the highest in recent years, since high levels used to be reported in 1950's and 1960's.

BFTE-3 State of the stocks

The Committee notes that national reviews of catch statistics in the Mediterranean resulted in reported landings that were substantially larger for the period 1991-1995 than were used in the previous assessment.

An ADAPT VPA assessment was developed with appropriate specifications (given in the Report of the Bluefin Stock Assessment Session, SCRS/98/22). Results of this assessment differ somewhat from the previous assessment, due, primarily to an abrupt increase of the catches of the spawning aged fish since 1994 and also to the revision of the catch statistics by various countries mentioned above.

After discussion, it was decided to use the natural mortality estimates made for southern bluefin tuna (a similar species) in which natural mortality is age specific as this is thought to be more biologically correct.

The assessment indicates a strong decline in number and biomass of older fish (spawning stock) since 1993. This corresponds with an the increase in fishing mortality rates **(BFT-Figure 8**). The decline in spawning stock (biomass and number of fish) beginning in 1993 followed a period of relatively stable abundance in the 1980's. There appears to have been a general trend of increasing recruitment in the early 1980's followed by a period without trend **(BFT-Figure 8)**. Fishing mortality rates for all ages are estimated to have increased during the 1970-1997 period, particularly in the most recent years for the older age groups **(BFT- Figure 8)**. Estimates in recent years should be judged with caution since such VPA estimates are generally imprecise.

The Committee recognizes that many of the inputs to the assessment are uncertain. These include doubts about the historical catches, the absences of size composition for many fisheries, the amount of mixing with the west stock, and the unknown accuracy of abundance indices available for model specifications. These uncertainties make it easier to interpret trends in relative abundance rather than absolute levels of the stock.

BFTE-4 Outlook

Projections were made assuming that future recruitment would vary around recent levels. Since the Committee was unable to identify adequate assumptions about the relationship between stock size and recruitment, projected recruitments were obtained by sampling from the bootstrap estimates of recruitment from the period 1980 to 1997. It should be noted that incomplete catch data from the period prior to 1950 might indicate that there have been periods in the past with very different levels of recruitment from that at present. Therefore, one should be cautious when making long term projections, especially if spawning stock biomass falls below historically observed levels. For these reasons the Committee focused the projections on the short term trends in abundance and mortality rate in relation to the Commissions recommendation for catch reduction.

Catch projections **(BFT-Figure 9)** were made for the east Atlantic using approximately 43,000 MT (the 1994-1997 average), 33,000 MT (75% of the 1994-1997 average) and 25000 MT (as recommended in 1996). The projections indicate that the current catch level is not sustainable, and a reduction to 75% of the 1994 level is not sufficient to halt a continuing decline in spawning stock biomass. A catch of 25000 mt halts the decline in spawning stock biomass in the medium term, but spawning stock biomass is not expected to return to historic levels. If spawning stock biomass falls below the 1997 level, the validity of the projections might be questioned since they used high recent estimates of recruitment which might no longer be appropriate. If future recruitment were to be reduced and fishing mortality were to remain at current levels then declines in spawning stock biomass would be expected.

When making decisions on these projections, the Commission should be aware that assessments (including those reported here) are inherently uncertain. Many sources of uncertainty are considered in the Detailed Report.

The Committee continues to be concerned about the intensity of fishing pressure on small fish. This contributes

substantially to growth over-fishing, and it seriously reduces the long term potential yield from the resource. Additionally, recent abrupt increase of catches of large fish is of grave concern.

BFTE-5. Effect of current regulations

A regulatory recommendation stating that Contracting parties should limit the fishing mortality to recent levels came into force in 1975 for one year and was extended indefinitely in 1982 for the East Atlantic. Fishing mortality rates have exceeded that of 1974 levels in most years **(BFT-Figure 8)**.

The Commission recommended in 1994 that bluefin tuna catches in the East Atlantic Ocean and Mediterranean Sea should be reduced from the 1993 or 1994 levels (whichever is higher) by 25% starting in 1996 and until 1998. While this regulation can not be evaluated finally until the 1998 catches have been reported, overall, the 1996 and 1997 catches are 8.4 % and 2.9 % *higher*, respectively, than 1994 levels (which were 27.3 % higher than 1993 levels). Further, taking into account the exceptional level of catches taken by French fisheries in 1994 (about 12,000 MT), supplemental quotas were applied to France for 1996-1998. French catches in 1996 and 1997 have been about 50 % higher than these quotas (though the 1997 catch is 30% lower than the 1994 levels). An indirect positive effect of the catch reductions regulation has been to inspire countries to critically review their catch statistics from the early 1990s to the present (SCRS/98/8), and to implement improved statistical reporting systems. In 1997, NEI classified catches were much reduced, due to country-specific reviews of historical catches and statistical systems.

In 1975, a minimum size of 6.4 kg with a 15 % tolerance, in number of fish, was recommended for the entire Atlantic (including the Mediterranean). The 6.4 kg size regulation has been poorly enforced for the East Atlantic and Mediterranean fisheries (44 % and 30 % average for 1985 to 1995). In the East Atlantic, even though the percentage is variable (between 16 and 75 %), recent percentages in 1995 to 1997 have been 40 to 60%. Overall, in the Mediterranean, the percentage has undergone strong variations (between 13 and 60%), though 1996 and 1997 have been within the tolerance level, indicating a positive effect of recent regulations (area closures), though individual countries are still over the tolerance. In 1997, there was a complete prohibition of retaining bluefin < 1.8 kg. It is known that there are catches of age 0 fish, but they are clearly under-reported.

There is a regulation which entered into force on 1 June 1994 which prohibits large pelagic longliners of more than 24 m in length from fishing in the Mediterranean during the months of June and July. The objective of this regulation is to limit fishing mortality. The SCRS noted that there have been many reported activities by many longliners flying flags of convenience or without any country identification fished in Mediterranean waters in 1995, 1996 and 1997 during the closure period (the number of these boats may have declined in 1997 according to the report of Joint Meeting of GFCM/ICCAT, 1998).

There is a prohibition of purse seine fishing in the Mediterranean in August, and the use of airplanes or helicopters in June (entered into force on 4 August 1997). Most purse-seine fleets have observed this measure in 1997 and 1998. However, if the goal of this regulation is to protect under-sized juveniles, the regulation period may not be appropriate for certain fisheries (e.g., Croatia, EC-France). The dates chosen for this measure adopted in 1996 were not based on solid scientific information, but the SCRS has no scientific basis to propose alternate closure dates. A slight change in the dates would probably not affect the effectiveness of the closure.

BFTE-6. Management recommendations

The Committee expressed concern about the status of east Atlantic bluefin tuna resources in the light of assessment results and the historically high catches made in 1996-1997 (in excess of 40,000 MT).

The projections indicate that future catch levels of 33,000 MT, or more, are not sustainable **(BFT- Figure 9)**. Catches of 25,000 MT or less would halt the decline of biomass. It should be noted that even these results may be optimistic since they assume that future recruitment continues at the average level observed since 1981.

When making decisions based on these projections, the Commission should be aware that there are many sources of uncertainty (which are discussed in Detailed Report).

Given the large increase in catches since, combined with the results of the present analyses, the Committee considers

that a 35% reduction in catches from the 1993 to 1994 levels (i.e., to about 25,000 MT) would be necessary to prevent further decline of stock.

The Committee is concerned about the high catch of small individuals and recommended that every effort be made so that the current measures on the size limit of 6.4 kg be adhered to. The Committee reiterated that effective measures be taken to avoid catches of age 0 fish (<1.8 kg), and not allow any tolerance with respect to the percentage (in number) of age 0 fish in the landings.

It should also be noted that the condition of the east Atlantic stock and fishery could adversely affect recovery in the west Atlantic because of mixing between two stocks.

ATLANTIC BLUEFIN TUNA SUMMARY

	West Atlantic	*East Atlantic*
Current (1997) Catch	2,211MT (discards included)	41,255 MT
Current (1997) Sustainable Yield	about 2000 -2500 MT[1]	about 25,000 MT
Maximum Sustainable Yield (MSY)	2,800-7,700 MT[1]	not estimated
Relative Spawning Stock Biomass	$(SSB_{1997}/SSB_{1975})^2$ = 0-14-0.17	(SSB_{1997}/SSB_{1970}) = 0.19
Relative Number	$(N_{1998}/N_{1975})^2$ = 0.17-0.20 (ages 8+)	N_{1997}/N_{1970} = 0.65 (ages 8+)
Management Measures in Effect	--No landing of fish <6.4 kg, with a 15% tolerance. --Fishing mortality not to exceed circa 1975 level. --Limit catches <115 cm (30 kg) to no more than 8% by weight. --Total catch limit of 1,995 MT in 1994; 2,200 MT in 1995, 2,202 MT in 1996; and 2,354 in 1997 & 1998.	--No landing of fish <6.4 kg, with a 15% tolerance in #. --Fishing mortality not to exceed circa 1975 level. --No longlining in Med. in June-July by vessels>24 m. –No purse seining in August in Med. –No use of spotter helicopter or plane in Med., in June. --A progressive 25% reduction over 3 years starting in 1996 on 1993 or 1994 catches. --No landing, retaining aboard or selling of fish <1.8 kg,

1 For the most recent age-specific selectivity pattern in the fishery , assuming either a 2-line or a Beverton-Holt stock-recruitment relationship.

2 For VPA results fitting a stock-recruitment relationship for the period 1976-1990 and 1970-1994, respectively.

EX-BFT-Table 1. Landings of Atlantic and Mediterranean bluefin by flag 1975-1997

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
CATCH	26249	28168	25468	20408	18478	19904	19616	23820	24202	26717	26836	22828	20669	27278	24869	25974	28851	30779	35674	45504	46594	48514	43466
LANDINGS	26249	28168	25468	20408	18478	19904	19616	23820	24202	26717	26836	22314	20477	27063	24607	25841	28652	30735	35643	45428	46453	48437	43409
DISCARDS	0	0	0	0	0	0	0	0	0	0	0	514	192	215	262	133	199	44	31	76	141	77	57
WEST ATLANTIC	5032	5883	6694	5763	6255	5801	5771	1445	2542	2292	2685	1808	2400	2796	2605	2665	2793	2070	2280	2029	2285	2324	2154
-PURSE SEINE	2320	1582	1502	1230	1381	758	910	232	384	401	377	360	367	383	385	384	237	300	295	301	249	245	251
-ROD & REEL + SPORT	328	590	630	475	499	535	523	308	476	401	466	328	539	439	557	780	728	354	628	533	1039	995	1145
-LONGLINE	1522	3066	3752	3217	3691	3972	3879	363	829	835	1245	764	1134	1373	678	739	895	674	696	538	466	528	387
-OTHER & UNCL GEARS	862	645	810	841	684	536	459	542	853	655	597	356	360	601	985	762	933	742	661	657	531	556	371
ARGENTIN	0	0	0	0	0	0	0	0	0	0	6	0	2	0	1	2	0	0	0	0	0	0	0
BRASIL	0	0	0	14	10	2	3	1	1	++	1	0	2	++	2	1	++	0	0	++	++	0	0
CANADA	641	846	972	670	245	324	425	291	433	264	142	73	83	393	619	438	485	443	459	392	576	597	503
CHINESE-TAIPEI	1	0	1	1	49	15	7	11	2	3	3	3	0	0	0	0	0	0	0	0	0	0	0
CUBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EC-IRELAND	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
JAPAN	1513	2902	3658	3144	3621	3936	3771	292	711	696	1092	584	960	1109	468	550	688	512	581	427	387	436	329
KOREA	8	7	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MEXICO	24	37	14	28	22	10	20	14	0	0	0	0	0	0	0	0	0	0	0	4	0	0	2
NORWAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
POLAND	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
STLUCIA	**	**	**	**	**	0	0	0	0	0	0	0	1	3	2	14	14	14	2	43	9	3	0
TRINIDAD	0	0	0	0	0	0	0	0	0	0	1	0	0	++	++	0	0	0	0	0	0	0	0
UK-BERMUDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
URUGUAY	0	0	0	0	0	0	1	3	0	9	16	6	0	2	0	0	1	++	1	++	2	0	0
USA	2845	1931	1956	1848	2297	1505	1530	807	1394	1320	1424	1142	1352	1289	1483	1636	1582	1084	1237	1163	1311	1285	1317
NEI_1	0	0	0	0	0	0	0	14	1	0	0	0	0	0	30	24	23	17	0	0	0	0	0
NEI-28	0	157	92	58	10	9	14	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NEI-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
DISCARDS	0	0	0	0	0	0	0	0	0	0	0	514	192	215	262	133	199	44	31	76	141	77	57
CANADA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	6
USA	0	0	0	0	0	0	0	0	0	0	0	514	192	215	248	133	199	44	31	76	141	77	51

EX-BFT-Table 1. Landings of Atlantic and Mediterranean bluefin by flag 1975-1997

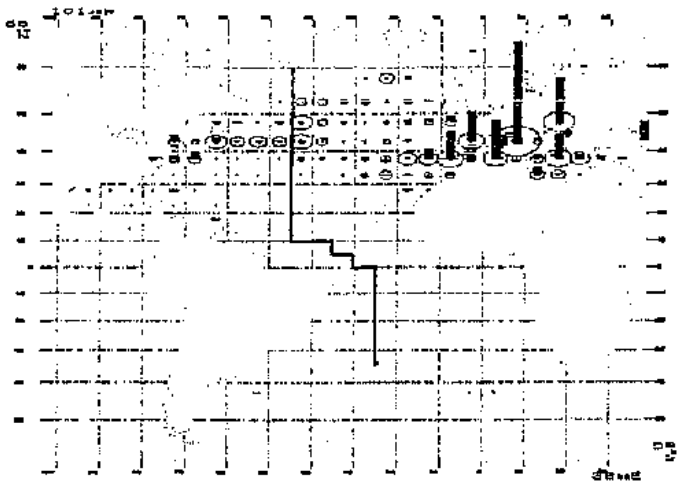
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
EAST ATL. + MEDI.	21217	22285	18774	14645	12223	14103	13845	22375	21660	24425	24151	20506	18077	24267	22002	23176	25859	28665	33363	43315	44050	46033	41255
-BAITBOAT	2991	1803	2881	3904	2128	1874	1553	957	3032	2948	2366	2253	2128	2682	2683	1993	1648	1466	4000	2285	3093	5357	3538
-PURSE SEINE	11677	14830	10989	7556	6369	8978	8795	12786	10746	10302	13494	11076	8755	11365	10512	11322	13173	16072	17339	23506	20631	22329	20386
-TRAP	2027	2008	1717	1458	1350	1251	1446	3673	3274	4507	2390	1740	1953	3658	2789	4376	2993	2186	2001	3745	2083	2522	4848
-LONGLINE	4286	3266	2398	886	947	1231	885	4215	3575	2713	1742	1407	1630	2335	1908	2354	5590	5629	6375	9184	13228	11383	9300
-OTHER & UNCL GEARS	236	378	789	841	1429	769	1166	744	1033	3955	4159	4030	3611	4227	4110	3131	2455	3312	3648	4595	5015	4442	3183
ALGERIE	66	49	40	20	150	190	220	250	252	254	260	566	420	677	820	782	800	1104	1097	1560	156	156	157
CAP VERT	0	0	0	0	0	0	0	0	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0
CHINA-PR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	84	118	80	42
CHINESE TAIPEI	5	3	2	0	3	5	6	16	2	0	0	0	0	0	0	0	0	0	334	729	502	472	504
CROATIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1418	1076	1058	1410	1220	1360	1105
CYPRUS	0	0	0	0	0	10	10	10	10	10	10	10	10	10	10	10	10	10	14	0	0	0	0
EC-DENMARK	++	3	1	2	1	0	3	++	++	1	2	1	++	0	0	++	++	++	37	0	++	++	0
EC-GREECE	0	0	0	0	0	0	++	5	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0
EC-ESPAÑA	2567	2255	3072	4190	3656	2468	2601	3813	5257	7547	5090	3577	3654	5995	5210	5379	3664	4532	7096	5878	8426	8762	8047
EC-FRANCE	2292	4067	3774	2320	1853	1961	2503	5028	4060	4202	5920	3838	4863	6504	4894	5223	5185	8270	8094	12179	10329	9690	8470
EC-GERMANY	0	0	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EC-GREECE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EC-IRELAND	0	0	0	0	0	0	0	0	0	0	11	131	99	102	131	155	123	100	96	362	615	1403	538
EC-ITALY	7083	10369	6263	4983	4020	6272	6017	6658	5865	7140	7199	7576	4607	4201	4317	4110	3783	5005	5328	6882	7063	10006	9548
EC-NETHERLA	0	0	0	0	0	0	0	++	++	++	++	++	++	++	++	++	++	++	0	0	0	0	0
EC-PORTUGAL	303	24	14	56	35	24	17	41	174	34	29	193	163	48	3	27	395	358	208	668	481	473	749
EC-SWEDEN	2	8	2	2	++	++	1	++	1	++	0	0	0	++	++	0	1	++	0	0	0	0	0
EC-UK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
GUINEA CONAKR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	189	0	0
ISRAEL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0
JAPAN	4160	2941	2114	638	729	999	615	3534	3286	2550	1426	1080	1180	1427	965	1636	3066	3473	3277	2611	4784	4106	3198
KOREA	15	3	2	0	1	0	0	0	3	0	77	0	0	0	0	0	0	0	0	688	663	683	613
LIBYA	780	799	336	677	424	398	271	310	270	274	300	300	300	300	84	258	290	650	546	1332	1500	732	104
MALTA	37	25	47	26	23	24	32	40	31	21	21	41	36	24	29	48	63	48	151	344	353	243	236
MAROC	2664	332	891	36	208	161	179	993	366	175	98	344	472	577	746	1557	1456	767	495	1812	1713	1621	2603
NORWAY	988	529	764	221	60	282	161	50	1	243	0	31	0	0	0	0	0	0	0	0	0	0	0
POLAND	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S.AFRICA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TUNISIE	83	66	131	141	262	228	218	298	293	307	369	315	456	624	661	406	1366	1195	2132	2503	1897	2393	2200
TURKEY	17	181	177	127	27	391	565	825	557	869	2230	1524	910	1550	2809	2137	2436	679	1155	998	837	633	503
USA	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
YUGOSLAV	155	562	932	1049	756	573	376	486	1222	755	1084	796	648	1523	560	940	0	0	0	0	0	0	0

EX-BFT-Table 1. Landings of Atlantic and Mediterranean bluefin by flag 1975-1997

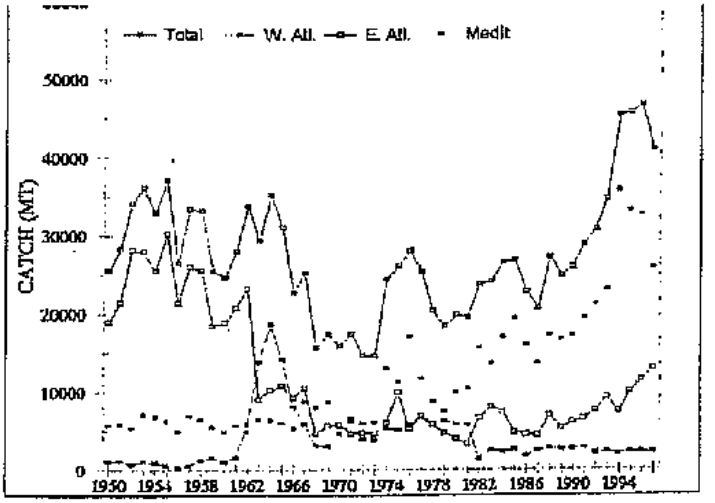
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
YUGOSLAV.F.R.																				0	2	4	0
NEI-1	0	0	0	0	0	0	0	1	0	25	3	172	255	705	763	489	1754	1349	1624	0	0	0	0
NEI_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	49	49	0.	0	0	0	0
NEI_21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1803	1088	392	666
NEI-105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	282	240	1990	362
NEI-118	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30
NEI-134	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	145	398	0	0
NEI-28	0	69	212	156	14	117	48	12	0	17	22	11	4	0	0	0	0	0	513	1129	1293	829	674
NEI-71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	104	0	0	0	0
NEI-81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	300	71	904
UNCL REGION																							
CHINA PR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	84	118	80	0

* Estimated value based on the BFTSDP or latest year for which data are available.

** This figure was later estimated to be 15 MT.

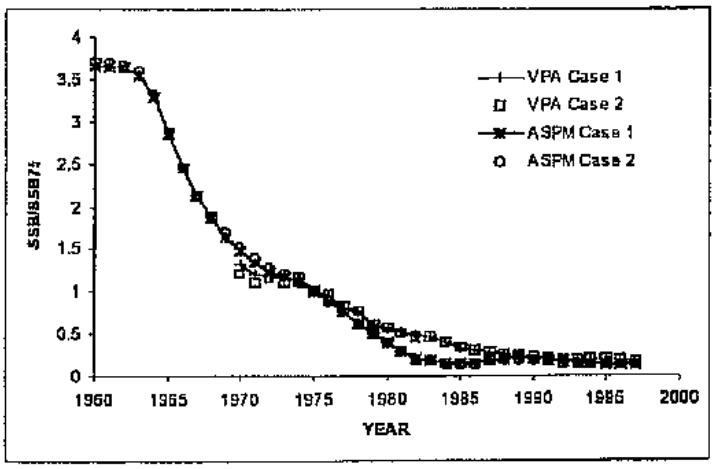


BFT-Fig. 1. Distribution of Atlantic bluefin catches by longline (in circles) and surface gears (histogram), accumulative for the period of 1990-1996. The data for 1997 and revisions made in 1998 session still not incorporated. The division lines for east and west stocks are also shown.

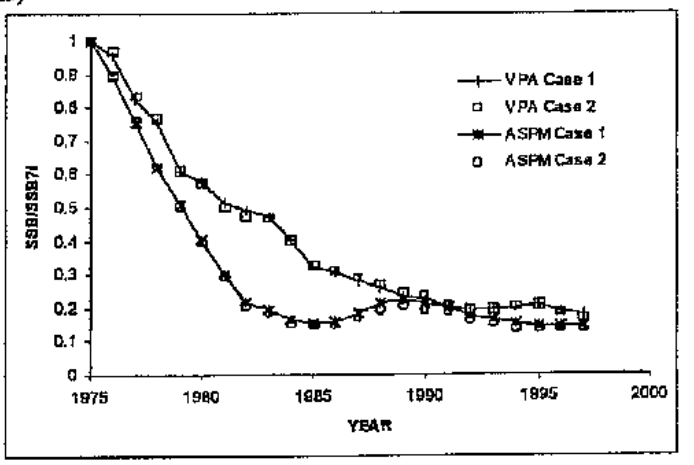


BFT-Fig. 2. Total catch (including discards in MT) of bluefin tuna in east, west Atlantic and the Mediterranean Sea

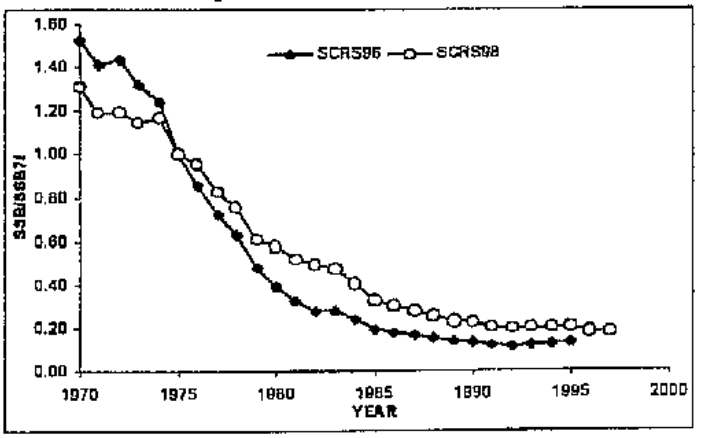
A)



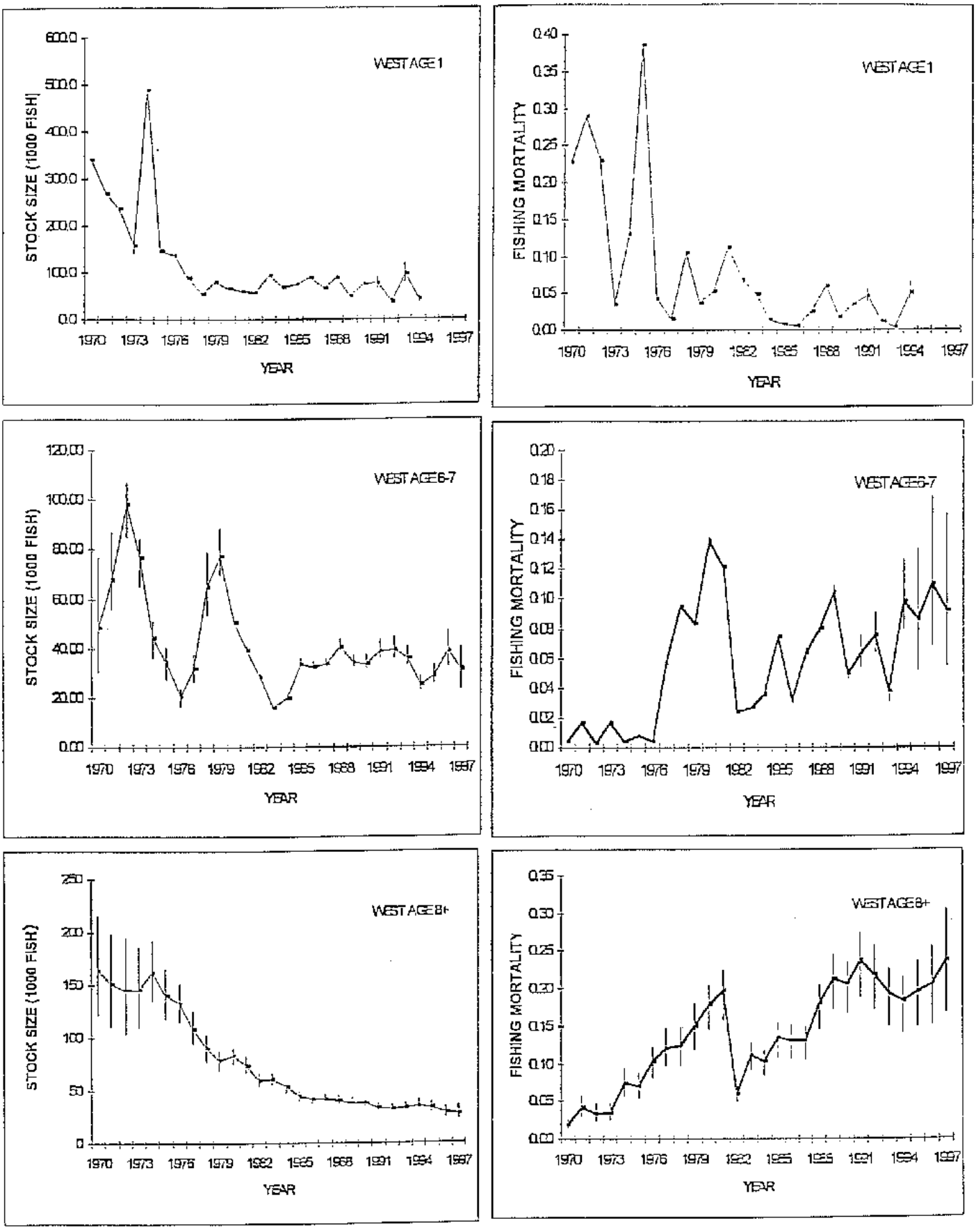
B)



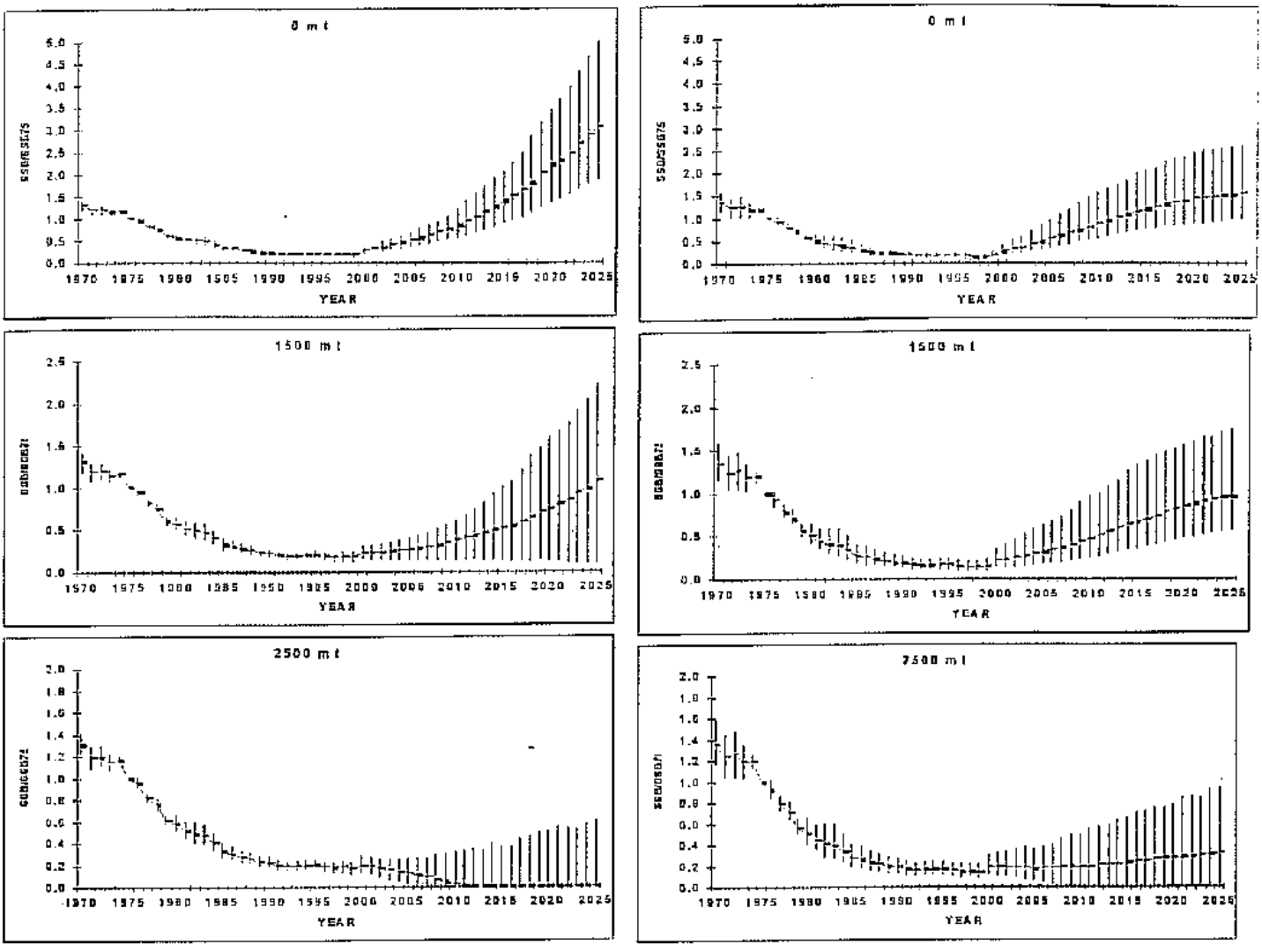
BFT-Fig. 3. Median spawning biomass relative to 1975 for west Atlantic bluefin tuna, estimated using VPA and production models (ASPM) using equal index weights and a constant M=0.14 (case 1) and SBF M vector (case 2). A) represents the trajectories estimated since 1960, B) represents the trajectories since 1975.



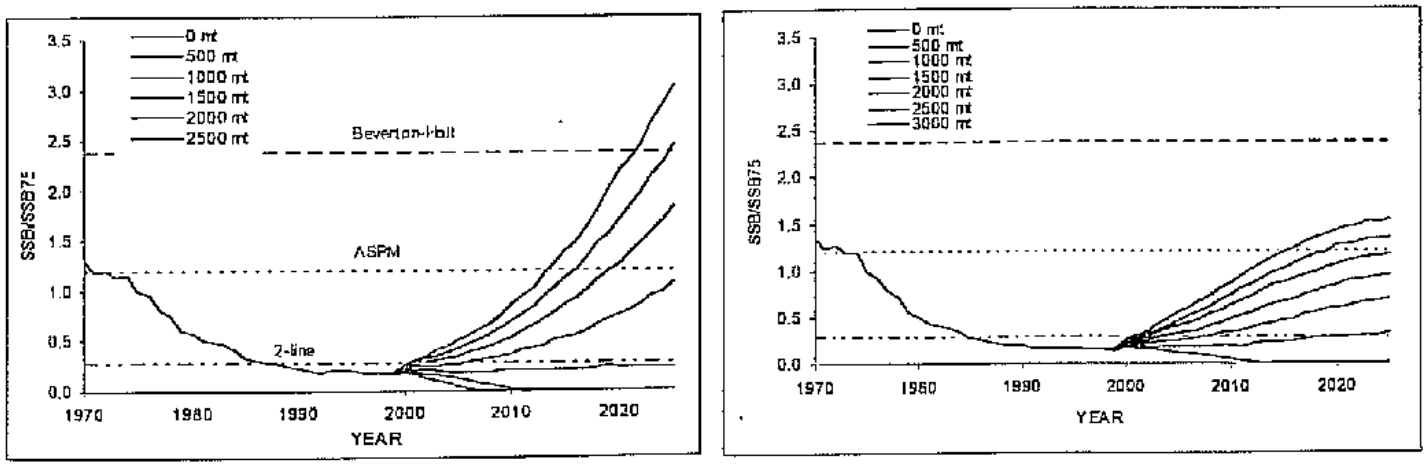
BFT-Fig. 4. Comparison of relative biomass trajectories resulting from the 1996 assessment and the 1998 assessment using updated and new information.



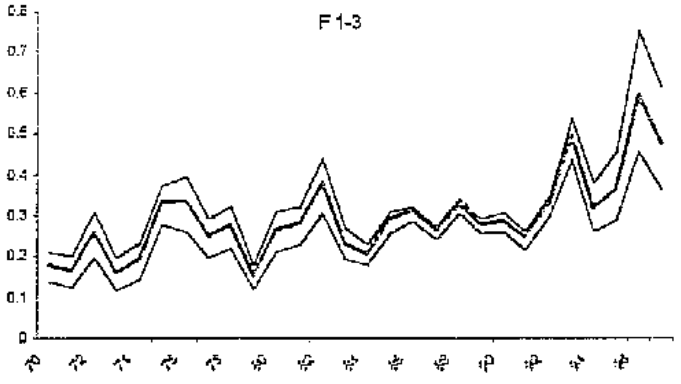
B FT-Fig. 5. Stock size (in number of fish) and fishing mortality rates for west bluefin tuna, estimated by VPA with 80% confidence intervals.

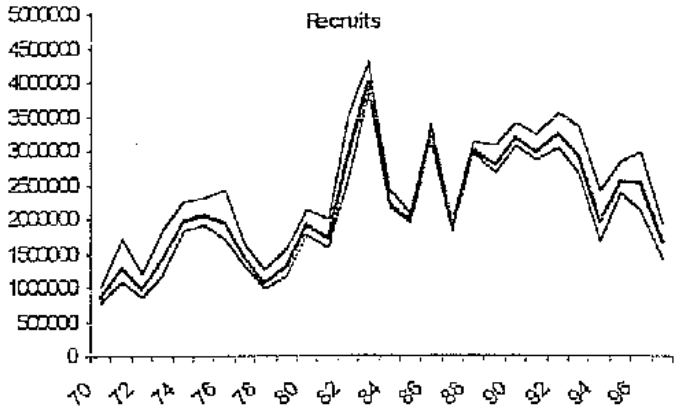


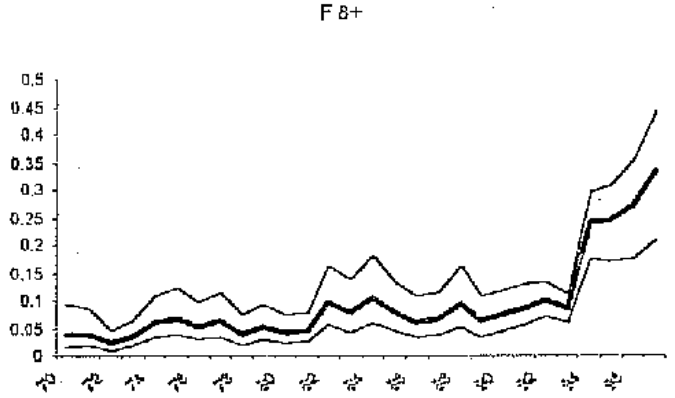
BFT-Fig. 6. Stochastic projections of the VPA results assuming a Beverton-Holt (left panels) and a 2-line (right panels stock recruitment.

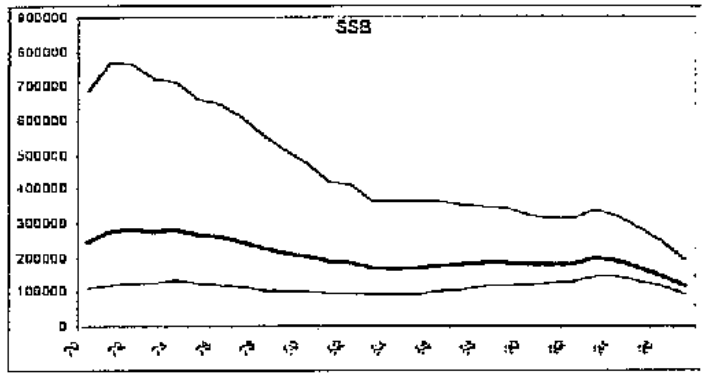


BFT-Fig. 7. Median projections made for west bluefin tuna VPA results assuming a Beverton-Holt (left panel) and a 2-line stock recruitment relationship (right panel) for constant catches of 0-3000 MT. Median SSB_{mdy} relative to SSB_{75} for the Beverton fit (upper dash) 2-line fit (lower dash, and ASPM model (center dash) are shown as horizontal reference lines.

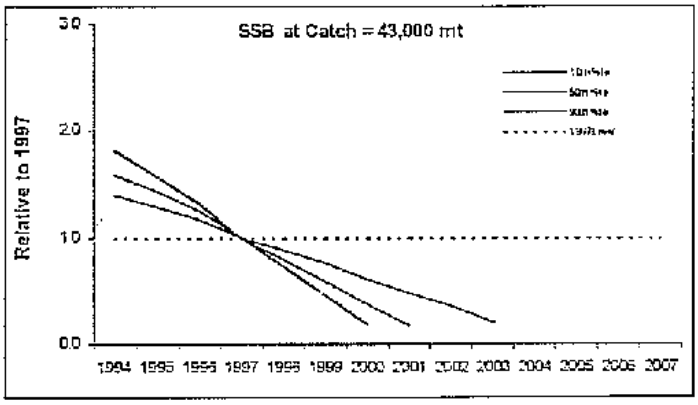


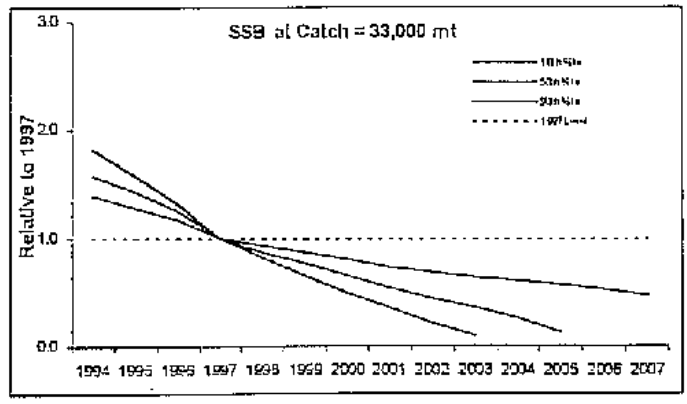


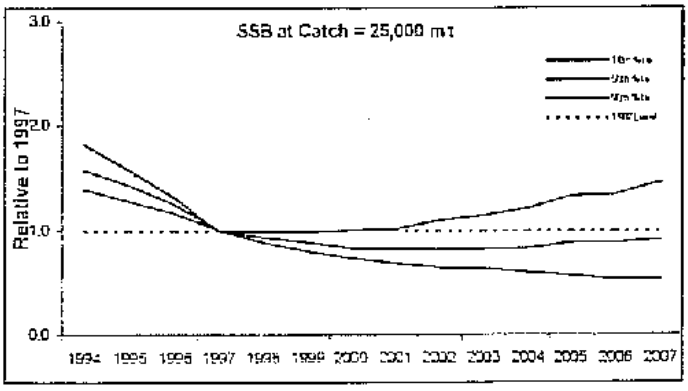




BFT-Fig. 8. Results (fishing mortality of ages 1-3 and 8+ as well as number of recruits and spawning stock biomass) estimated by base case VPA for east bluefin tuna.







BFT-Fig. 9 Results of projection of east bluefin spawning biomass assuming constant annual catch of 45, 000, 33,000 and 25,000 MT - east bluefin tuna.

BUM – BLUE MARLIN

BUM-1. BIOLOGY

Blue marlin are found throughout tropical and temperate waters of the Atlantic Ocean and adjacent seas, and range from Canada to Argentina on the western side, and from the Azores to South Africa on the eastern side **(BUM-Figure 1)**. Blue marlin are large apex predators with an average weight of about 100-175 kgs. Blue marlin have an extensive geographical range, often have migratory patterns that include trans-Atlantic as well as trans-Equatorial movements, and are generally considered to be a rare and solitary species relative to the schooling scombrids. Blue marlin are considered sexually mature by ages 2-4, spawn in tropical and subtropical waters in the summer and fall, and are found in the colder temperate waters during the summer. Young blue marlin are one of the fastest, if not the fastest growing of all teleosts, reaching from 30-45 kgs by age 1. Females grow faster and reach a much larger maximum size than males.

Blue marlin feed on a wide variety of fish and squid, but show a dietary preference for scombrids. They are found predominately in the open ocean near the upper reaches of the water column and are typically caught most frequently as a by-catch by the offshore longline fisheries which target tropical or temperate tunas using shallow deployment of gear. However, significant by-catch landings are also made by offshore longline fisheries which target swordfish, particularly in the west Atlantic Ocean.

The stock hypotheses for assessment purposes has historically been a north Atlantic and south Atlantic stock (divided at 5°N), and a total Atlantic stock. However, the 1995 SCRS recognized the increased importance of the total Atlantic hypothesis for blue marlin. More recently (1996), the Committee reviewed and discussed new data on genetic mitochondria DNA analysis, as well as tag release-recapture data, and concluded that these data were most consistent with a total Atlantic hypothesis. Additionally, the Committee concluded that the north/south separation is arbitrary for this tropical species (as with white marlin). Nevertheless, the Committee still recommends that, if possible, it would be prudent to also assess the status of the stock under a separate north and south Atlantic hypothesis.[1]

BUM-2. DESCRIPTION OF FISHERIES

The fisheries for Atlantic blue marlin are characterized by many different participants. The major landings of blue marlin are incidental to the large offshore longline fisheries which target tuna and swordfish, including Brazil, Cuba, Japan, Korea, Chinese Taipei, and others. Other major fisheries are the directed recreational fisheries of the United States, Venezuela, Bahamas, Brazil, and many other countries and entities in the Caribbean Sea and off the west coast of Africa. Other directed fisheries include artisanal fisheries in the Caribbean Sea and off west Africa. Development and geographical expansion of other longline fisheries which take blue marlin in the western Atlantic, Caribbean Sea, and east and south Atlantic by various countries have been reported (mainly Spain and the U.S. for eastern and western Atlantic, respectively). Purse seine fisheries also have an incidental catch of blue marlin.

Landings for the total Atlantic first developed in the early 1960's, reached a peak of over 9,000 MT in 1963, declined to the range of about 2,000 - 3,000 MT during the period 1967-1977, and have fluctuated with an increasing trend over the period 1978-1996. Unfortunately, landings data are incomplete for 1997 because 34 percent of fisheries-areas that reported landings in 1996 failed to report their 1997 landings. **(BUM-Table 1 and Figure 2)**. However, prior to 1997, landings for the north Atlantic generally show trends similar to those for the total Atlantic. The general trend in catches have followed the intensity of the offshore longline fisheries.

1 The production model analysis of the south Atlantic database could not be made to converge to a solution without fixing several parameters, thus making the assessment results unreliable. Because of the poor model fit, benchmark values are not provided in the summary table.

BUM-3. STATE OF STOCKS

No new stock assessment for Atlantic blue marlin was submitted to the 1998 SCRS. The most recent assessment for blue marlin was conducted during the Third ICCAT Billfish Workshop held in Miami, Florida, during July, 1996. This assessment included data through 1995. The general results from this analysis using a non-equilibrium production model indicated that biomass had been below B_{MSY} for about three decades for both the total and north Atlantic hypotheses **(BUM--Figures 3 and 4)**. The Committee considered these stocks to be over-exploited. The assessment results for the south Atlantic were judged to be unreliable and results are not presented for this hypothesis. Because the South Atlantic information influences the total Atlantic stock analysis, a somewhat different perspective could result if only the North Atlantic catch rate patterns were applied under this hypothesis. However, it should be noted that the Committee indicated that the total Atlantic assessment results were the most appropriate for this species. Bias-corrected point estimates of maximum sustainable yield derived from production model analyses for the 1996 total Atlantic and north Atlantic were about 4,461 and 1,963 MT, respectively. Landings for the total and north Atlantic in 1996, the most recent year landings were fully reported, were estimated at 4,437 and 1,855 MT, respectively. Biomass for the total and north Atlantic in 1996 was estimated to be about 24 and 61%, respectively, of the biomass needed to produce MSY; i.e., B_{1996}/B_{MSY}. Similar statistics for 1997 could not be developed because of incomplete reporting. Concerns over the present assessment have been raised by some members of the Committee. Therefore, the Committee recommends that additional detailed analyses of the available data be conducted and that alternative assessment methodologies, which make use of all available information (particularly size frequency and environmental data) be explored for application to marlins.

BUM-4. OUTLOOK

Because the landing reports for 1997 are incomplete, the data for 1996 represent the most recent estimates of total landings. For the total Atlantic hypothesis, reported landings from 1996 (4,437 MT) were much larger than the estimated equilibrium replacement yield of about 1,920 MT. The 1996 landings for blue marlin were the second highest in the last quarter century. Landings greater than the replacement yield are expected to result in further decline in stock status. The reported landings for 1996 (1,855 MT) from the north Atlantic were also higher than the estimated equilibrium replacement yield for 1996 of about 1,694 MT. Again, landings greater than the replacement yield are expected to result in further decline in stock status. Although the 1995 SCRS previously recognized the increase in stock biomass from north Atlantic production model results (presented at the 1992 SCRS) as a sign of recovery, the slight upturn in the biomass trajectory of the current north Atlantic assessment was not characterized as a recovery by the Committee. It should be reiterated that the Committee recognized that the biology of Atlantic blue marlin was most consistent with the total Atlantic hypothesis. Although the outlook for the north Atlantic hypothesis is more optimistic relative to the total Atlantic assessment results, the Committee has concerns about the status of blue marlin stocks for both stock hypotheses when considered separately. In addition, even though assessment results for the south Atlantic are considered unreliable, similar concerns about the resource status for this hypothesis also exist. Nevertheless, the Committee continues to regard the persistent high level of fishing mortality, which has depressed stock biomass to levels below that which could produce MSY in stock hypotheses examined here, as **inconsistent** with the management objective of MSY, as well as inconsistent with precautionary principles outlined in the United Nations Agreement on Straddling Stocks and Highly Migratory Fish Stocks.

BUM-5. EFFECT OF CURRENT REGULATIONS

The only ICCAT regulations in effect for blue marlin are from the 1997 Commission resolution to reduce marlin landings by at least 25% from 1996 levels. This reduction was to be initiated in 1998 and fully implemented by the end of 1999.

Two ICCAT Contracting Parties (the U.S. and Venezuela) and two non-contracting parties (Mexico and St. Lucia) had previously established domestic regulations for commercial and recreational fisheries involving blue marlin to reduce mortality. The U.S. made changes to its existing regulations for the recreational fishery for billfishes (blue marlin, white marlin, and sailfish) in 1998 by increasing minimum size for each species to conform with the ICCAT resolution to reduce marlin landings by at least 25% from 1996 levels. Mandatory billfish tournament registration was also implemented by the U.S. in 1998 to improve monitoring of this fishery. In addition, many other countries participating in the recreational fisheries for Atlantic blue marlin have had volunteer release or tag and release policies which also have the effect of reducing mortality.

BUM-6. MANAGEMENT RECOMMENDATIONS

The 1996 stock assessments for Atlantic blue marlin indicate that this species is over-exploited and warrants consideration for development of methods to reduce fishing mortality rates. The Committee believes that one approach to reducing mortality would be to release or tag and release those blue marlin that are caught by longline vessels which appear to be alive when brought alongside the boat. Such an approach would first have to be implemented on an experimental and selective basis while additional research is conducted to determine the rate of survival of billfish caught and released off longline vessels. The projections of population response to releasing live longline marlin bycatch, submitted to the 1997 SCRS, suggested that this would be an effective approach to reducing mortality to reach the management objective (MSY). This approach could be considered consistent with the precautionary approach outlined in the United Nations Agreement on Straddling Stocks as current best estimates indicate that, if perfectly implemented, this measure would reduce fishing mortality rates below Fmsy for this species.

The Committee acknowledges that progress has been made on many aspects of past resolutions on billfish, approved at the 1995 and 1997 Commission meeting, including convening the Third Billfish Workshop, revising the billfish databases, updating billfish assessments, and changing the financial structure of the Billfish Program by providing Commission funding for the first time, starting in 1998. The Committee feels that the earliest updating of marlin assessments that could allow examination of the effects of the 1997 Commission Resolution for reducing blue marlin landings by 25% from 1996 levels (to be fully implemented by the end of 1999), would be when the 1999 data are available in 2000.

ATLANTIC BLUE MARLIN SUMMARY
(Bias corrected point estimates)

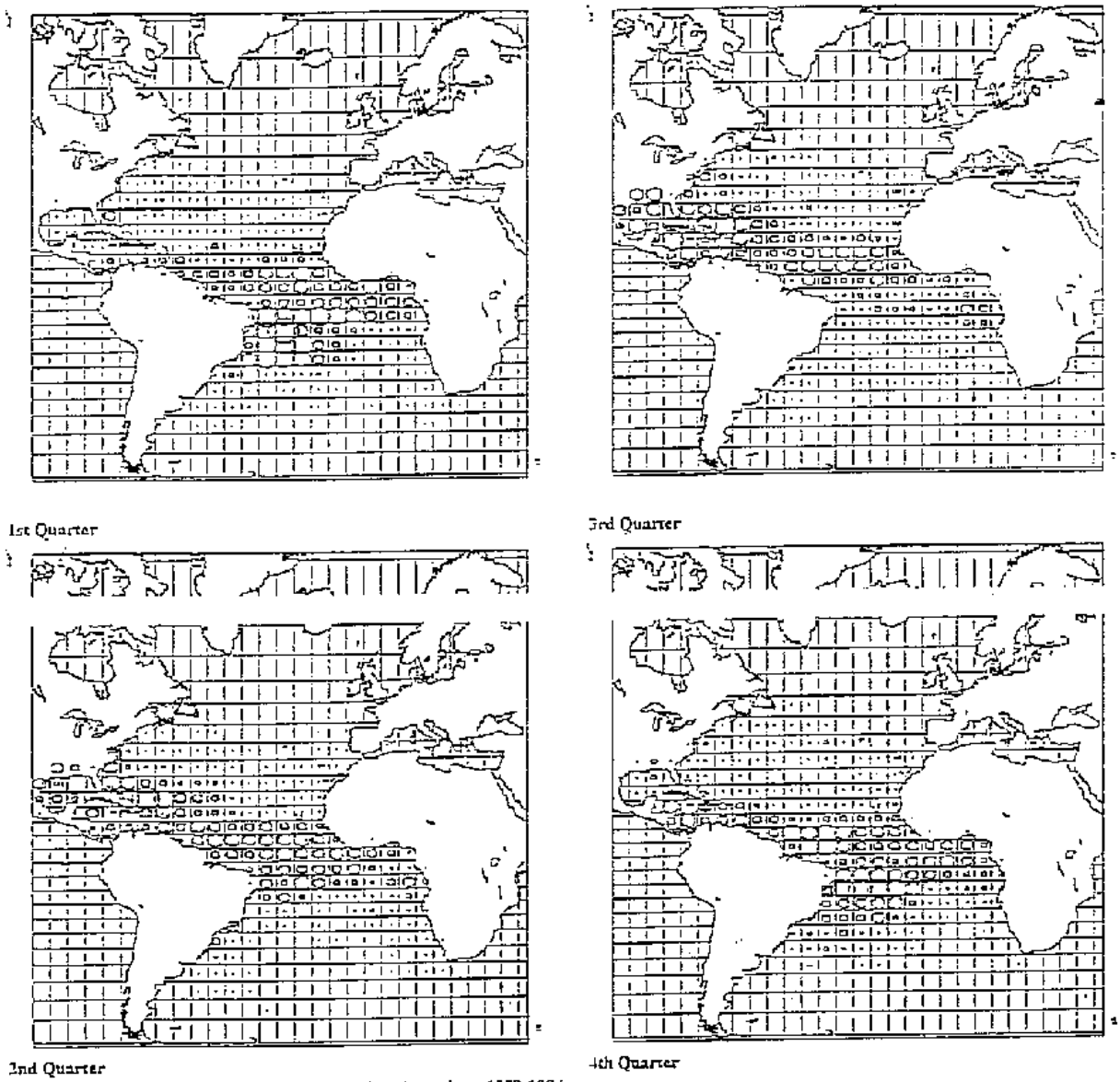
	Total Atlantic	*North Atlantic*	*South Atlantic*
Maximum Sustainable Yield, (MSY):	4,461 MT	1,963 MT	–
Approximate 80% CI	4,096-4,787 MT	1,742-2,133MT	–
Current (1997) Yield (observed)	Incomplete	Incomplete	–
1996 Replacement Yield	1,920 MT	1,694 MT	–
Relative Biomass (B_{1996}/B_{MSY})	0.236	0.608	--
Relative Fishing Mortality: F_{1995}/F_{MSY} (approx. 80% CI)	2.87 (1.45-3.41)	1.21 (0.96-1.56)	--
Management Measures in Effect	None	None	None

EX-BUM-Table 1. Nominal landings (MT) of Atlantic blue marlin 1975-1997

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
TOTAL	**3185**	**2310**	**2047**	**1506**	**1401**	**1584**	**1947**	**2763**	**1892**	**2664**	**3239**	**2031**	**2116**	**2744**	**4253**	**4503**	**4163**	**2992**	**3215**	**3995**	**3821**	**4452**	**2779**
NORTH ATLANTIC	**2076**	**1366**	**1255**	**976**	**897**	**1084**	**1296**	**1650**	**1214**	**1378**	**1566**	**1058**	**835**	**903**	**1554**	**1940**	**1414**	**1047**	**1244**	**1585**	**1478**	**1775**	**1120**
LONGLINE	*1683*	*978*	*876*	*553*	*480*	*643*	*792*	*1162*	*809*	*920*	*1223*	*695*	*464*	*533*	*1215*	*1755*	*1124*	*736*	*914*	*1244*	*1149*	*1525*	*971*
ROD & REEL	*243*	*268*	*298*	*301*	*299*	*301*	*300*	*299*	*199*	*206*	*168*	*202*	*180*	*186*	*142*	*48*	*55*	*81*	*108*	*112*	*68*	*60*	*49*
OTHER & UNC	*150*	*120*	*81*	*122*	*118*	*140*	*204*	*189*	*206*	*252*	*175*	*161*	*191*	*184*	*197*	*137*	*235*	*230*	*222*	*229*	*261*	*190*	*100*
BARBADOS	150	120	81	72	51	73	117	99	126	126	10	14	13	46	3	18	12	18	21	19	31	25	25
CANADA	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	*	0	0	0	0	0	0	0
CHI.TAIP	105	169	64	81	51	160	98	100	125	102	148	117	52	26	11	937	716	336	281	272	187	170	136
CUBA	594	250	220	97	156	162	178	318	273	214	246	103	68	94	74	112	127	135	69	39	85	43	0
EC-ESPAÑA	0	0	0	0	0	0	0	0	0	3	4	1	0	2	23	2	4	8	0	0	0	2	0
EC-PORTUGAL	0	0	0	0	0	0	0	1	2	1	8	1	8	2	1	1	4	2	15	11	10	7	3
GRENADA	**	**	**	**	**	1	1	12	6	8	11	36	33	34	40	52	64	52	58	52	50	26	47
JAMAICA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
JAPAN	551	260	118	54	68	193	332	637	192	351	409	174	78	206	593	250	145	193	207	532	496	798	596
KOREA	304	174	307	185	67	48	71	19	43	110	154	36	13	14	252	240	34	11	2	16	16	41	16
MEXICO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	13	13	13	13
NLD.ANT.	0	0	0	50	50	50	50	50	50	50	50	50	50	50	50	50	40	40	40	40	40	40	0
ST.VINCE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	*	*	1	2	2	2	*	1
TRINIDAD	0	0	0	0	0	0	0	0	3	8	3	17	2	0	28	4	6	4	226	150	150	150	13
UKRAINE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	5	0	0	0	0	0
U.K.-BERMUDA	1	2	2	5	2	4	1	2	7	8	9	11	6	8	15	17	18	19	11	15	15	15	3
USA	241	265	295	295	312	312	342	329	215	280	295	273	428	345	314	187	173	158	186	191	186	232	143
USSR	3	0	1	1	**	0	0	0	0	0	0	7	23	0	0	0	0	0	0	0	0	0	0
VENEZUELA	83	79	80	94	134	81	106	83	172	117	219	218	60	76	149	70	56	65	66	133	97	113	0
NEI_1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	57	100	100	100	100
NEI-28	44	47	87	42	6	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0
SOUTH ATLANTIC	**1109**	**944**	**792**	**530**	**504**	**500**	**438**	**832**	**533**	**1086**	**1473**	**773**	**1080**	**1641**	**2498**	**2362**	**2547**	**1706**	**1750**	**2202**	**2134**	**2477**	**1459**
LONGLINE	*1109*	*933*	*739*	*526*	*490*	*498*	*430*	*822*	*533*	*975*	*1362*	*661*	*964*	*1530*	*2002*	*1958*	*2274*	*1450*	*1397*	*1601*	*1502*	*1883*	*1431*
OTHER & UNC	*0*	*11*	*53*	*4*	*14*	*2*	*8*	*10*	*0*	*111*	*111*	*112*	*116*	*111*	*496*	*404*	*273*	*256*	*353*	*601*	*632*	*594*	*28*
BENIN	0	0	0	0	0	0	6	8	0	9	10	7	4	12	0	6	6	6	6	5	5	5	0
BRASIL	15	41	100	49	34	23	28	30	27	32	33	46	51	74	60	52	61	125	147	81	180	331	188
C.IVOIRE	0	0	0	0	0	0	0	0	0	100	100	100	100	88	65	72	78	58	110	153	144	144	0
CHINESE TAIPEI	422	240	107	177	139	129	104	150	47	70	165	98	265	266	462	767	956	488	404	391	280	490	393
CUBA	195	159	100	113	180	187	108	118	123	159	205	111	137	191	77	90	62	69	0	0	0	0	0

EX-BUM-Table 1. Nominal landings (MT) of Atlantic blue marlin 1975-1997

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
GHANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	430	324	126	123	236	441	472	422	0
JAPAN	57	4	17	15	66	115	136	495	248	482	691	335	362	617	962	967	755	824	719	991	913	881	691
KOREA	354	392	356	140	78	46	55	31	88	234	262	60	139	361	437	84	503	13	11	40	40	103	40
MALTA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
USA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	42
USSR	15	1	9	4	**	0	1	0	0	0	7	16	22	32	5	0	0	0	0	0	0	0	0
NEI_1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	117	100	100	100	100
NEI-28	51	107	103	32	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UNCL. REGION	**0**	**0**	**0**	**0**	**0**	**0**	**213**	**281**	**145**	**200**	**200**	**200**	**201**	**200**	**201**	**201**	**202**	**239**	**221**	**208**	**209**	**200**	**200**
LONGLINE	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*0*	*1*	*1*	*2*	*39*	*21*	*8*	*9*	*0*	*0*
PURSE SEINE	*0*	*0*	*0*	*0*	*0*	*0*	*213*	*281*	*145*	*200*	*200*	*200*	*200*	*200*	*200*	*200*	*200*	*200*	*200*	*200*	*200*	*200*	*200*
OTHER & UNC	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*1*	*5*	*0*	*1*	*5*	*5*	*21*	*0*
EC-ESPAÑA	0	0	0	0	0	0	63	101	45	100	100	100	100	100	100	100	100	100	100	100	100	100	100
FIS	0	0	0	0	0	0	150	180	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
GABON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	8	0
SENEGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	5	0	0	5	5	5	0
USA	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	2	39	21	8	9	8	0



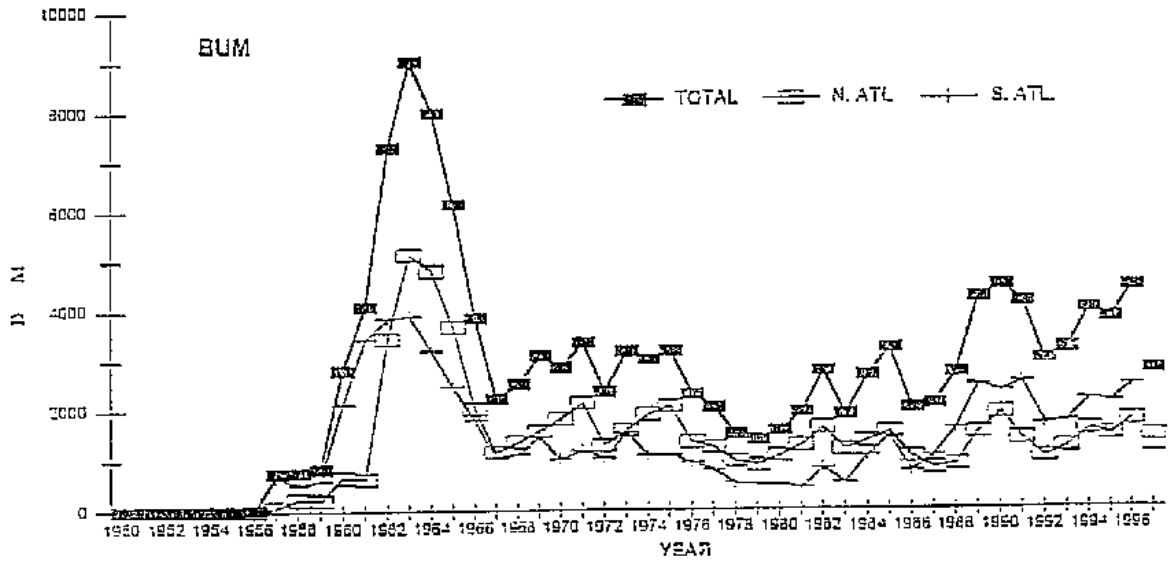
1st Quarter

3rd Quarter

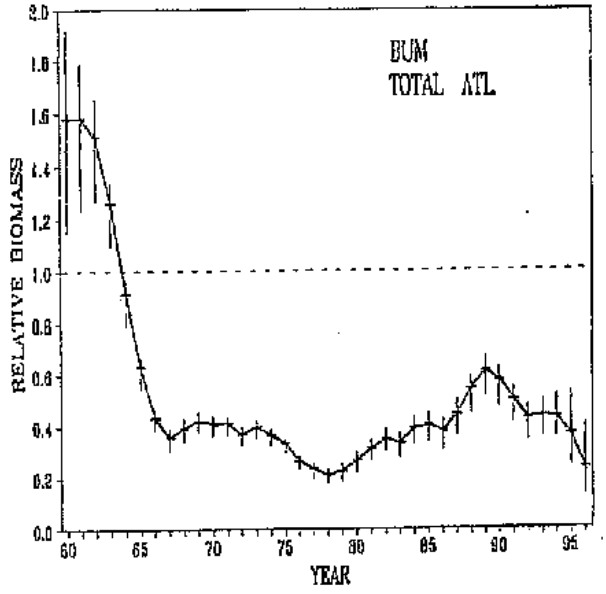
2nd Quarter

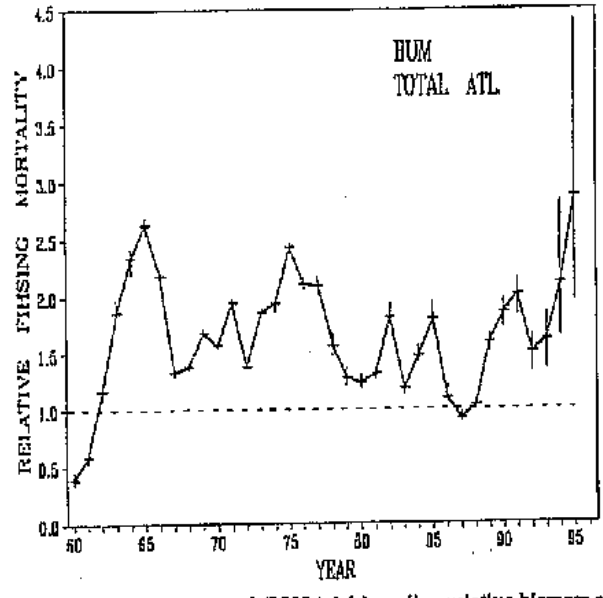
4th Quarter

BUM-Fig. 1. Distribution of blue marlin catches throughout 1950-1994

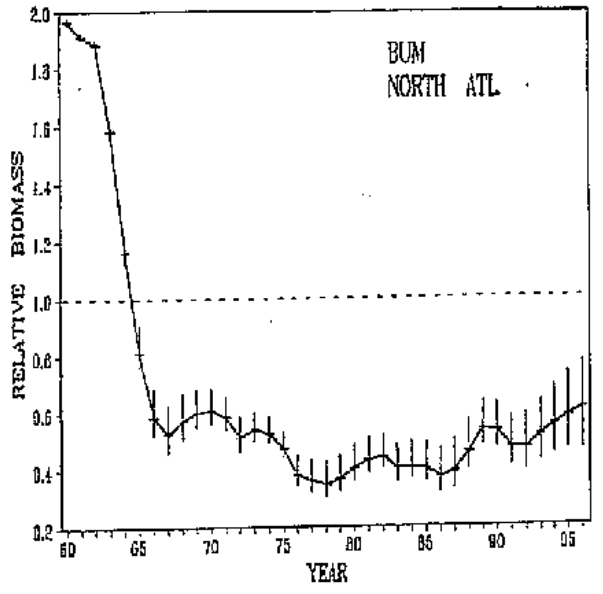


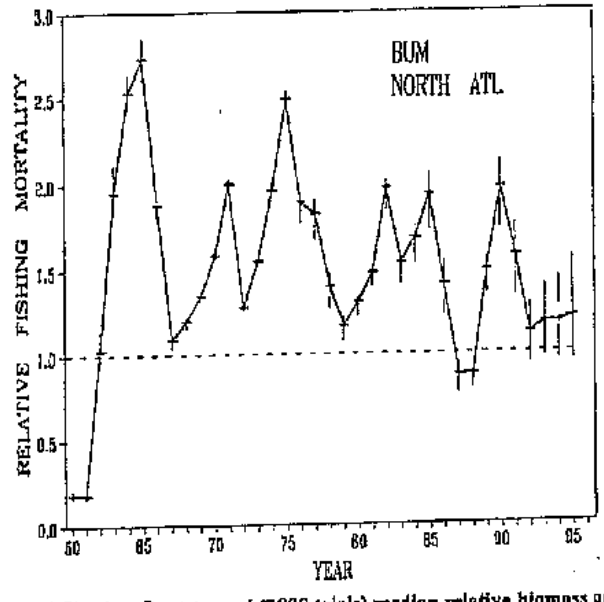
BUM-Fig. 2. Task I catches (MT) of blue marlin by regions, 1950-1997 (1997 catches were incomplete, therefore the 1997 points were not connected to the prior time series).



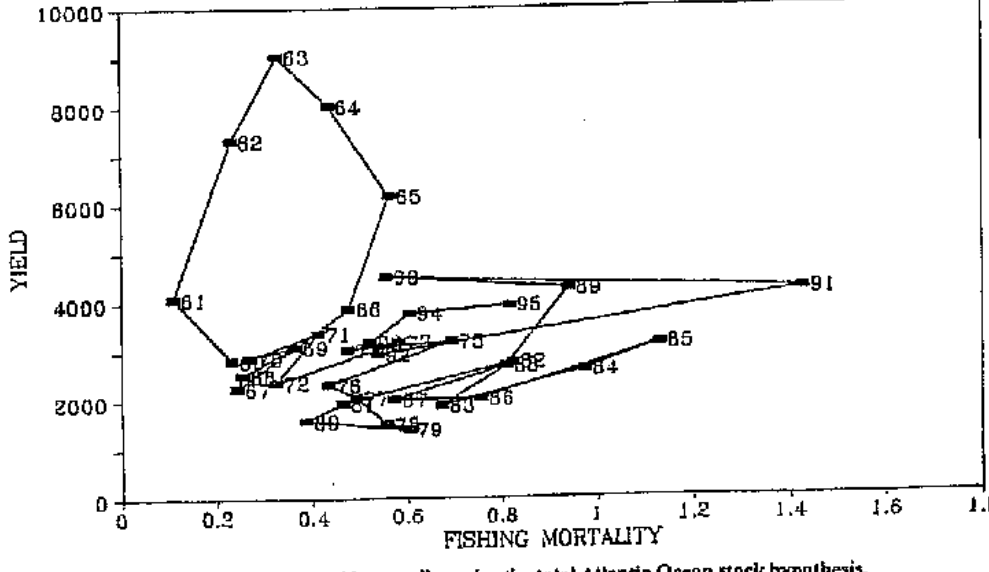


BUM-Fig. 3. Bootstapped (2000 trials) median relative biomass and relative fishing mortality for blue marlin fisheries from the total Atlantic with approximate nonparametric 80% confidence intervals from the estimation procedures. Other sources of error are not quantified..





BUM-Fig. 4. Bootstapped (2000 trials) median relative biomass and relative fishing mortality for blue marlin fisheries from the north Atlantic with approximate nonparametric 80% confidence intervals from the estimation procedures. Other sources of error are not quantified.



BUM-Fig. 5. Yearly catch vs fishing mortality for blue marlin under the total Atlantic Ocean stock hypothesis.

WHM - WHITE MARLIN

WHM-1. BIOLOGY

White marlin are found throughout tropical and temperate waters of the Atlantic Ocean and adjacent seas. Their range is almost identical to that of blue marlin **(WHM-Figure 1)**, although they seem to be less abundant in the east Atlantic. Their average size is about 20-30 kg. White marlin occur only in the Atlantic Ocean, which is not the case for blue marlin and sailfish. Although white marlin are generally considered to be a rare and solitary species relative to the schooling scombrids, they are known to occur in small groups consisting of several individuals. They spawn in tropical and subtropical waters in mid- to late spring, and are found in the colder temperate waters during the summer. Very little is known about the age and growth of white marlin, although they are considered to be very fast growing, as are all the istiophoridae. Female white marlin grow faster and reach a larger maximum size than males.

White marlin are generally considered piscivorus, but also have been know to consume squid. They are found predominately in the open ocean near the upper reaches of the water column and are typically caught most frequently as a by-catch by the offshore longline fisheries which target tropical or temperate tunas using shallow deployment of gear. However, significant by-catch landings are also made by offshore longline fisheries which target swordfish, particularly in the west Atlantic Ocean.

As with blue marlin, the SCRS stock hypotheses for white marlin assessments historically has been a north and south Atlantic stock (divided at 5°N), as well as a total Atlantic stock. However, the SCRS initially recognized the increased importance of the total Atlantic hypothesis for white marlin in 1995. More recently (1996), the Committee reviewed and discussed new data on genetic mitochondria DNA analysis, as well as tag release-recapture data, and concluded that these data were most consistent with a total Atlantic hypothesis. In addition, the Committee concluded that the north/south separation is arbitrary for this tropical species (as with blue marlin). The Committee did recommend that, if possible, it would be prudent to also assess the status of the stock under a separate north and south Atlantic hypothesis.[2]

WHM-2. DESCRIPTION OF FISHERIES

See section on "Description of Fisheries" in Blue Marlin Executive Summary report.

Landings for the total Atlantic first developed in the early 1960's, reached a peak of almost 5,000 MT in 1965, declined to about 1,000 MT per year during the period 1977-1982, and have fluctuated between about 940 and 1,700 MT through 1996 **(WHM-Table 1 and Figure 2)**. Unfortunately, landings data are incomplete for 1997 because 12 percent of country/area strata that reported landings in 1996 failed to report their 1997 landings. This includes the country with the second largest landings in 1996, which represents about 29% of the 1996 white marlin landings for the total Atlantic. Landings for the north Atlantic generally show a trend similar to that of the total Atlantic. The general trend in catches have followed the intensity of the offshore longline fisheries.

WHM-3. STATE OF STOCKS

No new stock assessment was submitted to the 1998 SCRS for Atlantic white marlin. The most current assessment for white marlin was conducted during the Third ICCAT Billfish Workshop held in Miami, Florida, during July, 1996. This assessment included data through 1995, which represented revisions and updating from the previous assessment presented at the 1992 SCRS. The general results from these analyses using a non-equilibrium production model indicated that biomass had been below B_{MSY} for three decades for the total Atlantic hypothesis **(WHM-Figure 3)** and two decades under a north Atlantic hypothesis **(WHM-Figure 4)**. The Committee considered these stocks to be severely over-exploited. The assessment results for the south Atlantic were judged to be unreliable and results are not presented for this stock hypothesis. Previous statements in the Blue Marlin Executive Summary Report concerning the influence of the South Atlantic data base

1 The production model analysis of the south Atlantic database could not be made to converge to a solution without fixing several parameters, thus making the assessment results unreliable. Because of the poor model fit, benchmark values are not provided in the summary table.

under a north Atlantic hypothesis **(WHM-Figure 4)**. The Committee considered these stocks to be severely over-exploited. The assessment results for the south Atlantic were judged to be unreliable and results are not presented for this stock hypothesis. Previous statements in the Blue Marlin Executive Summary Report concerning the influence of the South Atlantic data base on the total Atlantic stock analysis and recommendations for applying additional analyses involving all available data and using alternative assessment methodologies also apply to white marlin. However, it should be noted that the Committee indicated that the total Atlantic assessment results were the most appropriate for this species. Bias-corrected point estimates of maximum sustainable yield were estimated from production model analyses for the total Atlantic and north Atlantic to be about 2,177 and 536 MT, respectively. Current landings data for 1997 are incomplete, however the landings in 1996 for the total and north Atlantic were estimated at 1,509 and 441 MT, respectively. Biomass for the total and north Atlantic in 1996 was estimated to be about 23 and 32%, respectively, of the biomass needed to produce MSY; i.e., B_{1996}/B_{MSY}.

WHM-4. OUTLOOK

For the total Atlantic hypothesis, landings for 1996 (1,509 MT), which is the most recent year with full reporting, were much larger than the estimated equilibrium replacement yield of about 921 MT. Landings greater than the replacement yield are expected to result in further decline in stock status. Similarly, in the north Atlantic, the reported landings from 1996 (441 MT) were larger than the estimated equilibrium replacement yield of about 300 MT. Again, landings in excess of this level are expected to result in further stock decline. The Committee has concerns about the status of white marlin stocks in both the total Atlantic and north Atlantic, when considered separately. In addition, even though assessments results for the south Atlantic are considered unreliable, similar concerns of the resource status for this hypothesis also exist. Nevertheless, the Committee regards the continuing high level of fishing mortality, which has depressed stock biomass to levels considerably below that which could produce MSY, as **inconsistent** with the management objective of MSY, as well as inconsistent with the precautionary principles outlined in the United Nations Agreement on Straddling Stocks and Highly Migratory Fish Stocks. The improving situation in the total Atlantic over the period 1977-1985 **(WHM-Figure 3)** appears to have reversed itself with a steady decline in biomass indicated over the period 1989-1996. When considering the north Atlantic separately, the relative biomass trajectory has been decreasing steadily over the entire time-series **(WHM-Figure 4)**.

WHM-5. EFFECT OF CURRENT REGULATIONS

The only ICCAT regulations in effect for white marlin are from the 1997 Commission resolution. See Blue Marlin Executive Summary Report.

Two Contracting Parties and two non-contracting parties having existing regulations and the U.S. changes to regulations for the recreational fishery for white marlin are the same as discussed for blue marlin. See Blue Marlin Executive Summary Report.

WHM-6. MANAGEMENT RECOMMENDATIONS

The 1996 stock assessments for Atlantic white marlin indicated that this species is severely over-exploited and warrants consideration for development of methods to reduce fishing mortality rates. As with blue marlin, projections of populations response to releasing live longline marlin bycatch, submitted to the 1997 SCRS, suggests that this could be an effective approach to reducing mortality to reach the management objective of MSY. This approach could be viewed as a precautionary measure consistent with the United Nations Straddling Stocks Agreement as current best estimates indicate that, if perfectly implemented, this measure would reduce fishing mortality rates below F_{MSY} for this species. The constraints for examining the effects of the 1997 Commission resolution, which can not be fully evaluated by updating assessments until 2000, referred to previously for blue marlin also holds for white marlin as well. See Blue Marlin Executive Summary Report.

ATLANTIC WHITE MARLIN SUMMARY

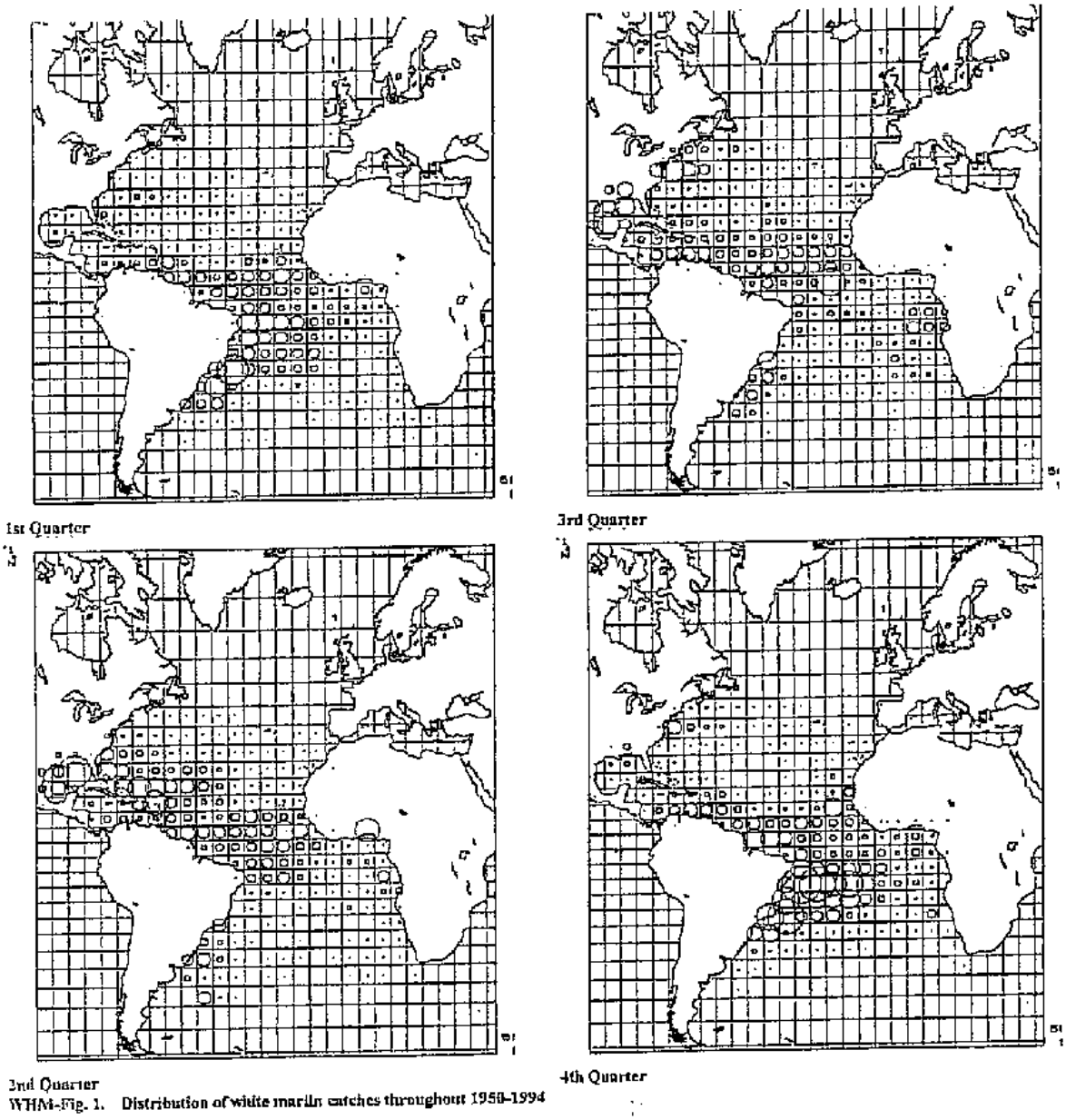
	Total Atlantic	*North Atlantic*	*South Atlantic*
Maximum Sustainable Yield(MSY)	2,177 MT	536 MT	–
Approximate 80% Confidence Interval	2,102-2,228 MT	85-771 MT	–
Current (1997) Yield (observed)	Incomplete	Incomplete	–
1996 Replacement Yield	921 MT	301 MT	–
Relative Biomass (B_{1996}/B_{MSY})	0.226	0.321	–
Relative Fishing Mortality: F_{1995}/F_{MSY} (approx. 80% CI)	1.96 (1.33-2.91)	2.37 (1.60-8.41)	--
Management Measures in Effect	None	none	none

EX-WHM-Table 1. Reported landings (MT) of Atlantic white marlin 1975-1997

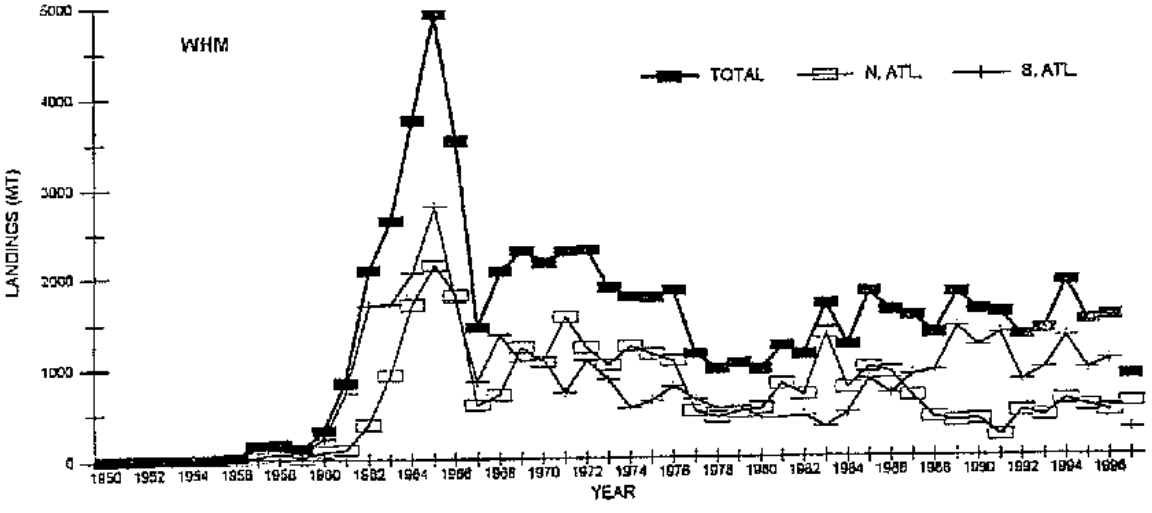
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
TOTAL	**1745**	**1819**	**1125**	**950**	**1016**	**943**	**1204**	**1112**	**1666**	**1211**	**1795**	**1588**	**1527**	**1336**	**1783**	**1591**	**1551**	**1298**	**1371**	**1898**	**1467**	**1512**	**859**
NORTH ATLANTIC	**1129**	**1052**	**501**	**428**	**482**	**521**	**789**	**670**	**1347**	**740**	**966**	**908**	**647**	**416**	**373**	**395**	**217**	**478**	**430**	**600**	**530**	**473**	**286**
-LONGLINE . .	*1018*	*938*	*390*	*317*	*370*	*403*	*671*	*548*	*1196*	*570*	*788*	*812*	*494*	*190*	*340*	*332*	*189*	*428*	*377*	*508*	*462*	*434*	*249*
-ROD & REEL .	*111*	*114*	*111*	*111*	*111*	*112*	*111*	*110*	*146*	*153*	*149*	*35*	*99*	*76*	*22*	*23*	*11*	*18*	*24*	*30*	*20*	*14*	*3*
OTHER & UNCL.	*0*	*0*	*0*	*0*	*1*	*6*	*7*	*12*	*5*	*17*	*29*	*61*	*54*	*150*	*11*	*40*	*17*	*32*	*29*	*62*	*48*	*25*	*34*
BARBADOS	0	0	0	0	0	0	0	0	0	0	0	0	0	117	11	39	17	24	29	26	43	15	34
CANADA	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	2	0	8
CHINESE TAIPEI .	125	142	44	79	62	105	174	134	203	96	128	319	153	*	4	85	13	92	123	270	181	146	113
CUBA	294	68	67	43	68	70	189	205	728	241	296	225	30	13	21	14	0	0	0	0	0	0	0
EC-ESPAÑA	0	0	0	0	0	0	0	0	0	9	14	0	0	24	13	4	2	10	0	19	0	10	0
JAPAN	404	540	80	27	42	99	118	84	27	52	45	56	60	68	73	34	45	180	33	41	31	80	38
KOREA	71	64	71	33	16	18	49	12	6	18	147	37	2	2	82	39	1	9	4	23	3	7	2
MEXICO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	8	8	0	5
UK-BERMUDA	0	0	0	0	0	*	*	*	1	1	*	1	1	1	1	1	1	1	1	1	1	1	1
USA	107	109	109	109	110	116	117	122	148	168	181	119	246	149	121	100	95	89	75	50	101	68	35
USSR	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VENEZUELA	117	112	110	129	183	113	142	113	234	155	155	151	154	42	47	79	43	73	117	110	110	96	0
NEI_1 .	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	46	50	50	50	50
NEI-28 .	10	17	20	8	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SOUTH ATLANTIC	**616**	**767**	**624**	**522**	**534**	**422**	**415**	**442**	**319**	**471**	**829**	**680**	**879**	**920**	**1408**	**1196**	**1334**	**813**	**937**	**1293**	**929**	**1036**	**569**
-LONGLINE . .	*616*	*742*	*621*	*520*	*530*	*419*	*340*	*442*	*308*	*471*	*825*	*654*	*870*	*831*	*1332*	*1152*	*1311*	*799*	*915*	*1292*	*923*	*624*	*569*
OTHER & UNCL.	*0*	*25*	*3*	*2*	*4*	*3*	*75*	*0*	*11*	*0*	*4*	*26*	*9*	*89*	*76*	*44*	*23*	*14*	*22*	*1*	*6*	*412*	*0*
ARGENTINA	2	2	2	0	0	0	0	0	0	0	4	4	0	0	8	9	6	0	0	0	0	0	0
BRASIL	32	68	275	175	133	58	100	76	81	61	87	143	93	149	204	205	377	211	301	91	105	75	105
BZ-SH-OB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0
CHINESE TAIPEI	382	377	119	198	155	145	136	227	87	124	172	196	613	565	979	810	790	506	493	1080	726	420	328
CUBA	55	38	57	127	205	212	116	45	112	153	216	192	62	24	22	6	10	10	0	0	0	0	0
GABON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	406	0
GHANA	0	0	0	0	0	0	0	0	0	0	0	22	6	88	68	31	17	14	22	1	2	1	0
HO-SH-OB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0
JAPAN	14	3	26	14	15	7	25	27	17	24	81	73	74	76	73	92	77	68	49	51	26	32	31
KOREA	109	220	111	5	24	0	36	57	9	44	225	34	25	17	53	42	56	1	4	20	20	52	18
URUGUAY	0	0	0	0	0	0	1	10	13	65	44	16	6	1	1	1	1	3	0	0	0	0	0
USA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	37
USSR	6	0	3	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NEI_1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	68	50	50	50	50
NEI-28	16	59	31	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

EX-WHM-Table 1. Reported landings (MT) of Atlantic white marlin 1975-1997

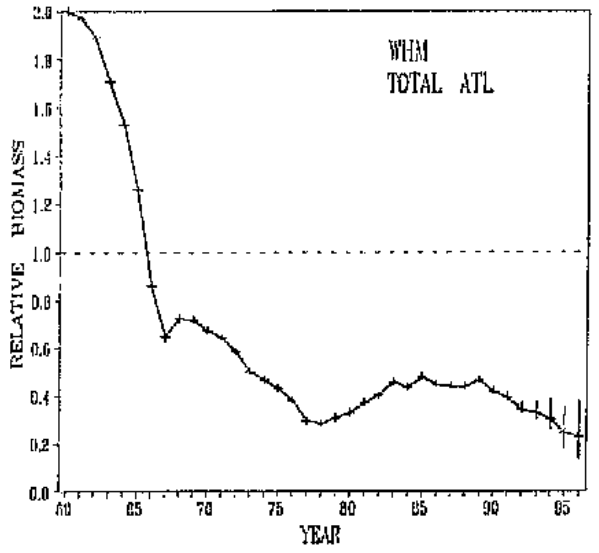
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
UNCL. REGION .	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**2**	**0**	**0**	**7**	**4**	**5**	**8**	**3**	**4**
-LONGLINE . .	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*0*	*2*	*0*	*0*	*7*	*4*	*5*	*8.*	*0*	*4*
OTHER & UNCL.	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*3*	*0*
BZ-SH-OB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
EC-ESPANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	*	0
HO-SH-OB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
KOREA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
ST.VINCENT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	*	*	*	0
USA	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	7	4	5	8	3	0

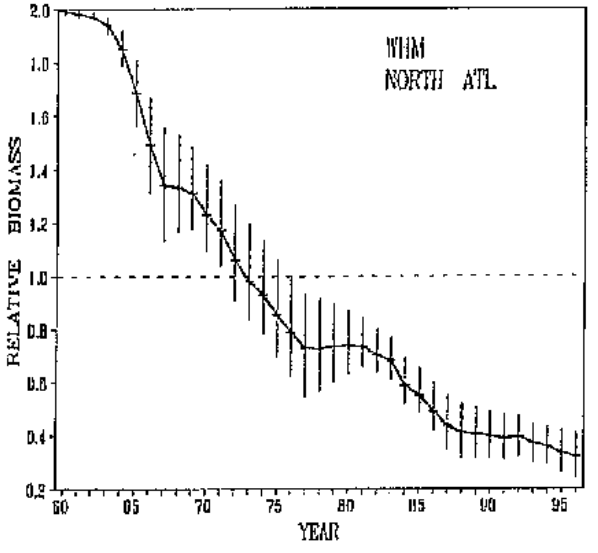


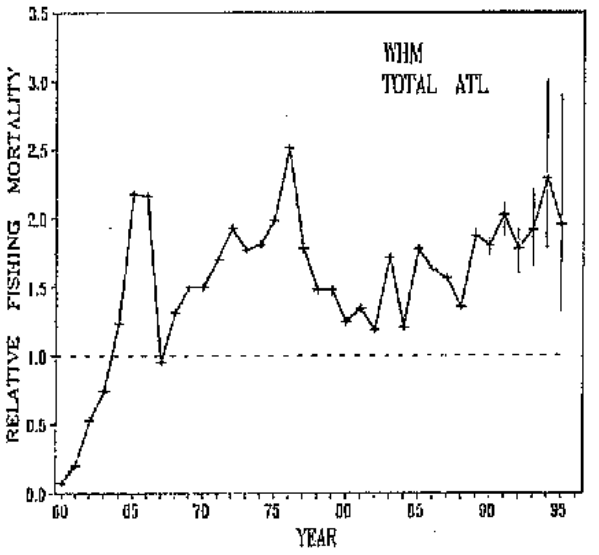
WHM-Fig. 1. Distribution of white marlin catches throughout 1950-1994

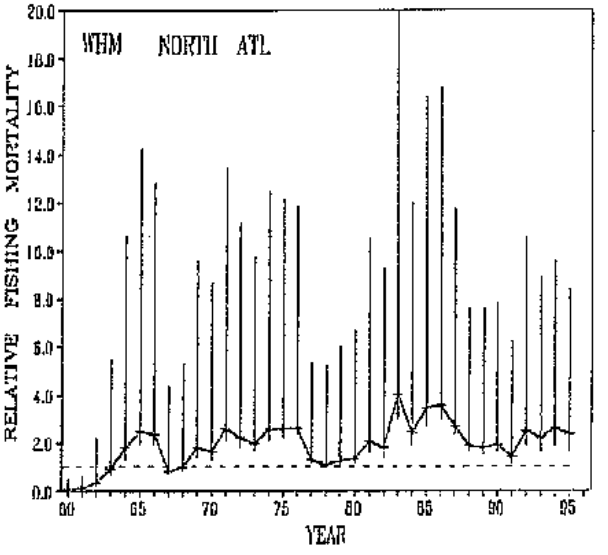


WHM-Fig. 2. Task I catches (MT) of white marlin by regions, 1950-1997, (1997 catches were incomplete, therefore 1997 points were not connected to the prior time series).



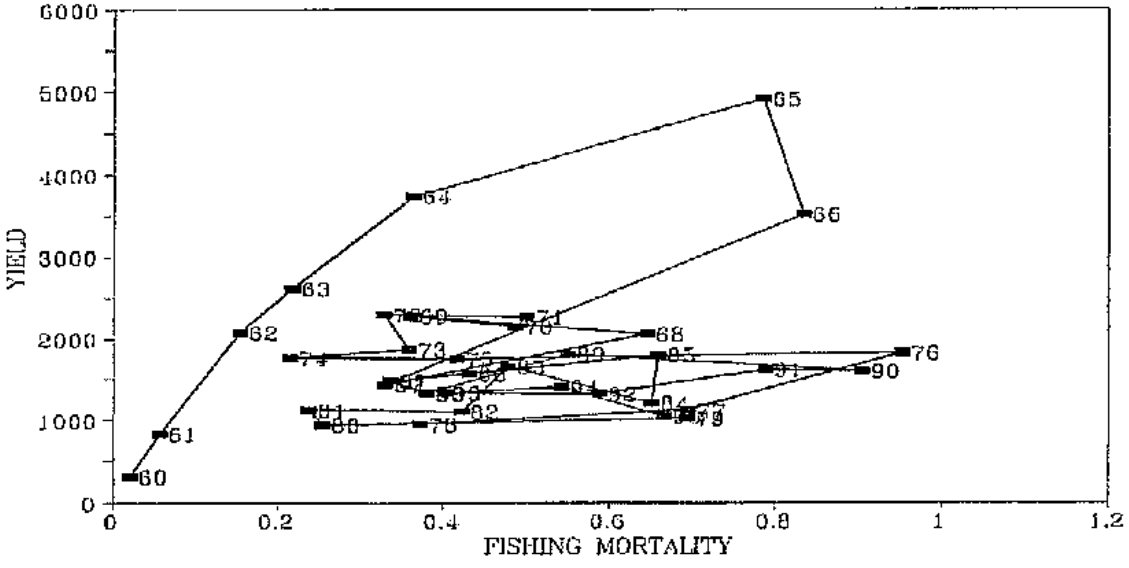






WHM-Fig. 3. Bootstapped (1000 trials) median relative biomass and relative fishing mortality for white marlin fisheries from the north Atlantic with approximate nonparametric 80% confidence intervals from the estimating procedure. Other sources of error are not quantified.

WHM-Fig. 4. Bootstapped (1000 trials) median relative biomass and relative fishing mortality for white marlin fisheries from the north Atlantic with approximate nonparametric 80% confidence intervals from the estimating procedure. Other sources of error are not quantified..



WHM-Fig. 5. Yearly catch vs. fishing mortality for white marlin under the total Atlantic Ocean stock hypothesis.

SAI -- SAILFISH/SPEARFISH

SAI-1. BIOLOGY

Since longline catches of sailfish and spearfish have been reported together in ICCAT landing statistics (except for Japan since 1994), these species will be summarized together for the purposes of this report. Sailfish and spearfish have a circum-tropical distribution **(SAI-Figure 1)**. Although sailfish have high concentrations in coastal waters (more than any other istiophorid), they are still found in oceanic waters. Spearfish are most abundant in offshore waters. Tag returns for sailfish/spearfish have not demonstrated trans-Atlantic or trans-Equatorial movements. Although sailfish and spearfish are generally considered to be rare and solitary species relative to the schooling scombrids, sailfish are the most common Atlantic istiophorid and are known to occur along tropical coastal waters in small groups consisting of at least a dozen individuals. Spearfish are generally the rarest Atlantic istiophorid, even in the offshore catches. The stock hypotheses for sailfish/spearfish assessment purposes are a western Atlantic and eastern Atlantic stock (divided at 30º W).

Sailfish and spearfish are generally considered piscivorous, but also have been known to consume squid. They are found predominately in the upper reaches of the water column and are typically caught together most frequently as a bycatch of the offshore longline fisheries. However, in coastal waters, artisanal fisheries using many types of shallow water gear target sailfish.

Sailfish spawn in tropical and subtropical waters in the spring through summer. Due to their relative rare abundance in offshore waters, virtually nothing is known about spearfish reproduction. Both sailfish and spearfish are considered to be very fast growing, although sailfish and spearfish are probably the slowest growing Atlantic istiophorids. Female sailfish grow faster and reach a larger maximum size than males.

SAI-2. DESCRIPTION OF FISHERIES

The fisheries in the west and east Atlantic for sailfish/spearfish are both characterized by participants from many different countries. For example, the recent major catches of sailfish in both the western and eastern Atlantic result from the artisanal fisheries. In the west Atlantic, the primary artisanal fisheries are from many countries in the Caribbean sea, whereas in the east Atlantic major artisanal fisheries are off west Africa (primarily Ghana, Senegal, Cote d'Ivoire, and others). Directed recreational fisheries for sailfish occur in the west Atlantic from the United States, Venezuela, Bahamas, Brazil, Dominican Republic, Mexico, and other countries in the Caribbean Sea. Directed recreational fisheries for sailfish in the east Atlantic also exist off west Africa in Senegal. Prior to the 1970's, the major sailfish/spearfish landings were a result of the bycatch from the offshore longline fisheries. The offshore longline fisheries in the west and east Atlantic include those from Brazil, Japan, Korea, Cuba, and Chinese Taipei. Development and geographical expansion of other longline fisheries in the west (by the U.S.) and east (by Spain) also include a bycatch of sailfish/spearfish. Mediterranean spearfish are usually a by-catch from longline and driftnet fisheries from a number of Mediterranean countries. Some occasional catches of spearfish are also made by a direct harpoon fishery.

Landings for the total Atlantic first developed in the early 1960`s, reached a peak of almost 3,000 MT in 1965, declined to about 1,600 MT by 1973, reach an historical peak of 6,100 MT in 1976, then fluctuated between 2,000 to 4,000 MT through 1996. Unfortunately, landings data are incomplete for 1997 because 15 percent of country/areas strata that reported landings in 1996 failed to report their 1997 landings (**SAI-Table 1 and Figure 2**). Landings for the east Atlantic generally paralleled the total Atlantic increasing trend, whereas the landings in the west were steady over the last decade. It should be noted that a significant segment of the landings between 1965 and 1983 were listed as unclassified regions. During the Third ICCAT Billfish Workshop data preparatory meeting (Miami, FL, July 1996) these data were partitioned into either the west or east Atlantic. However, the Committee continues to recognize that some uncertainties of the landings data, particularly in the east Atlantic, still persist. The overall trend in Atlantic landings are very much governed by the large landings from artisanal fisheries off of west Africa.

SAI-3. STATE OF STOCKS

No new stock assessment was submitted to the 1998 SCRS for Atlantic sailfish/spearfish. The most current assessment for west Atlantic sailfish/spearfish was submitted to the SCRS in 1993 and these analyses included data through 1991. The general results from these exploratory analyses using a non-equilibrium production model indicated that biomass trends had declined to fully exploited or over exploited levels, particularly near the end of the time series **(SAI-Figures 3 and 4)**. Maximum sustainable yield was estimated from production model analyses for the west Atlantic to be about 700 MT, whereas landings for 1996, the most recent year landings were fully reported, were about 886 MT. Biomass in 1992 was estimated to be 62% of the biomass needed to produce MSY. Statements about the current yield are inappropriate due to incomplete landings reported for 1997.

The most current assessment for east Atlantic sailfish/spearfish was submitted during the 1997 SCRS and this analysis, using a non-equilibrium production model, included data through 1995. The Working Group decided to exclude the Japanese longline CPUE from the current analysis because of the mixing of spearfish in the sailfish catch for the early part of the time series and changes in gear, deployment locations, target species, and reduced reports of sailfish landings in the most recent part of this time series. The general results from these exploratory analyses, using the artisanal fisheries as the primary index of abundance, indicated that biomass trend had declined to fully exploited levels near the end of the time series **(SAI-Figures 5 and 6)**. Maximum sustainable yield was estimated from the production model analyses for the east Atlantic to be about 1,390 MT, whereas landings for 1996 are about 1,332 MT. Biomass in 1996 was estimated to be 88% of the biomass needed to produce MSY. Similar statistics for 1997 cannot be developed because of incomplete landings for 1997**.**

SAI-4. OUTLOOK

The Committee remains concerned about the downward trend in the indices of abundance and the biomass trajectories for western Atlantic sailfish, which indicate the stock has declined to fully exploited or over-exploited levels. The reported landings for west Atlantic sailfish since 1992 were considerably higher than the replacement yield (about 600 MT) and therefore the stock biomass are expected to have continued to decline. However, landings for 1997 were incomplete and therefore statements on current stock status are inappropriate, particularly since the most recent western Atlantic assessment was conducted in 1992.

The Committee is encouraged by the increase in information on eastern Atlantic sailfish (particularly standardized artisanal indices of abundance) but also recognizes continued improvement is still necessary. The Committee feels that the most recent assessment results (1995), which indicate the stock is likely fully exploited (more optimistic than for the west Atlantic), reflect the improvements to this data base. The Committee was also unanimous in its conclusion that the west African artisanal indices of abundance best describe populations trends for this stock hypothesis. The reported landings for east Atlantic sailfish in 1996 (1906 MT) are higher than the replacement yield (about 1,473 MT) and therefore the stock biomass are expected to decline further.

SAI-5. EFFECT OF CURRENT REGULATIONS

No ICCAT regulations are currently in effect for Atlantic sailfish/spearfish.

See section in the Blue Marlin Executive Summary Report.

SAI-6. MANAGEMENT RECOMMENDATIONS

The most recent stock assessments for eastern Atlantic (1995) and particularly western Atlantic sailfish (1992) indicate that this species is at least fully exploited or possibly over-exploited and warrants consideration for development of methods to reduce fishing mortality rates. The need for a stock assessment meeting, previously referenced for blue and white marlin, also applies to sailfish as well. See Blue Marlin Executive Summary Report.

ATLANTIC SAILFISH SUMMARY

	West Atlantic[1]	*East Atlantic*
Maximum Sustainable Yield (MSY)	~ 700 MT	1,390 MT
Current (1997) Yield	Incomplete	Incomplete
Current (1992/95) Replacement Yield	~ 600 MT	1,473 MT
Relative Biomass ($B_{1992/95}/B_{MSY}$)	~ 0.62	0.87
Relative Fishing Mortality: $F_{1991/95}/F_{MSY}$	~ 1.4	1.3
Management Measures in Effect	None	None

[1] Model D4

EX-SAI-Table 1. Reported landing (MT) of Atlantic sailfish, by flag, 1975-1997

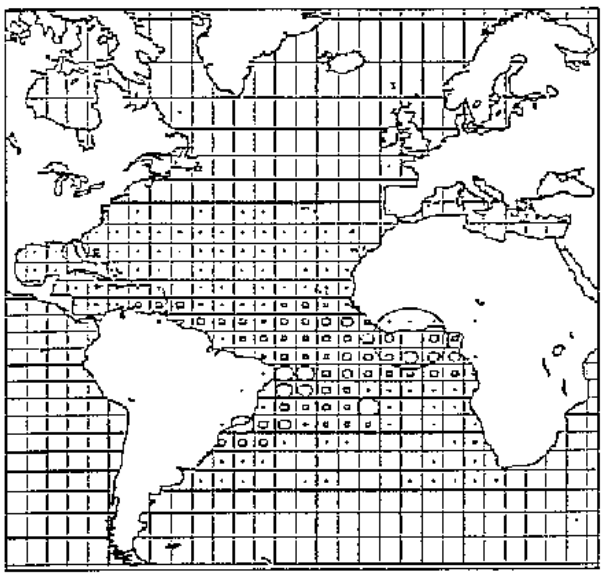
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
TOTAL	**5873**	**6132**	**2076**	**2937**	**3784**	**2574**	**2458**	**3330**	**3961**	**3175**	**2972**	**2720**	**3089**	**2490**	**1972**	**2710**	**2111**	**2580**	**3144**	**2103**	**2238**	**2813**	**1830**
EAST ATLANTIC	**5081**	**5319**	**1144**	**2142**	**2881**	**1667**	**1627**	**2355**	**3188**	**2138**	**1964**	**1702**	**2172**	**1629**	**1229**	**1723**	**1299**	**1552**	**2035**	**1041**	**1417**	**1906**	**1405**
LONGLINE	*233*	*599*	*220*	*114*	*83*	*151*	*202*	*309*	*270*	*224*	*148*	*140*	*112*	*98*	*152*	*153*	*46*	*45*	*492*	*167*	*223*	*136*	*57*
ROD & REEL	*61*	*76*	*93*	*79*	*77*	*62*	*88*	*69*	*49*	*41*	*25*	*45*	*73*	*46*	*37*	*51*	*47*	*45*	*60*	*50*	*34*	*52*	*0*
TROLLING.	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*9*	*45*	*99*	*53*	*29*	*147*	*172*	*26*	*75*	*72*	*168*
OTH.&UNC GEARS	*4787*	*4644*	*831*	*1949*	*2721*	*1454*	*1337*	*1977*	*2869*	*1873*	*1791*	*1516*	*1978*	*1440*	*941*	*1466*	*1177*	*1315*	*1311*	*798*	*1085*	*1646*	*1180*
BENIN	0	0	0	0	0	0	36	48	0	53	50	25	32	40	8	21	20	21	20	20	20	19	0
COTE D'IVOIRE	0	0	0	0	0	0	0	0	0	40	40	40	40	67	55	62	40	71	44	60	71	196	196
CAP VERT	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CHINESE TAIPEI	25	217	59	7	19	5	12	67	20	8	9	1	0	0	7	13	0	0	420	101	155	65	29
CUBA	110	185	65	69	40	79	79	158	200	115	19	55	50	22	53	61	184	200	77	83	72	533	0
EC-ESPAÑA	0	0	0	0	0	0	0	10	0	4	7	9	**	**	14	**	**	**	**	**	**	0	0
EC-PORTUGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0
GABON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	109	7
GHANA	4726	4517	764	1885	2691	1191	891	1426	2408	1658	1485	925	1392	837	462	395	463	297	693	450	353	303	303
JAPAN	38	4	24	11	19	33	50	38	47	63	84	71	37	57	57	63	16	42	58	45	52	47	13
KOREA	46	165	46	18	5	34	24	33	3	34	29	2	20	15	17	16	30	3	3	6	6	14	5
SENEGAL	122	189	160	143	107	325	498	572	510	163	241	572	596	587	552	1092	546	917	636	260	678	610	842
USSR	7	1	13	5	**	0	37	0	0	0	0	2	5	4	4	0	0	0	0	0	0	0	0
NEI_1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	15	10	10	10
NEI-28	7	41	13	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WEST ATLANTIC	**792**	**813**	**932**	**795**	**903**	**907**	**831**	**975**	**773**	**1037**	**1008**	**1018**	**917**	**861**	**743**	**987**	**809**	**1020**	**1107**	**1061**	**820**	**905**	**425**
LONGLINE	*496*	*437*	*395*	*279*	*378*	*360*	*408*	*471*	*320*	*512*	*506*	*489*	*493*	*615*	*474*	*444*	*297*	*396*	*631*	*536*	*323*	*338*	*207*
ROD & REEL	*258*	*266*	*339*	*338*	*350*	*368*	*336*	*331*	*312*	*352*	*228*	*234*	*237*	*38*	*31*	*29*	*32*	*50*	*38*	*73*	*15*	*1*	*1*
OTH&UNC GEAR	*38*	*110*	*198*	*178*	*175*	*179*	*87*	*173*	*141*	*173*	*274*	*295*	*187*	*208*	*238*	*514*	*480*	*574*	*438*	*452*	*482*	*566*	*217*
ARUBA	10	20	20	30	30	30	30	30	30	30	30	30	23	20	16	13	9	5	10	10	10	10	0
BARBADOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69	45	29	42	50	46	74	25	59
BRASIL	76	186	287	246	201	231	64	153	60	121	187	292	174	152	147	301	90	351	243	128	245	310	137
CHINESE TAIPEI	28	126	5	10	18	36	81	22	31	45	39	64	31	300	171	83	73	33	223	233	38	37	17
CUBA	152	0	91	51	151	119	134	181	28	169	130	50	171	78	55	126	83	70	42	46	37	37	0
DOMINICAN REP.	0	0	0	0	0	0	0	22	50	49	46	18	40	44	44	40	31	98	50	90	40	40	0
GRENADA	**	**	31	37	40	31	36	27	37	66	164	211	104	114	98	218	316	310	246	151	119	56	83
JAPAN	112	133	23	9	20	22	44	135	22	34	38	28	6	22	22	25	73	1	2	8	2	4	17
KOREA	63	0	65	14	19	51	41	19	0	52	72	14	1	0	17	25	0	3	0	8	8	22	8
MEXICO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	19	19	0	9

EX-SAI-Table 1. Reported landing (MT) of Atlantic sailfish, by flag, 1975-1997

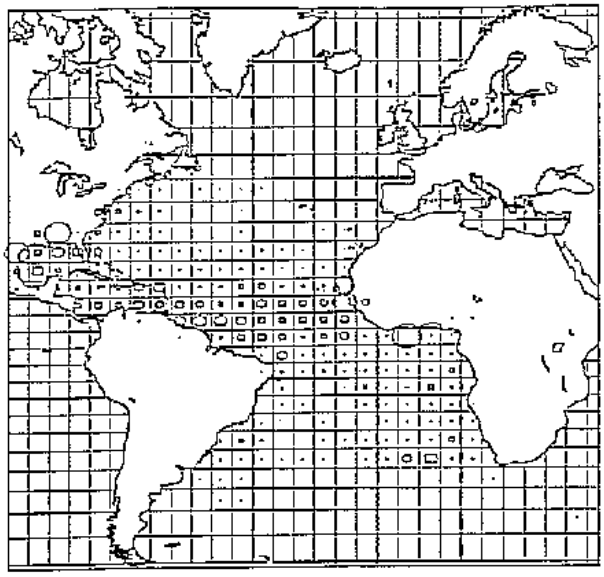
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
NLD.ANTILLES	28	28	28	21	21	21	21	21	21	21	10	10	10	10	10	10	10	10	15	15	15	15	0
ST.VINCENT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	4	4	4	2	1	3
TRINIDAD & TOB	0	0	0	0	0	0	0	0	64	58	14	25	35	24	11	9	4	4	55	100	100	100	5
USA	254	261	308	308	308	308	308	308	311	311	197	199	242	75	59	66	66	43	70	73	39	70	57
VENEZUELA	60	59	56	66	93	58	72	57	119	81	81	77	80	22	24	24	24	46	64	100	42	148	0
NEI_1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	30	30	30	30
NEI-28	9	0	18	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UNCL. REGION	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**8**	**2**	**1**	**1**	**2**	**0**
LONGLINE	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*3*	*8*	*2*	*1*	*1*	*0*	*0*
OTH&UNC GEAR	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*2*	*0*
CHINESE TAIPEI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
JAPAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
USA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	8	2	1	6	2	0
NEI-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

EX-SPF-Table 1. Nominal landings of spearfish 1975-1997

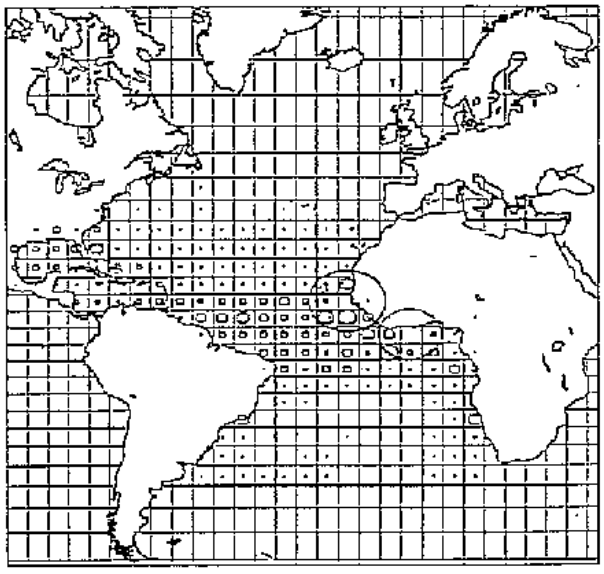
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**54**	**75**	**10**	**40**	**1**	**0**	**0**	**122**	**38**	**35**	**32**	**31**
EAST ATLANTIC	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**33**	**0**	**0**	**0**	**58**	**36**	**26**	**25**	**30**
LONGLINE	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*33*	*0*	*0*	*0*	*58*	*36*	*26*	*25*	*30*
EC-ESPANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33	**	**	**	**	**	**	0	0
JAPAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	58	36	26	25	30
WEST ATLANTIC	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**54**	**75**	**10**	**7**	**1**	**0**	**0**	**64**	**2**	**7**	**5**	**1**
LONGLINE	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*54*	*75*	*10*	*7*	*1*	*0*	*0*	*64*	*2*	*7*	*5*	*1*
ROD & REEL	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
JAPAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	3	4	1
TRINIDAD & TOBAGO	0	0	0	0	0	0	0	0	0	0	0	54	75	10	7	1	0	0	62	0	0	0	0
USA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0
UNCL. REGION	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**2**	**0**
LONGLINE	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*2*	*0*	*0*
OTHER & UNCL. GEARS	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*2*	*0*
USA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0



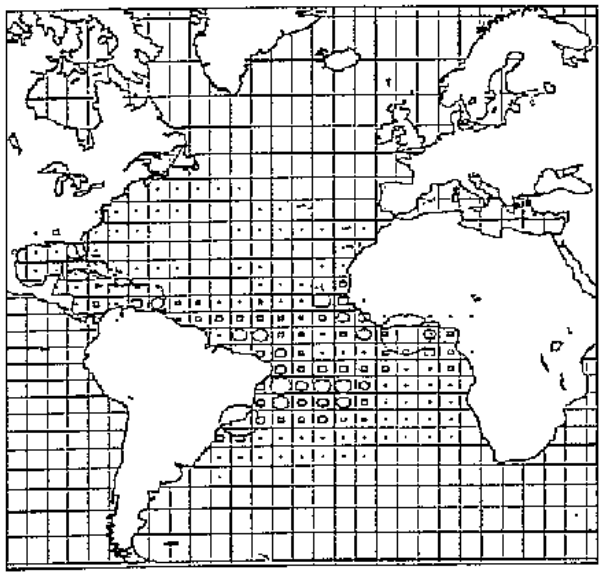
1st Quarter



3rd Quarter

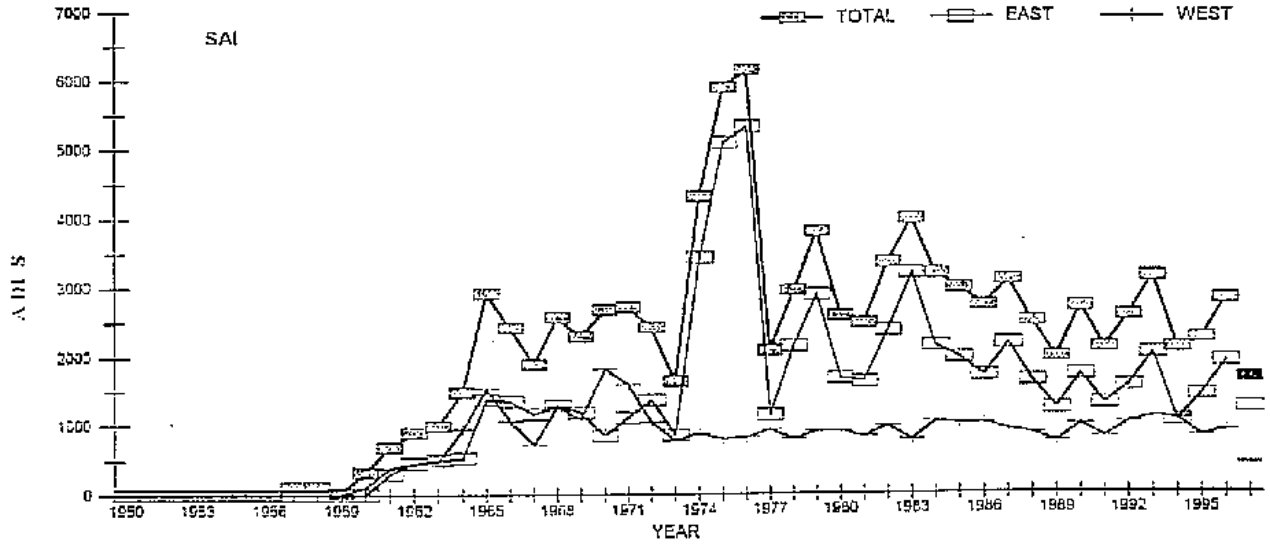


2nd Quarter

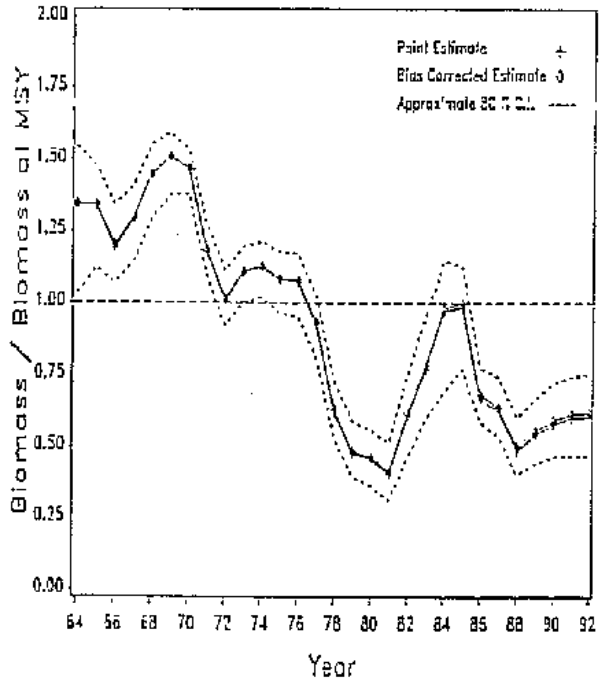


4th Quarter

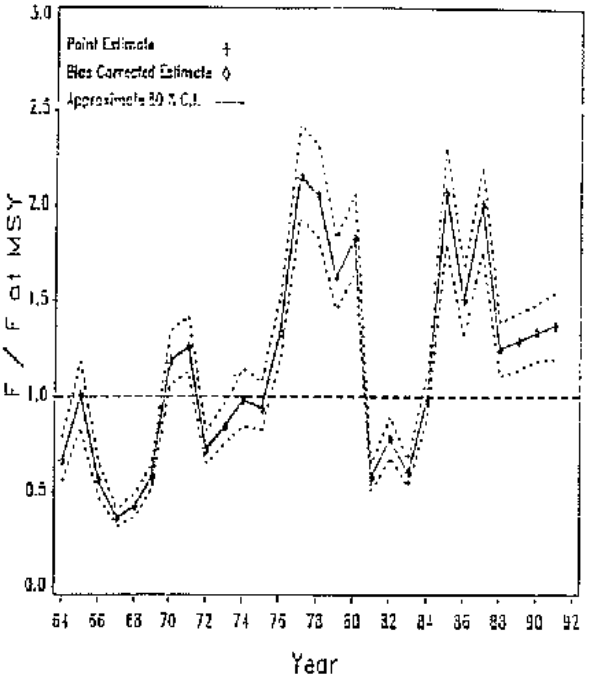
SAI-Fig. 1. Distribution of sailfish catches throughout 1950-1994



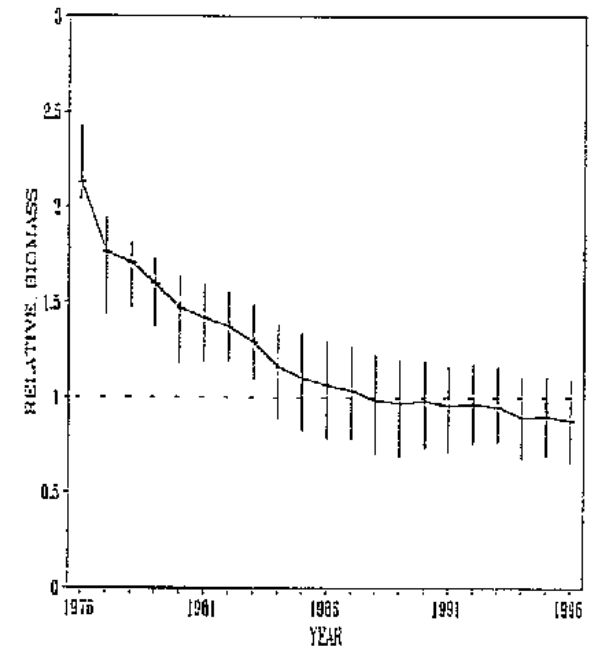
SAI-Fig. 2. Task I catches (MT) of sailfish including spearfish by regions, 1950-1997 (1997 catches were incomplete, therefore the 1997 points were not connected to the prior time series.



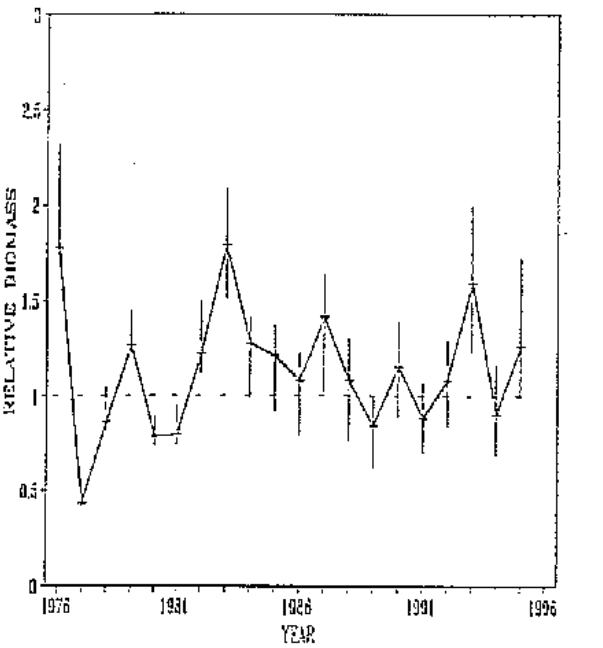
SAI-Fig. 3. Bootstrapped annual relative biomass (= B_t/B_{msy}) from the ASPIC models fitted to west Atlantic sailfish catch and effort information. Confidence intervals are from the estimation procedures and are based on 1000 trials. Other sources of errors are not quantified. Annual values for the first two years are omitted due to extreme imprecision. (1993 SCRS Report).



SAI-Fig. 4. Bootstrapped annual relative fishing mortality (= F_t/F_{msy}) from the ASPIC models fitted to west Atlantic sailfish catch and effort information. Confidence intervals are from the estimation procedures and are based on 1000 trials. Other sources of errors are not quantified. Annual values for the first two years are omitted due to extreme imprecision. (1993 SCRS Report).



SAI-Fig. 5. Bootstrapped annual relative biomass trajectory (B_t/B_{msy}) for east Atlantic sailfish from non-equilibrium production method fits. 80 % confidence limits are from the estimation procedures and are based on 1000 trials. Other sources of errors are not quantified.



SAI-Fig. 6. Bootstrapped annual relative fishing mortality trajectory (F_t/F_{msy}) for east Atlantic sailfish from non-equilibrium production method fits. 80 % confidence limits are from the estimation procedures and are based on 1000 trials. Other sources of errors are not quantified.

SWO-ATL – A T L A N T I C S W O R D F I S H

No new Atlantic stock assessment was conducted in 1997 or 1998. This report updates the description of fisheries, current regulations, and comments on the 1996 and 1997 CPUE in the state of the stocks section. Other sections, and the conclusions of the Committee, remain unchanged from the 1996 report. During the Bermuda Inter-sessional (SCRS/98/18) and subsequent Species Group Meeting (SCRS/98/det rep), the methods for conducting the 1999 sex-specific analyses for the north stock were established. The methods for assessing the south stock will be established during an April 1999 Inter-sessional.

SWO-ATL-1. Biology

Swordfish are distributed widely in the Atlantic Ocean and Mediterranean Sea, and range from Canada to Argentina on the western side, and from Norway to South Africa on the eastern side (**SWO-Figure 1**). The management units for assessment purposes are a separate Mediterranean group, and North and South Atlantic groups separated at 5ºN. There is uncertainty as to whether the management units used correspond to the biological stock units.

Swordfish feed on a wide variety of prey including groundfish, pelagics, deep-water fish and invertebrates. They are believed to feed throughout the water column, following the diel migration of the deep-scattering layer by maintaining their position within a preferred level of illumination (isolume). They are typically caught on pelagic longlines at night when they feed in surface waters.

Swordfish spawn in the warm tropical and subtropical waters throughout the year. They are found in the colder northern waters during summer months. Young swordfish grow very rapidly, reaching about 140 cm LJFL (lower jaw-fork length) by age 3, but grow slowly thereafter. Females grow faster than males and reach a larger maximum size. Swordfish are difficult to age, but the females are considered mature by age 5.

SWO-ATL-2. Description of fisheries

Directed longline fisheries in Spain, the United States and Canada have operated since the late 1950s or early 1960s, and harpoon fisheries have existed since the late 1800s. The Japanese tuna longline fishery started in 1956 and has operated throughout the Atlantic since then, with substantial catches of swordfish that are produced as a by-catch in their tuna fisheries. There are other directed swordfish fisheries (i.e., Brazil, Portugal, Venezuela, Morocco and Uruguay) and by-catch or opportunistic fisheries which take swordfish (i.e. Chinese Taipei, Korea, France and Brazil). The SCRS scientists believe that ICCAT Task I landings data provide minimum estimates because of unreported landings from vessels flying flags of convenience and from other sources including member and non-member nations.

The total Atlantic reported catch of swordfish (north and south, including discards) reached an historical high of 37,975 MT in 1995, 11% higher than the previous peak catch of 34,176 MT in 1989 **(SWO-Table 1 and SWO-Figure 2**). The 1997 reported catch was 30,526 MT. As a few of countries have not yet reported their catches, this value should be considered provisional and subject to revision.

From 1989 to 1996, the North Atlantic reported catch has averaged about 16,000 MT **(SWO-Table 1 and SWO-Figure 2)**, although the 1997 landings were reduced to 12,510 MT in response to ICCAT regulatory recommendations. In 1997, Spain and the U.S. have decreased their peak north Atlantic landings, by 54% since 1987 and by 53% since 1989, respectively, in response to ICCAT recommendations. If the U.S. discards are counted, the total U.S. landings and discards have declined by 46% from the peak catch level of 1989. Reduced landings have also been attributed to shifts in fleet distributions, including movement of some vessels out of the Atlantic. In addition, some fleets, including the United States, Spain and Canada, have changed operating procedures to opportunistically target tuna and/or sharks, taking advantage of market conditions and higher relative catch rates.

The South Atlantic reported catch was relatively low (generally less than 5,000 MT) until the early 1980s. Since then, landings have increased continuously through the 1980s and 1990s to a peak of 21,423 MT in 1995, followed by a 18% reduction to 17,544 MT in 1997, levels that match peak north Atlantic harvests. Since 1988, reported landings have exceeded 12,000 MT. The historic peak in reported landings for 1995 was 24% higher than reported landings in 1990 (17,215 MT). The increase in landings was in part the result of progressive shifts of fishing effort to the south Atlantic, primarily from the north Atlantic, as well as other waters.

SWO-ATL-3. State of stocks

In 1997, updated north and south Atlantic CPUE data (1996) were examined and show similar trends to those in recent years. In 1998, most updated north CPUE data (1997) also show similar trends with one important exception--the recruitment index used in the last assessment shows substantially improved recruitment in 1997. This improvement, should it prove to be real, could allow for increases in spawning biomass in the future (2001 and thereafter), and a more optimistic outlook than indicated in Section SWO-ATL-4, if this year-class is not heavily harvested until after it is allowed to grow to spawning size. Updated 1997 South Atlantic CPUE generally show a downward trend. As no full assessment has been conducted since 1996, the following text is unchanged from that time.

North: In 1996, the status of the North Atlantic swordfish resource was assessed using both non-equilibrium stock production models and virtual population analyses (VPA) based on catch **(SWO-Table 1)** and CPUE data through 1995. The relationship between catches and standardized fishing effort is shown in **SWO-Figure 3.** The current base case assessments indicate that the North Atlantic swordfish resource has continued to decline despite reductions in total reported landings from peak values in 1987 **(SWO-Figure 4)**. Although some fleets have reduced their catch levels and partial fishing mortality by a substantial amount, it is apparent that these have not resulted in reductions in the overall fishing mortality rate because recent landings have exceeded surplus production. The decline in stock size is reflected in declining CPUE's for several fisheries. An updated estimate of maximum sustainable yield from production model analyses is 13,000 MT (with estimates ranging from 5,300 to 16,500 MT). Since 1982, only in one year (1984) have north Atlantic swordfish catches been less than 13,000 MT; preliminary estimates of catches in 1995 were about 16,900 MT.

The biomass at the beginning of 1996 was estimated to be 58% (range: 41 to 104%) of the biomass needed to produce MSY. The 1995 fishing mortality rate was estimated to be 2.05 times the fishing mortality rate at MSY (range: 1.07 to 3.82). The replacement yield for 1996 was estimated to be about 11,300 MT. Preliminary landings in 1995 and anticipated landings in 1996 are expected to exceed this level substantially; thus, it is likely that the stock will decline further.

Overall, the virtual population analyses conducted for North Atlantic swordfish in 1996 were consistent with the non-equilibrium stock production model results, particularly in terms of the trends in population trajectories. The Base Case VPA point estimates for age 1 gradually increased in the early 1980s, shifting to a higher level in 1985 to 1989. Subsequently, recruitment (age 1) shifted to a lower level between 1990 and 1993, before increasing in the last two years (1994 and 1995). However, estimates of recent recruitment are less precise. The age 2 abundance trend mimics the age 1 trend with the appropriate one year lag, but the pattern is less pronounced. Ages 3 and 4 estimated abundance trends from the VPA were variable during the initial years of the time series with a decline in the most recent years (although again these most recent estimates are less precise). Estimated abundance of older fish (ages 5+) declined to about one third from 1985 to 1995. While there has been a general decrease in fishing mortality rates for age 1 swordfish since 1988, all other fishing mortality rates (for ages 2, 3, 4, and 5+) have increased to peak levels, equal to or exceeding levels estimated for 1988. Estimated fishing mortality rates declined slightly from 1988 to 1991 for ages 2, 3, and 4, but have since continually increased. A preliminary virtual population analysis of catch from 1985-1995 aged by one set of sex-specific growth models (using an alternate growth curve from the Base Case), resulted in lower estimates of fishing mortality rates. While the assumption of sex-specific growth is, in principle, more biologically realistic than the 1:1 sex ratio assumed in the Base Case VPA, the Committee is uncertain that the 1996 sex-specific results will prove to be robust to factors the Committee has not had time to adequately investigate (including the effects of growth curve assumptions and sex-ratio estimates). Current fishing mortality rate estimates from the base case are well above common biological reference points obtained from yield per recruit analyses. Additionally, the long-term adult biomass per recruit corresponding to the current fishing mortality rate is very low. Given the fishing mortality pattern from the Base Case VPA in the north, the adult biomass per recruit would result in a level of about 2 percent of the maximum in equilibrium. This is well below the level which is commonly considered to result in risks of recruitment over-fishing in other stocks.

South and total: Previous Committees expressed serious concern about the stock status in the south Atlantic and total Atlantic based on the pattern of high and apparently increasing catches and declining CPUE trends in both the north and in several south Atlantic CPUE indices. The Committee is less certain if the CPUE series used are the most accurate indicators of resource abundance in the south due to factors that have not yet been investigated. However, for the first time, a quantitative assessment for the south Atlantic swordfish stock assumption was conducted, yielding preliminary results **(SWO-Figure 5)**. These assessment results quantify the reason for concern. Although biomass at the beginning of 1996 was estimated to be 99% (range: 82 to 118%) of the biomass needed to produce MSY, the 1995 fishing mortality rate was estimated to be 1.24 times the fishing mortality rate at MSY (range: 0.94 to 1.93), and the surplus production (estimated replacement yield) for 1996 was estimated to be about 14,600 MT (based on preliminary analyses). Reported landings in 1995 (about 20,600 MT) and 1996 (about 18,000 MT) have exceeded this level; thus, it is likely that the stock will decline further. If a total Atlantic stock was assumed, it is unlikely that the view of the status of the stock would be improved from that of the north or south Atlantic status. The Committee expressed concern about the uncertainty of the stock structure of Atlantic swordfish and the possibility that the assumed north Atlantic stock does not include the entire catch from the

biological stock. When boundaries are uncertain, in this case because of limited or imprecise data, it is important to implement appropriate measures which encompass several possible stock assumptions.

SWO-ATL-4. Outlook

Projections of north Atlantic swordfish based upon VPA's and age-structured and age-lumped non-equilibrium production models were conducted in order to evaluate the effects of possible management scenarios. These indicate that large reductions in yield and fishing mortality rate would be required to rebuild the stock in the short and medium term. Projections also indicate that the 1995 catch (estimated at approximately 17,000 MT) and anticipated 1996 catch levels are not sustainable and there is a 90% probability of radical reduction by the year 2000 (assuming it is possible to exert a high enough fishing mortality rate to maintain a constant catch at current levels as the stock declines). Even if future catches were maintained at the MSY level, the stock would be expected to exhibit further decline, since the stock is below that which would sustain MSY. Fishing at quota levels agreed to at the 1995 Commission meeting is projected to result in further stock declines since these levels are considerably above projected replacement yield levels. If catches in 1996 have been about 17,000 MT, the replacement yield for 1997 is likely to be about 8,000-12,000 MT.

The Committee noted that total swordfish biomass corresponding to MSY levels in the North Atlantic may not be achieved in 5 or 10 years without substantial reductions in catch from current levels. Further, unless recruitment increases substantially, a constant quota for a declining stock implies ever-increasing levels of fishing mortality and, therefore, over-exploitation. A large increase in recruitment is unlikely if the spawning stock size continues to decline and is unlikely on a sustained basis from any level of spawning biomass. The Committee noted that target fishing mortality rates are less risky than constant catches for rebuilding over-fished stocks. The target F's are usually translated into corresponding quotas which require adjustment after each assessment, depending on the status of the stock.

Results of the 1996 preliminary analyses of the South Atlantic indicate that current levels of harvest are not sustainable. These analyses indicated that replacement yield was estimated to be about 14,600 MT for 1996. Estimated catches for 1996 have exceeded this level and biomass is expected to decline further.

SWO-ATL-5. Current regulations

Tables 2 and 3 of the Detailed Report contain details on reported catch levels by fleet in relation to current regulations.

North catch limits. In the north Atlantic there were 1997 specific quotas for Bermuda (28.0 MT), Canada (1,130.0 MT), Japan (706.3 MT), Portugal (847.5 MT), Spain (4,661.3 MT), and USA (3,277.0 MT). The total allowable catch in the north Atlantic in 1997 was 11,300 MT. Reported landings exceeded this by 11% (1,210 MT). Of the six country-specific quotas, Bermuda (5 MT), Canada (1,089 MT) and the USA (2,988 MT) were within the quota in 1997. The remaining country-specific quotas were exceeded in 1997: Spain (5,137 MT; 10%), Portugal (903 MT; 7%), Japan (1,437 MT; 103%). It should be noted that Japan has a five-year carry-over provision in the ICCAT regulatory recommendation. The “other” category was 42% over the 678 MT catch limit.

South catch limits. In 1995, 1996 and 1997, catches for contracting parties exceeding 250 MT should not have exceeded 1993 or 1994 levels, whichever was higher. Those with catches less than 250 MT should not have exceeded that level. Given this open-ended regulation, the potential catches that could have been taken in 1997 for those countries presently fishing in the South Atlantic would have been 21,015 MT. Reported landings in 1997 were 17,544 MT. In 1997 Brazil (4,100 MT; 133%), Portugal (441 MT; 76%), Spain (8,461 MT; 7%), Uruguay (760 MT; 192%), and USA (396 MT; 58%) exceeded their catch limits. The Committee noted that the USA reported landings of 96 MT for their 1997 fishing year (1 June 1997 to 31 May 1998; SCRS/98/117).

Minimum size limits. There are two minimum size options which are applied to the entire Atlantic: 125 cm LJFL with a 15% tolerance or 119 cm LJFL with zero tolerance. Only Canada and the USA have adopted the latter. Canada, Japan, Spain, USA and Chinese Taipei provide catch-at-size data based on national sampling. Other nations are either partially or completely substituted from these data. The level of compliance of these countries is affected by the criteria used for these substitution procedures. In 1996, the percentage of swordfish landed less than 125 cm LJFL was about 22% (by number) overall for all nations fishing in the Atlantic. Both Canada and the USA have small fish landings (less than 2%) when the 119 cm LJFL criterion is used, however, both nations are well within the 125 cm limit (which includes the 15% tolerance). Of those nations that supply the size data to ICCAT, only Spain for the North (44.9%) landed large numbers of small swordfish in 1997 (and in previous years). Increases in these 1997 Spanish percentages could reflect increases in recruitment (Section SWO-ATL.3). For the south, there are no clear excesses in the catch of small fish from the data available, however, the information for the south is even more affected by the lack of size distribution data than the north. The Committee expressed concern about the high catches (landings plus discards) of small swordfish and the lack of and possible

inaccuracies of size data from many fisheries, and emphasized that gains in yield could accrue if fishing mortality on small fish could be further reduced.

In general, previous regulatory recommendations have not been effective in the recovery of Atlantic swordfish and the effects of more recent regulatory recommendations can not be evaluated until the 1999 stock assessment session. The Committee emphasized the need for *effective* management measures throughout the Atlantic, to ensure recovery of Atlantic swordfish and to account for the uncertainty associated with the swordfish stock structure assumptions. The unreported catches, for example non-member countries and flags of convenience fleets, are of considerable concern to the Committee, as these may undermine the assessments and attempts at effective regulations for conservation.

SWO-ATL-6. Management recommendations

North: The Committee recommends that the Commission, if it desires to rebuild the North Atlantic swordfish stock, must immediately reduce both fishing mortality rates and catch dramatically. The recommendations for regulatory measures adopted in 1990 and 1994 were introduced to reduce both catch and effort, but these reductions, although different among countries involved, have not arrested the decline in the stock. It is important to recognize that the failure to achieve sufficient overall reductions in fishing mortality since 1991 has resulted in the need for more severe reductions now and in the future to achieve recovery. The current catch levels are not sustainable. However, the state of the north Atlantic stock is not in such a depressed state that recovery cannot be realized in a reasonable time period. Immediate and appropriate actions can improve the status, given that estimated stock sizes are below biomass at MSY and given the resilient nature of swordfish. In order to arrest the declining trend, the analyses generally suggest that catches should not exceed about 10,000 MT. A preliminary sex-specific VPA indicated that a catch of about 12,000 MT might allow an increase to MSY levels; however the Committee reiterated the preliminary nature of this analysis. In order to allow for increase in stock biomass, the level of harvest needs to be immediately reduced below the level of replacement yield.

South: The SCRS is seriously concerned about the stock status in the south Atlantic based on the results of the preliminary south Atlantic production model and on the pattern of high catches and declining CPUE trends in some fisheries. The 1995 and 1996 catches in the south are the two highest on record, and at the level of peak catches previously observed in the north. The results of the preliminary analysis indicate that current levels of harvest are not sustainable. If the Commission intends to keep the stock in a healthy condition, it should not delay actions and harvest levels must be reduced, otherwise even more restrictive measures will be needed in the future. Provided that the preliminary results are correct, in order to allow for increase in stock biomass, the level of harvest needs to be immediately reduced below the level of estimated replacement yield.

Total: If a total Atlantic stock was assumed, it is unlikely that the view of the status of the stock would be improved from that of the north or south Atlantic status. Current catches are not sustainable and substantial reductions in harvest are required.

ATLANTIC SWORDFISH SUMMARY

	North Atlantic	*South Atlantic*
Maximum Sustainable Yield[1]	13,000 MT (5,300-16,500 MT)[3]	14,200 MT (5,200-16,900 MT)
Current (1997) Yield (preliminary)	12,961 MT	17,565 MT
Current (1996) Replacement Yield[1]	11,360 MT (7,120-16,710 MT)	14,620 MT (8,400-17,140 MT)
Relative Biomass (B_{1996}/B_{MSY})[1]	0.58 (0.41-1.04)	0.99 (0.82-1.18)
Relative Fishing Mortality:		
F_{1995}/F_{MSY}[1]	2.05 (1.07-3.82)	1.24 (0.94-1.93)
F_{1995}/F_{max}[2]	2.4	not estimated[4]
$F_{1995}/F_{0.1}$[2]	3.5	not estimated[4]
Management Measures in Effect	Country- specific quotas; 125/119 cm LJFL minimum size.	Limit catch to 1993 or 1994 levels ; 125/119 cm LJFL minimum size.

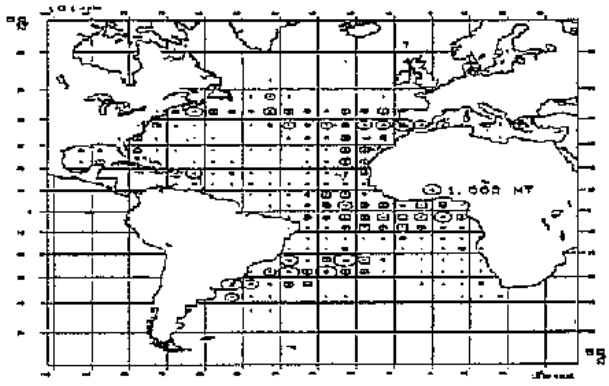
1 Base Case production model results based on catch data 1950-1995 (SWO-Table 1)
2 Base Case VPA results based on catch data through 1995 (SWO-Table 1)
3 80% confidence intervals are shown.
4 Production model results do not provide basis for these estimates.

SWO-Table 1. Reported catches (landings and discards) in MT of Atlantic swordfish by regions and major gears, 1974-1997

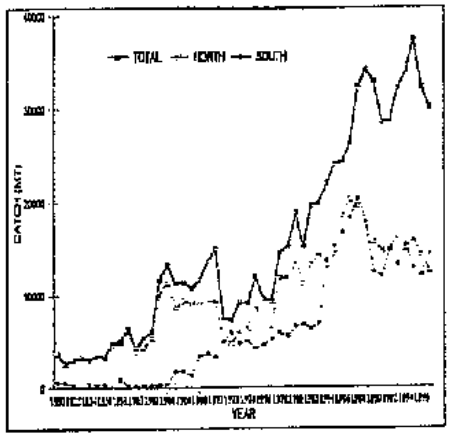
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
TOTAL (Land+Discard)	**9001**	**11836**	**9198**	**9214**	**14442**	**15179**	**18881**	**15155**	**19662**	**19929**	**21930**	**23969**	**24380**	**26266**	**32393**	**34065**	**32358**	**28815**	**29195**	**32639**	**34856**	**38082**	**33051**	**30563**
NORTH ATLANTIC	**6338**	**8814**	**6605**	**6387**	**11759**	**11911**	**13558**	**11180**	**13215**	**14527**	**12791**	**14383**	**18486**	**20236**	**19437**	**17137**	**15143**	**14931**	**15388**	**16758**	**15209**	**16552**	**14796**	**12961**
LANDINGS	**6338**	**8814**	**6605**	**6387**	**11759**	**11911**	**13558**	**11180**	**13215**	**14527**	**12791**	**14383**	**18486**	**20236**	**19437**	**17137**	**15143**	**14716**	**15005**	**16350**	**14501**	**16026**	**14208**	**12510**
LONGLINE	*5115*	*7053*	*5143*	*5436*	*11047*	*11151*	*12831*	*10549*	*13019*	*14023*	*12664*	*14240*	*18269*	*20022*	*18851*	*15236*	*13497*	*14208*	*14288*	*15682*	*14043*	*15511*	*13507*	*12302*
OTHER GEARS	*1223*	*1761*	*1462*	*951*	*712*	*760*	*727*	*631*	*196*	*504*	*127*	*143*	*217*	*214*	*586*	*1901*	*1646*	*508*	*717*	*668*	*458*	*515*	*701*	*208*
DISCARDS	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*215*	*383*	*408*	*708*	*536*	*588*	*451*
BARBADOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
CANADA	2	21	15	113	2314	2970	1885	561	554	1088	499	585	1059	954	898	1247	911	1026	1547	2234	1676	1610	739	1089
CHI.TAIPEI	265	272	471	246	164	338	134	182	260	272	164	152	157	52	23	17	270	577	441	127	507	489	521	509
CUBA	572	280	283	398	281	128	278	227	254	410	206	162	636	910	832	87	47	23	27	16	50	86	7	7
EC-DENMARK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0
EC-ESPANA	2893	3747	2816	3309	3622	2582	3810	4014	4554	7100	6315	7441	9719	11135	9799	6648	6386	6633	6672	6598	6185	6953	5547	5137
EC-FRANCE	0	0	0	0	0	0	5	4	0	0	1	4	4	0	0	0	75	75	75	95	46	46	0	0
EC-IRELAND	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	15
EC-ITALY	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EC-PORTUGAL	92	58	32	38	17	29	15	13	11	9	14	22	468	994	617	300	475	773	542	1961	1599	1617	1703	903
EC-U.K	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	1	5	11
GRENADA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	56	5	1	2	3	13	0	1	4	15
JAPAN	1178	2462	1149	793	946	542	1167	1315	1755	537	665	921	807	413	621	1572	1051	992	1064	1126	933	1043	1494	1437
KOREA	152	172	335	541	634	303	284	136	198	53	32	160	68	60	30	320	51	3	3	19	16	16	19	15
LIBERIA	0	0	0	0	0	0	5	38	34	53	*	24	16	30	19	35	3	0	7	0	0	0	0	0
MAROC	15	15	12	7	11	208	136	124	91	129	81	137	181	197	196	222	91	110	69	39	36	79	462	267
MARTINIQ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MEXICO	3	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	14	0	0	14
NEI_1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	76	112	529	0	0	0	0	0	0	0
NEI_2	0	0	0	0	0	0	0	12	0	0	0	0	14	3	131	190	185	43	35	111	0	0	0	0
NEI-28	24	25	91	22	76	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NORWAY	**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
POLAND	0	0	0	0	6	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ROUMANIE	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ST VINCENT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ST.LUCIA	*	*	*	*	*	*	0	0	0	0	0	0	0	0	0	0	3	0	3	23	*	4	3	1
TRINIDAD &TOB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	*	0	0
UK-BERMUDA	0	0	0	0	0	0	0	0	0	21	26	6	45	151	42	79	66	71	562	125	0	0	43	0
USA	1125	1700	1429	912	3684	4619	5625	4530	5410	4820	4749	4705	5210	5247	6171	6411	5519	4310	3852	3782	3366	4026	3560	2988
USSR	17	32	19	15	23	10	21	0	69	0	16	13	18	4	0	0	0	0	0	0	0	0	0	0
VENEZUELA	24	52	43	15	46	182	192	24	25	35	23	51	84	86	2	4	9	78	103	73	69	54	85	85
DISCARDS	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*215*	*383*	*408*	*708*	*526*	*588*	*451*
CANADA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
USA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	215	383	408	708	526	588	446

SWO-Table 1. Reported catches (landings and discards) in MT of Atlantic swordfish by regions and major gears, 1974-1997

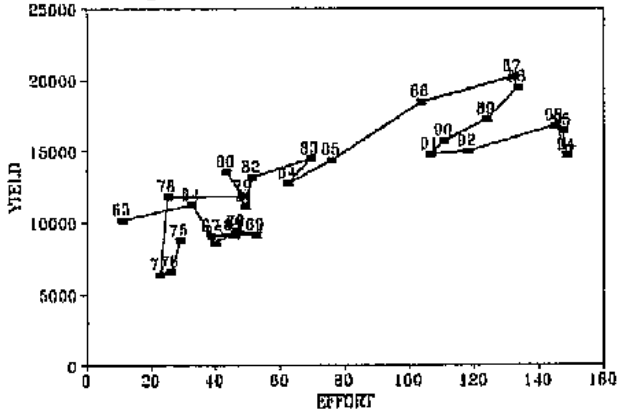
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
SOUTH ATLANTIC	**2663**	**3022**	**2593**	**2827**	**2683**	**3268**	**5323**	**3975**	**6447**	**5402**	**9139**	**9586**	**5894**	**6030**	**12956**	**16927**	**17215**	**13878**	**13801**	**15812**	**19556**	**21423**	**18127**	**17544**
LONGLINE	*2663*	*3022*	*2593*	*2812*	*2666*	*3239*	*5179*	*3938*	*6344*	*5307*	*8920*	*8863*	*4951*	*5446*	*12404*	*16398*	*16705*	*13287*	*13173*	*15547*	*17365*	*20575*	*17829*	*17395*
OTHER GEARS	*0*	*0*	*0*	*15*	*17*	*29*	*144*	*37*	*103*	*95*	*219*	*723*	*943*	*584*	*552*	*529*	*510*	*591*	*628*	*265*	*2191*	*848*	*298*	*149*
DISCARDS	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*21*
ANGOLA	0	0	0	0	0	0	0	0	0	0	26	228	815	84	84	84	*	*	0	0	0	0	0	0
ARGENTINA	10	10	111	132	4	0	0	0	20	0	0	361	31	351	198	175	230	88	88	14	24	0	0	0
BENIN	0	0	0	0	0	0	0	18	24	0	86	90	39	13	19	26	28	28	26	28	25	24	24	24
BRASIL	465	514	365	396	372	521	1582	655	1019	781	468	562	753	947	1162	1168	1696	1312	2609	2013	1571	1744	1922	4100
BULGARIA	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BZ-SH-OB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
C.IVOIRE	0	0	0	0	0	0	0	0	0	0	10	10	10	10	12	7	10	21	15	19	24	24	0	0
CHI.TAIPEI	802	935	745	675	625	1292	702	528	520	261	199	280	216	338	798	610	900	1453	1686	846	2829	2876	2873	1847
CUBA	509	248	317	302	319	272	316	147	432	818	1161	1301	95	173	159	830	448	209	246	192	452	778	60	60
E.GUINEA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
EC-ESPANA	0	0	0	0	0	0	0	0	0	0	0	0	66	0	4393	7725	6166	5760	5651	6974	7937	11290	9622	8461
EC-PORTUGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	380	389	441
GHANA	0	0	0	0	0	0	110	5	55	5	15	25	13	123	235	235	235	235	235	0	0	0	140	0
HO-SH-OB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	4	5
JAPAN	191	805	105	514	503	782	2029	2170	3287	1908	4395	4613	2913	2620	4453	4019	6708	4459	2870	5256	4699	3619	2197	1365
KOREA	563	279	812	699	699	303	399	311	486	409	625	917	369	666	1012	776	50	147	147	198	164	164	7	18
LITUANIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	794	0	0	0
NEI_I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	856	439	0	0	0	0	0	0	0
NEI-28	90	40	219	28	83	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NIGERIA	0	0	0	0	0	0	0	**	**	83	69	0	0	0	0	0	0	0	3	0	857	0	9	0
SOUTH AFRICA	0	0	0	0	0	28	31	9	3	7	0	8	5	5	4	0	0	5	9	4	1	4	1	1
TOGO	0	0	0	0	0	0	0	0	0	0	0	6	32	1	*	2	3	5	5	8	14	14	64	64
URUGUAY	0	0	0	0	0	0	0	92	575	1084	1927	1125	537	699	427	414	302	156	210	260	165	499	644	760
USA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	171	396
USSR	123	231	138	106	161	70	154	40	26	46	158	60	0	0	0	0	0	0	0	0	0	0	0	0
LL-DISCARDS	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*21*
USA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	21
UNCL. REGION.	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**6**	**6**	**69**	**91**	**107**	**128**	**58**
LONGLINE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30
OTHER GEARS	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*0*	*6*	*6*	*69*	*91*	*107*	*128*	*28*
ANGOLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CAP VERT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0
CHINA PR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	55	65	79	100	30
GHANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LIBERIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	26	28	28	28
MAROC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SENEGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	*	6	6	0	0	0	0	0



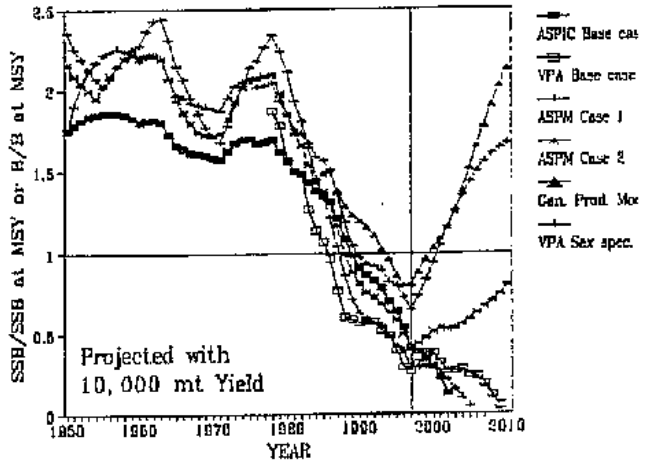
SWO-Fig. 1. Relative geographical distribution of swordfish longline landings of 1995.

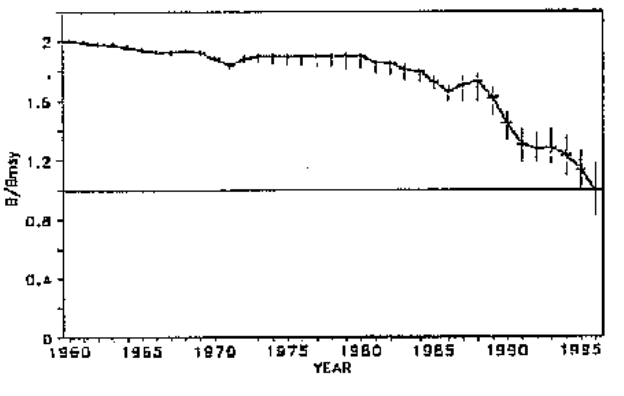


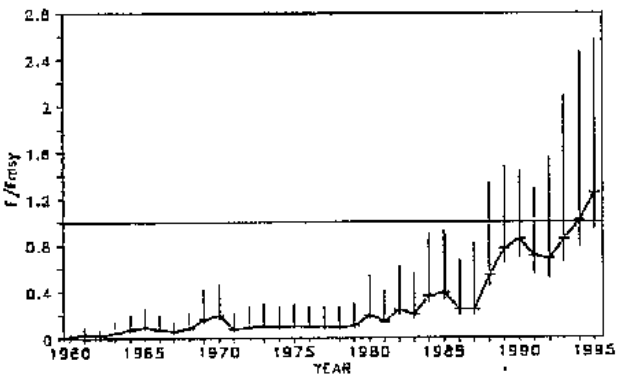
SWO-Fig. 2. Reported swordfish total landings of north and south Atlantic and total catches (including discards) in the entire Atlantic.



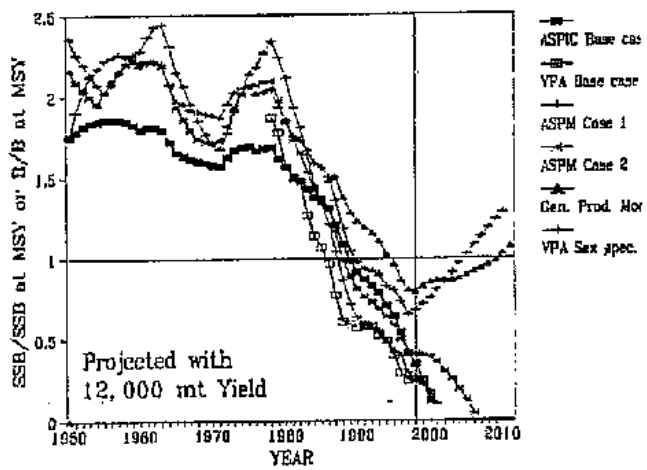
SWO-Fig. 3. Relationship between nominal catch and standardized effort for north swordfish.







SWO-Fig. 5. Relative biomass (upper panel) and relative fishing mortality rate (lower panel) estimated by the ASPIC production model for the South Atlantic. Bars indicate approximate 80% confidence intervals.



SWO-Fig. 4. Stochastic stock trajectories and projections (spawning stock biomass or total biomass relative to that at MSY) from the Base Case lumped biomass production model (ASPIC), and the Base Case virtual population analysis (VPA) [dark lines]. Deterministic stock trajectories and projections from sensitivity trials and preliminary analyses [light lines]: two age-structured production model runs (ASPM Case 1—selectivities based on SCRS/94/116 and ASPM Case 2—selectivities based on Base Case VPA); generalized production model (using alternate skew parameter); and preliminary sex-specific VPA. Projections are based on 10,000 MT yield (upper figure) and 12,000 MT yield (lower figure), for 1997 and thereafter

SWO-MED – MEDITERRANEAN SWORDFISH

SWO-MED-1. Biology

Swordfish is a cosmopolitan species found in the Atlantic Ocean and the Mediterranean Sea. Several recent genetic studies suggest that Mediterranean swordfish form a unique stock which is reproductively isolated from the Atlantic stocks. Several fisheries and biological studies suggest that there is limited movement from the Mediterranean to areas immediately adjacent in the North Atlantic. Genetic studies have confirmed this pattern.

Swordfish feed mainly in the meso-pelagic zone and its prey is comprised mostly of cephalopods and pelagic fish species. Spawning occurs in the Strait of Messina and the Tyrrhenian Sea and around the Balearic Islands and probably in other locations. It has been described that in the Mediterranean, swordfish spawn during the summer months and young swordfish grow very rapidly, reaching more than 80 cm by the end of their first year of life. Females grow faster than males and reach a larger maximum size. Female swordfish reach sexual maturity in their third year of life at a length of about 130 cm, while males mature one year earlier ; this is substantially younger than the age of maturity assumed for the Atlantic stocks (age 5).

SWO-MED-2. Description of fisheries

Mediterranean swordfish fisheries are characterized by high catch levels. It should be noted that average annual catches (about 15,000 MT for the past 10 years) are similar to those of the north Atlantic (about 16,000 MT for the past 10 years). The Mediterranean is a much smaller body of water compared to the north Atlantic. However, the potential reproductive area in the Mediterranean is probably relatively larger than that in the Atlantic.

Swordfish fishing has been carried out in the Mediterranean using harpoons and driftnets at least since Roman times. Mediterranean total swordfish landings showed an upward trend from 1965-72, stabilized between 1973-1977, and then resumed an upward trend reaching a peak in 1988 (20,339 MT) **(SWO-MED-Table 1, SWO-MED-Figure 1)**. The sharp increase between 1983 and 1988 may be partially attributed to improvement in the national systems for collecting catch statistics. Since 1988, the reported landings of swordfish in the Mediterranean Sea have declined and since 1990, they have fluctuated from about 12,000 to 16,000 MT.

Swordfish fishing is carried out all over the Mediterranean Sea. The biggest producers of swordfish in the Mediterranean Sea in 1997 were Italy (43%), Morocco (33%), and Spain (7%). Also, Algeria, Cyprus, Greece, Malta, Tunisia, and Turkey have fisheries targeting swordfish in the Mediterranean. Incidental catches of swordfish have also been reported by Croatia, France, Japan and Libya.

At present, mainly surface longlines and driftnets are used for fishing. Most of the above-mentioned countries operate longline fisheries, and large-scale driftnet fisheries are mostly limited to Italy (3632 MT in 1997) and Morocco (4653 MT in 1997). Swordfish are also caught with harpoons, purse seines and traps, but the latter two gears are not used for targeting swordfish.

There is a high demand for swordfish for fresh consumption in most Mediterranean countries.

SWO-MED-3. State of stocks

The Committee is concerned about the high catches of juvenile swordfish (those which have never spawned) in the Mediterranean, the apparent scarcity of large fish in the catch, and high uncertainty in estimates of high annual recruitments. Even without the aid of a robust analytical assessment, there are obvious warning signs from the Mediterranean fishery which warrant concern. The fact that the fishery is based on 2-3 young year-classes **(SWO-MED-Figure 2)** makes it vulnerable to recruitment changes. Furthermore, compared to the north Atlantic swordfish stock, the age of maturity is substantially less and fish have a smaller size at age in the Mediterranean, either suggesting possible biological compensation for heavy mortality and/or the influence of different environmental conditions in the Mediterranean. The VPA conducted in 1995 was not updated in 1998 partly because of a lack of sufficient improvements to input data, and partly due to time constraints. The results of the 1995 analysis were highly uncertain owing to uncertainty in the biological parameters, catch (1990-1996 since revised upwards substantially), and standardized CPUE used in tuning the analysis. As such, there was uncertainty about the veracity of the estimated trends in abundance, exacerbated by a lack of knowledge of current stock sizes relative to an unfished condition.

SWO-MED-4. Outlook

Given the short time series of reliable data and the long history of exploitation in the Mediterranean, it is uncertain where the Mediterranean stock is in relation to unexploited stock levels. The unknown status of the stock, the very large and uncertain catch of very small fish, and warning signs from the fishery are cause for concern.

SWO-MED-5. Effects of current regulations

Although ICCAT has no specific regulatory recommendations for Mediterranean swordfish fisheries, several countries do. The EC Mediterranean Member States are enforcing the regulations adopted by the EC to this effect and particularly the minimum size of 120 cm LJFL. More restrictive measures were adopted by some of these countries at the national level, such as the ban of driftnet use in the Ligurian Sea; the implementation of a closed season (1 October-30 January) by Greece; the setup of a special licensing system for bluefin and swordfish fishing. Spain adopted a limit to the number and size of hooks for longline (2000 hooks). Non-EC Member Countries are enforcing the GFCM regulation of relevance to large pelagic fisheries, particularly the maximum size of driftnets to 2.5 km. Some non-EC Member Countries, such as Croatia and Turkey, apply the minimum size of 120 cm LJFL. Additional national regulations are described in SCRS/98/11-bis.

The Committee reviewed the various measures taken by member countries and noted the difficulties in implementing some of the management measures, particularly that of minimum size. This minimum size regulation may not be practical in all situations given that 64% of the Mediterranean catches of swordfish in 1994 were less than 120 cm. Alternate and complementary measures are suggested in the Report of the Fourth Meeting of the Ad Hoc GFCM/ICCAT Joint Working Group.

SWO-MED-6. Management recommendations

Consistent with the Precautionary Approach and if managers want to be assured of maintaining the Mediterranean stock of swordfish, then the Committee strongly recommends reducing the fishing pressure on juvenile swordfish in order to improve yield per recruit and spawning biomass per recruit. In addition, given the uncertainty of the location of the boundary between the Mediterranean and north Atlantic stocks, it is important to identify the biological origin of those catches reported at or near the boundary so that the resulting knowledge can be considered in the management of the north Atlantic and/or Mediterranean stocks.

MEDITERRANEAN SWORDFISH SUMMARY

Maximum Sustainable Yield	not estimated
Current (1997) Yield	14,670 MT
Replacement Yield	not estimated
Relative Biomass (B_{1994}/B_{MSY})	not estimated[1]
Relative Fishing Mortality:	
F_{1994}/F_{MSY}	not estimated[1]
$F_{1994}/_{Fax}$	~ 1.1 (0.9-1.4)[2]
$F_{1994}/F_{0.1}$	~ 1.9 (1.5-2.4)[2]
Relative Recruitment	not estimated[1]
Management Measures in Effect	No ICCAT regulations; National and European Union minimum size and effort controls

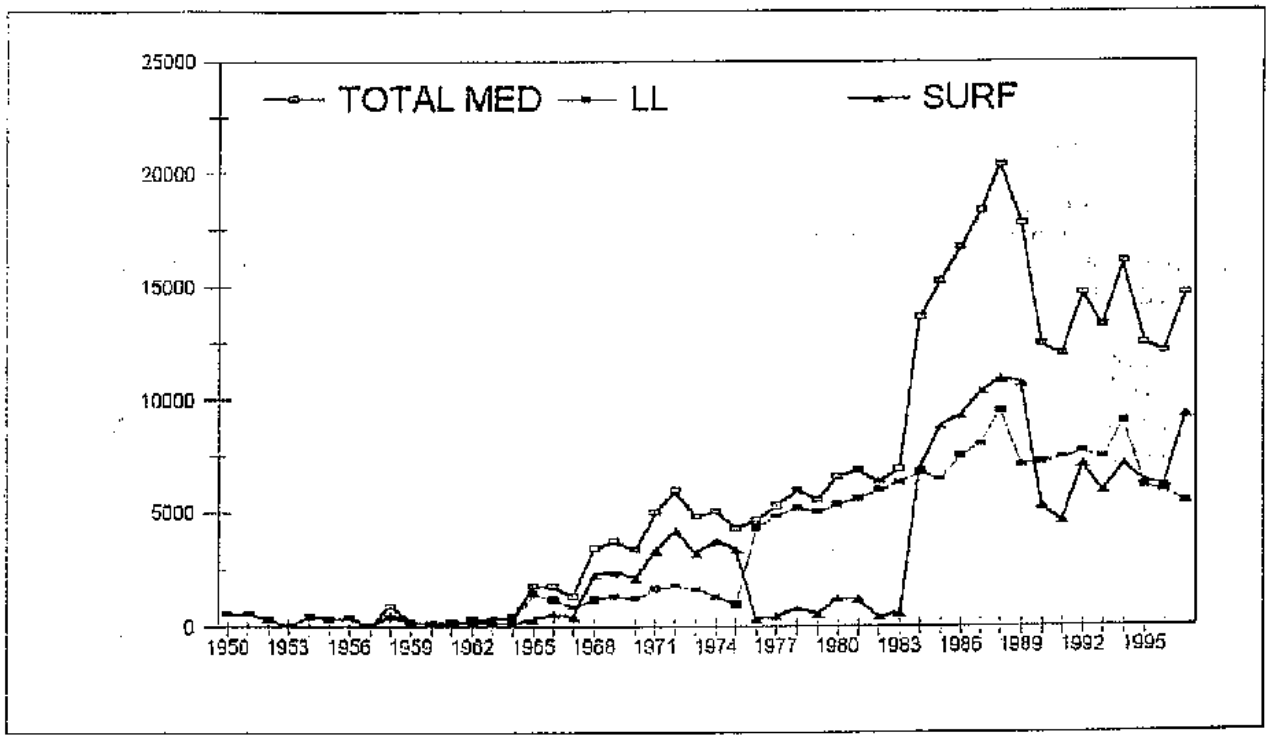
[1] Results suggest that it is unlikely that the Mediterranean stock can sustain continued high catches of juveniles without high recruitment. The odds of continued high recruitment diminish as mature fish are removed from the population.

[2] Based on stock size weighted average F's for age 2 and 3 fish in 1993 from VPA analysis conducted in 1995. Approximate 80% CI based on estimated CV(F) = 0.2.

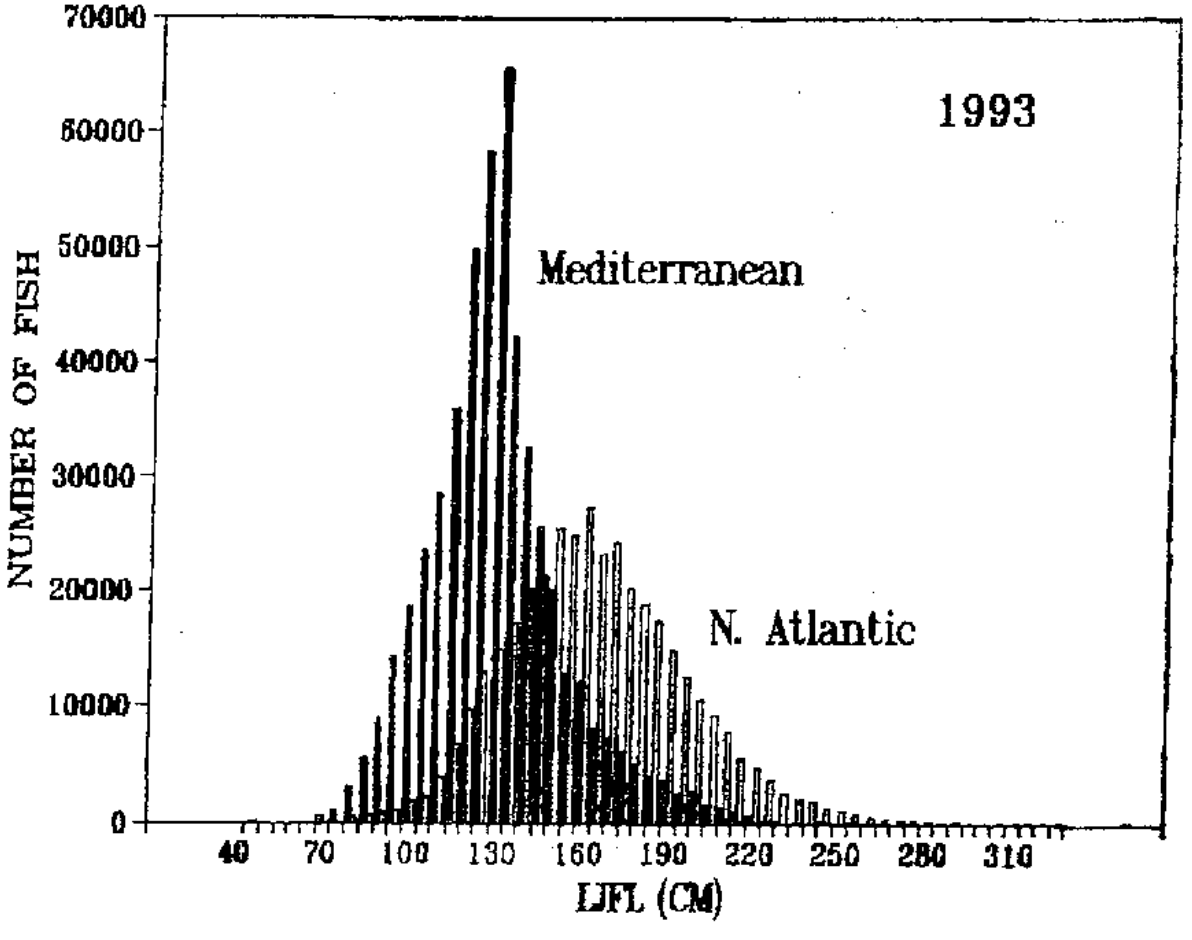
~ = approximate value.

EX-SWO-Table 1. Nominal landings of Mediterranean swordfish, 1975-1997.

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
MEDITERRANEAN	**4301**	**4637**	**5280**	**5958**	**5547**	**5851**	**6141**	**5826**	**6364**	**12895**	**14498**	**15951**	**17460**	**19464**	**16782**	**11068**	**10695**	**13420**	**13256**	**15298**	**12876**	**12074**	**14670**
-LONGLINE..	*713*	*4138*	*4606*	*5046*	*4877*	*5115*	*5411*	*5751*	*6239*	*6640*	*6260*	*7297*	*7781*	*9163*	*6784*	*6873*	*7202*	*7456*	*7011*	*7903*	*6154*	*5553*	*5050*
OTHER & UNCL	*3589*	*499*	*674*	*913*	*670*	*1464*	*1402*	*592*	*657*	*7026*	*8968*	*9421*	*10507*	*11176*	*10977*	*5555*	*4785*	*7256*	*6245*	*7395*	*6722*	*6521*	*9620*
ALBANIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	13
ALGERIE	500	368	370	320	521	650	760	870	877	884	890	847	1820	2621	590	712	562	395	562	600	807	807	807
CHI-TAIPEI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	*	1	3
CYPRUS	5	59	95	82	98	72	78	103	28	63	71	154	84	121	139	173	162	73	116	159	122	75	75
EC-ESPAÑA	89	89	667	720	800	750	1120	900	1322	1245	1227	1337	1134	1762	1337	1523	1171	822	1358	1503	1379	1186	1264
EC-FRANCE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	*	0	*	0	0
EC-GREECE	0	0	0	0	0	0	91	773	772	1081	1036	1714	1303	1008	1120	1344	1904	1456	1571	1741	1403	1237	750
EC-ITALY	3362	3747	3747	4506	3930	4143	3823	2939	3026	9360	10863	11413	12525	13010	13009	5524	4789	7595	6330	7765	6725	5286	6104
JAPAN	0	1	0	2	3	1	0	5	6	19	14	7	3	4	1	2	1	2	4	2	4	5	5
LIBYA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MALTA	214	175	223	136	151	222	192	177	59	94	108	97	131	207	121	122	119	71	76	42	58	58	83
MAROC	118	186	144	172	0	0	0	0	43	39	38	92	40	62	97	1249	1706	2692	2589	2654	1696	2734	4900
TUNISIE	3	5	0	0	0	0	7	19	15	15	61	64	63	80	159	176	181	178	357	298	378	352	346
TURKEY	10	7	34	20	44	13	70	40	216	95	190	226	557	589	209	243	100	136	292	533	304	320	320
NEI-2	0	0	0	0	0	728	672	517	532	771	730	767	828	875	979	1360	1292	1292	0	0	0	0	0



SWO-MED-Fig. 1. Mediterranean swordfish catches by gear categories.



SWO-MED-Fig. 2. Comparison of 1993 size distributions of swordfish catches in the Mediterranean and north Atlantic.

SBF -- SOUTHERN BLUEFIN TUNA

SBF-1. BIOLOGY

Southern bluefin tuna are distributed exclusively in the Southern Hemisphere of three oceans. The only known spawning ground is located in an area south of Java, Indonesia and off northwest Australia. Juveniles migrate southwards along the Australian west coast and stay in the coastal waters of southwest, south, and southeast Australia. As fish grow, they extend their distribution to cover the circumpolar area throughout the Pacific, Indian and Atlantic Oceans.

Southern bluefin tuna are considered to be mature at age 8 at the length of 155 cm. Though the life span of this species was considered to be about age 20 from the tagging results, recent analysis revealed that a significant number of fish bigger than 160 cm were older than age 25. The maximum age obtained from otolith analysis was age 42. Age-specific natural mortality, higher for young fish and lower for old fish, is supported by tagging experiments and applied for stock assessment. Southern Bluefin Tuna is a unique example of an acceleration of growth rate observed through 1960's to 1980's, that was supported by tagging experiments in that periods. This acceleration of growth rate is partially due to the fact that the stock has been faced with high fishing pressure in last fifty years.

Preliminary results from recaptured archival tags suggest that young fish migrate seasonally between the south coast of Australia and middle of the Indian Ocean. Archival tagging is noted as a powerful tool to investigate the biology and movement of fish.

SBF-2. DESCRIPTION OF FISHERIES

Historically, the stock has been exploited by Australian and Japanese fishermen for more than 40 years. During this period, the Japanese longline fishery (taking older aged fish) recorded its peak catch of 77,927 MT in 1961 and the Australian catches of young fish by surface fishery peaked at 21,501 MT in 1982. New Zealand, Chinese-Taipei and Indonesia have also exploited southern bluefin tuna, and Korea started a fishery in 1991.

The proportion of catch made by surface fishery peaked around the 1980s at the level of close to 50% of total catch but declined afterward to 13% (**SBF-Table 1 and SBF-Figure 2**). The proportion of surface catch started increasing again since 1994 and now has reached around 30%.

The catches of Australia, Japan and New Zealand have been controlled with quota since 1986. The current catch limits are 5,265 MT for Australia, 6,065 MT for Japan, and 420 MT for New Zealand, which has remained at the same level since 1990. However, the catches by nations other than the aforementioned three have increased steadily and stayed at the level around 2,200 MT during 1991 – 1994 and then doubled to 4,689 MT in 1996. The catch by these nations stayed high as 4,539 MT in 1997.

The Atlantic catch has varied widely between 400 and 6,200 MT since 1978 (**SBF-Table 1 and SBF-Figure 1**), reflecting the shifts of longline effort between the Atlantic and Indian Oceans. Fishing ground in the Atlantic is located off the southern tip of South Africa **(SBF-Figure 5)**.

Japanese longline vessels changed their catch retention practice to release fish less than 25 kg in 1995 and 1996, and a portion of these releases (considered to be dead discards) were incorporated into total estimate of catch.

SBF-3. STATE OF STOCKS

The fourth Scientific Committee of the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) was held in Shimizu and Tokyo, Japan, from July 23 to August 6, 1998. The Meeting examined the new biological information as well as the CPUE and VPA analyses presented and discussed the current status of stock.

The Japanese longline CPUE are standardized based on a range of hypotheses on fish density in cells without fishing effort (**SBF-Figure 3**). The CPUE for parental stock (age 8 and older) continued to decline to the early 1990s and then stayed at about the same level except one hypothesis. The juvenile CPUE declined through the 1970s to the mid 1980s but increased in 1993 to the different levels according to the hypotheses and then stayed about the same level afterward. The sequential increases in the global CPUE by age for fish born in the late 1980s can be followed from 3 year olds in 1990 to 8 year olds in 1995.

The Virtual Population Analyses (VPA) were conducted using various model structures, hypotheses on biological parameters, and different interpretations of Japanese CPUE series (**SBF-Figure 4**). All VPAs showed the similar recruitment trend of marked decline from the 1970s to the mid 1990s; the most recent recruitment estimate is about one third of the 1970 level. The tagging data and results of aerial surveys suggested that recruitment of 1993 to 1995 cohorts for which no VPA results were available stayed at low levels.

The parental biomass is notably lower than the 1980 level, the management target level for stock recovery. The recent trend in parental biomass varied from a continuous decline to an upturn since 1994. These trends depend greatly on the way the plus group is treated and the CPUE series used. The overall estimates of current biomass level, after incorporating different beliefs in alternative hypotheses held by different nations, ranged from 25 % to 53 % of the 1980 level.

Japan initiated an Experimental Fishing Programme (EFP) in July and August of 1998, trying to resolve uncertainties relating to CPUE series. The survey was designed to estimate fish density in areas without commercial operations relative to those in areas freely chosen by fishers. Preliminary analysis indicated that the non-commercial fishing area contained about the half of density of fish as those in commercially selected area on average.

SBF-4. OUTLOOK

Future projections were performed to examine the medium to long term consequences of current global catch on parental biomass as well as the probability to recover to the 1980 level, based on a set of VPAs incorporating an agreed upon range of uncertainties. The probability of stock recovery to the 1980 parental biomass level before 2020 ranged between 6 to 87 % reflecting different interpretations on the plausibility of various hypotheses. As noted above for the parental biomass estimates, the differences in plus group treatments and different interpretations of CPUE indices had major impacts on the assessment of the recovery probability.

SBF-5. EFFECTS OF CURRENT REGULATIONS

Southern bluefin tuna has been managed through quota among Australia, Japan and New Zealand since 1985. The global quota was reduced several times from 38,650 MT in 1984 - 1985 season and current quota has been maintained at 11,450 MT since 1989 -1990 season.

Management measures of the CCSBT were successful in reducing catches by 1990 but non-member catches, which have shown a marked and continuous increase over the 1990s, have contributed to the erosion of benefits over this period.

The continued low abundance of parental biomass is a cause for serious concern. The increasing pressure on the parental biomass, particularly on the spawning ground, is contributing to the continued low parental biomass. Also, the recent increase in the fishing mortality of juvenile fish is expected to lead to lower recruitment from these cohorts to the parental stock.

SBF-6. MANAGEMENT RECOMMENDATIONS

The Committee noted that the ICCAT statistical system will continue to be important for monitoring the fishery for this species in the Atlantic Ocean. While the CCSBT established in May 1994 has competence on the management of this species as a whole in the three oceans, ICCAT is responsible for the management of southern bluefin tuna in the Atlantic Ocean. Therefore, close collaboration should be maintained between the two organizations as regards of stock assessments and management measures.

No recommendation was made for the management of southern bluefin tuna in the Atlantic.

SOUTHERN BLUEFIN TUNA SUMMARY
(For Global Stock)

Maximum Sustainable Yield	not estimated
Current (1997) Yield	15,777 MT (preliminary)
Relative Biomass SSB(1998)/SSB (1980)	0.25 - 0.53
Current Management Measures	global quota at 11,450 MT

SBF-Table 1. Atlantic and world southern bluefin catch (MT) by gear, area and country.

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997*
ATLANTIC TOTAL	4358	2135	4357	2716	2679	666	753	3168	4685	6205	2827	2578	1138	525	1636	1497	432	1204	622	711	1266	1346	539	2144	767	1616	1376	422
-CATCH BY GEAR																												
Longline	4358	2135	4357	2714	2679	666	753	3168	4685	6205	2814	2572	1138	525	1636	1497	432	1200	620	705	1266	1346	539	2144	767	1616	1376	422
Baitboat	0	0	0	1	0	0	0	0	0	0	13	6	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Sport	0	0	0	1	0	0	0	0	0	0	0	0	++	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2	5	0	0	0	0	0	0	0	0
-CATCH BY FLAGS																												
Chinese-Taipei	71	109	87	196	121	30	61	0	34	13	26	66	3	20	0	29	43	80	72	80	64	15	14	456	172	168	157	47
Japan	4287	2026	4270	2518	2558	636	692	3168	4651	6192	2788	2506	1135	505	1636	1468	389	1120	548	635	1202	1331	525	1688	595	1448	1219	365
Korea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18
Poland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2	5	0	0	0	0	0	0	0	0
South Africa	0	0	0	0	2	0	0	0	0	0	13	6	++	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
World Catches (all oceans)	45036	45648	53025	41305	46959	33081	42537	42185	36002	38673	45054	45104	42794	42681	37091	33325	28319	25575	23145	17842	13569	13638	14076	14373.5	13250	13456	16339	15777
Longline	40929	39149	39458	31235	34005	34134	34099	29600	23658	27890	33959	29345	31363	35143	23678	20610	15344	14212	11977	12355	9500	10535	12140	12149	10726	10550	11552	10939
Surface Fishery	7097	6969	13397	9890	12672	8833	8393	12569	12190	10783	11195	16843	21501	17695	13411	12559	12531	10921	10591	5434	4319	2873	1835	1899	2554	2906	4777	4838

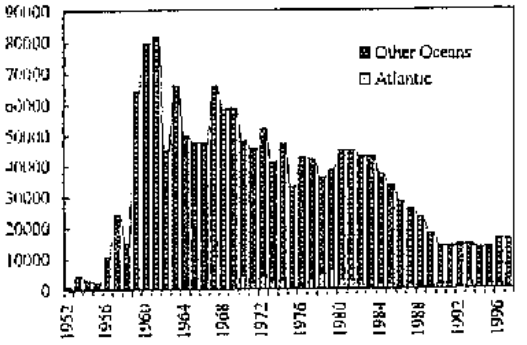
* Preliminary

++ Catch < 0.5 MT.

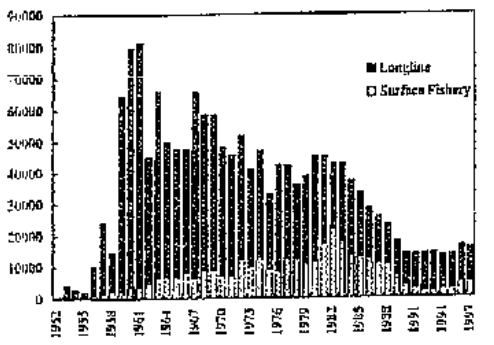
Source : Catch by Japan -- ICCAT Japanese National Report

World catches -- Reports presented at the 1998 CCSBT Scientific Committee held in Tokyo, August 3 to August 6, 1998 (CCSBT/SC/9807/4, 15, 34, and 41).

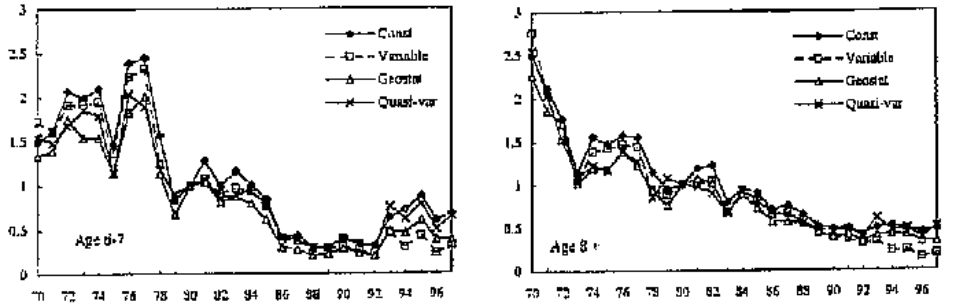
Australian domestic catch was considered to be made by surface fishery, unless the catch estimate by Australian domestic vessels available. Catches by the other nations were assigned to longline fishery.



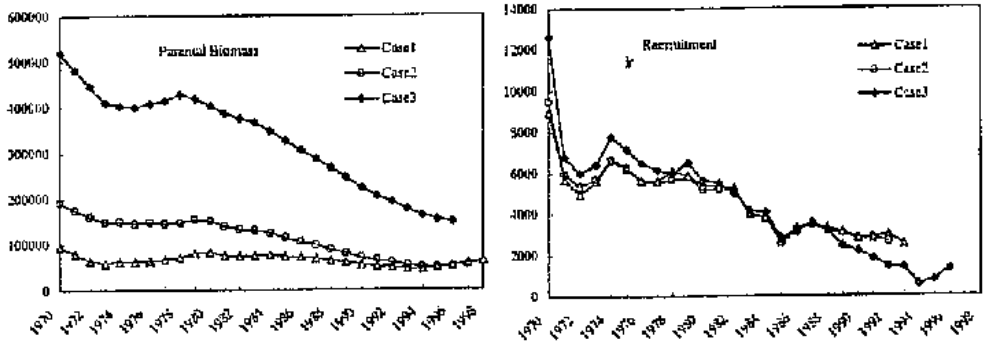
SBF-Fig. 1. Global and Atlantic catch of southern bluefin tuna.



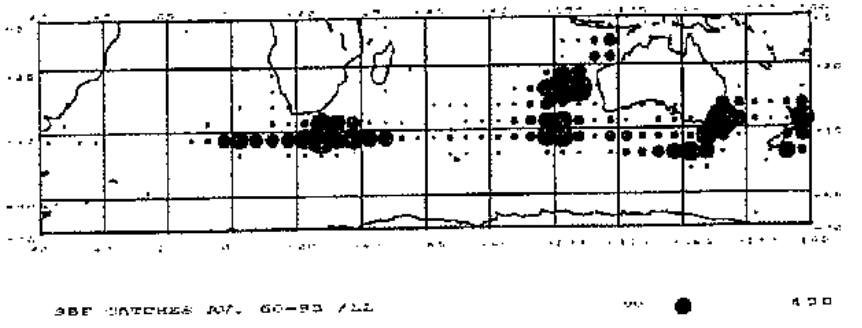
SBF-Fig. 2. Southern bluefin tuna global catch by fishery.



SBF-Fig. 3. Standardized CPUE of Japanese longline relative to 1980 for juvenile (age 6-7) and parental (age 8+) southern bluefin tuna. Different lines corresponded to different hypotheses on fish abundance within time-area strata without fishing effort. (Reference: CCSBT/SC/9807/27, and 37)



SBF-Fig. 4. VPA (with marks) and projection (without marks) results. Japanese and Australian reference cases (Case 1 and Case 2) and the result based on different approach (Case 3) were selected for presentation. (Reference : CCSBT/SC/9807/17, 27, and 31 with a modification to make them comparable.)



SBF-Fig. 5. Geographical distribution of SBF catch 1960-1993

SMT -- S M A L L T U N A S

SMT-1 Biology

Very little is currently known about the biology of small tunas. In fact, scientific studies on these species, are rarely undertaken. This is largely because many of these species are considered to have little economic importance, and because of difficulties in sampling landings from artisanal fisheries, which constitute a high proportion of the fisheries exploiting small tuna resources. The exceptions comprise some stocks of Spanish and king mackerel, such as those found in U.S. and Brazilian waters. The large industrial fleets often discard small tuna catches at sea or sell them in local markets, especially in Africa. The amount caught is rarely reported in logbooks.

These species are widely distributed in the tropical and subtropical waters of the Atlantic Ocean, the Mediterranean Sea, and the Black Sea. They are often found in large schools with other small sized tunas or related species in coastal and offshore waters. They have a varied diet with a preference for small pelagics (e.g. clupeids, mullets, carangids and ammodytes), crustaceans, mollusks and cephalopods. The reproduction period varies according to species and spawning generally takes place near the coast, where the waters are warm.

In the eastern tropical Atlantic, the size-at-first-maturity is about 42 cm for Atlantic black skipjack (*Euthynnus alletteratus)*, 30 cm for *Auxis spp.*, 38 cm for Atlantic bonito (*Sarda sarda)*, and 45 cm for mackerel *(Scomberomorus spp.)*. The growth rate currently estimated for these species is very rapid for the first two or three years, and then slows as these species reach size at first maturity.

SMT-2. Description of fisheries

Small tunas are exploited mainly by coastal fisheries and often by artisanal fisheries, although substantial catches are also made, either as target species or as by-catch, by purse-seiners (SCRS/98/99), mid-water trawlers (i.e. pelagic fisheries of West Africa-Mauritania), handlines and small scale gillnets (U.S. fisheries, SCRS/98/117). Unknown quantities of small tuna also comprise the incidental catches of some longline fisheries. Some U.S. sport fisheries target Spanish and king mackerels on a seasonal basis.

SMT-Table 1 shows the historical landings of small tunas for the period 1975 to 1997. The total reported landings of all species combined generally fluctuated during the period 1975 to 1979, ranging from about 67,000 MT to over 80,000 MT. In 1980, there was a marked increase in reported landings, which continued to increase, reaching a peak at about 133,000 MT in 1982 **(SMT-Figure 1)**. After 1982, reported landings decreased steadily until 1986 (92,000 MT), followed by a subsequent increase to approximately 144,000 MT in 1988. Landings reported for the period 1989-1991 remained relatively stable at an average of 126,000 MT **(SMT-Figure 1)**. The landings then decreased to about 92,000 MT during 1992-1995, followed by an increase to approximately 105,000 MT in 1996. A preliminary estimate for the total nominal landings of small tunas in 1997 is 96,939 MT **(SMT-Table 1)**. The Committee noted the relative importance of small tuna fisheries in the Mediterranean Sea, which account for 33.2% of the total reported catch in the period 1990-1997.

There are over ten species of small tunas, but only five of these account for 85% of the total catch by weight each year. These five species are: Atlantic bonito *(Sarda sarda)*, frigate tuna *(Auxis thazard)*, spotted Spanish mackerel *(Scomberomorus maculatus)*, king mackerel *(Scomberomorus cavalla)*, and Atlantic black skipjack *(Euthynnus alletteratus)* **(SMT-Figure 2)**.

Since 1991, tropical purse-seiners operating around artificial flotsam (fish aggregating devices) may have led to an increase in fishing mortality of small tropical tuna species. These species usually comprise part of the by-catch, and are often discarded. Provisional data collected by observers working on European purse-seiners during the period June 1997-August 1998 showed that while 3% of the total catch was discarded, 72% of the discards consisted of small tuna species (SCRS/98/99). Moreover, the majority of these small tuna discards were taken around floating objects. It was noted that the new statistical data for purse-seiners (Spain, France and NEI) is now reporting the estimated amount of small tunas catches by 1º x 1º square and month **(SMT-Figure 3)**.

Despite recent improvements in statistical reporting by some countries, the Committee also noted that uncertainties remain regarding the accuracy and completeness of reported landings in all areas, including the Mediterranean, and that there is a general lack of information on the mortality of these species as by-catch.

SMT-3 State of the stocks

There is little information available to determine the stock structure of many small tunas species. Some size data of frigate tuna (*Auxis thazard*), bullet *tuna (Auxis rochei*), Atlantic black skipjack (*Euthynnus Alletteratus*) and blackfin tuna *(Thunnus atlanticus*), by 1º x 1º square and month, were collected during an observer program on European purse seine tuna fleets operating in the Atlantic Ocean during the period from June 1997 to August 1998 (SCRS/98/99). In addition, during 1997, CARICOM continued its tagging program for blackfin tuna (*Thunnus atlanticus*), wahoo (*Acanthocybium solandri*) and king mackerel (*Scomberomorus cavalla*). To date, 754 small tunas have been successfully tagged and released, with 11 fish recaptures reported (SCRS/98/102).

A genetic study of Atlantic black skipjack (*Euthynnus Alletteratus*) using mtDNA control region sequence data, demonstrates extremely high levels of population differentiation between Bermuda and Côte d'Ivoire samples, suggesting total isolation between these populations (SCRS/98/130). The patterns of genetic differentiation reported suggest that this kind of genetic data could unravel the population substructure of Atlantic black skipjack along its range. Similar studies could be conducted in other small tuna species.

Status of stock information reported to the Committee is summarized as follows. Annual age-structured stock assessments of Spanish mackerel and king mackerel are carried out for the coastal areas of the southeastern United States and the Gulf of Mexico. These assessments indicated that the stocks of Atlantic Spanish mackerel and king mackerel in the Gulf of Mexico were over-exploited at that time. Reductions in fishing mortality were considered necessary, and hence a number of regulations (commercial trip limits, seasonal and area quotas, and recreational bag limits) have been implemented in order to allow the stocks to recover to levels that could provide high average long-term yields and to provide adequate safeguards against recruitment failure. At present, although improvements in stock status have been observed the Gulf of Mexico Spanish mackerel and King mackerel stocks are still considered over-fished by the criteria established by fisheries managers in the U.S.A. (SCRS/98/117).

Current information does not generally allow for an evaluation of stock status by the Committee for most of the coastal pelagic species. Most stocks, however, probably do not have an ocean-wide distribution. For this reason, the majority of the stocks can be managed at the regional or sub-regional level.

SMT-4. Outlook

The results of an ICCAT questionnaire circulated in 1996 indicate that small tuna fisheries are very diverse and complex , involving both artisanal and industrial fisheries using a variety of gears, as well as different types and sizes of vessels. The results also indicate that data collection and research including size sampling, age and growth research, maturity studies and tagging, are being conducted by several countries.

Nonetheless, catch and effort statistics for small tunas remain incomplete for many of the coastal and industrial fishing countries. There is also a general lack of available biological information needed to assess the stocks of most of these species. On the other hand, many of these species are of importance to coastal fishermen, especially to some developing countries, both economically and as a source of protein. The Committee therefore reiterates its previous recommendation that studies should be conducted to determine the state of these stocks and the best way to manage them. Such studies are probably best carried out at the local or sub-regional level.

SMT-5. Effects of current regulations

There are no ICCAT regulations in effect for these small tuna species.

A "U.S. Fishery Management Plan (FMP) for coastal pelagic species in the Gulf of Mexico and Atlantic Ocean Region" has been in effect since 1983. Under the FMP, fisheries management procedures were established to reduce fishing mortality on king and Spanish mackerels. It is believed that vessel landing limits, geographical quotas, and minimum size restrictions have helped to stabilize and improve overall stock conditions.

SMT-6. Management recommendations

No recommendations were presented due to the lack of data and analyses.

EX-SMT-Table 1. Reported landings of small tunas (MT) in the Atlantic Ocean and Mediterranean Sea

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Total	66988	64096	79421	76055	80894	115513	114279	133937	127129	111970	93322	92109	114006	144336	126450	132098	119627	95683	95878	87796	88817	105180	96939
Atlantic	56920	52279	64679	60421	60803	89622	79862	93896	83751	88327	67546	68787	84959	111249	105725	97968	84304	73936	66252	66099	67261	79066	78901
Mediterranean	10068	11817	14742	15634	20091	25891	34417	40041	43378	23643	25776	23322	29047	33087	20725	34130	35323	21747	29626	21697	21556	26114	18038
BLF- *T. atlanticus*	815	1026	1251	1341	1205	1175	1973	1941	1738	1908	1403	2822	3462	3322	2834	3887	4201	4352	3532	2710	4048	4515	4183
Atlantic																							
BERMUDA	9	10	9	7	7	6	4	5	6	4	9	17	11	7	14	13	8	6	5	7	4	5	6
BRASIL	123	56	273	195	173	181	85	89	57	203	133	172	254	229	120	335	130	49	22	37	153	647	390
CUBA	0	0	0	0	0	0	721	622	558	487	157	486	634	332	318	487	318	196	54	223	156	287	287
DOMINICA	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	19	10	14	15	19	30	0	0
DOMIN. REP.	86	90	68	78	105	125	124	144	144	106	90	123	199	4	564	520	536	110	133	239	892	892	892
ESPANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	307	46	0	0	0	0
FRANCE	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GRANADA	100	100	71	76	95	68	84	143	102	232	193	256	141	220	134	293	195	146	253	189	123	164	126
GUADELOUPE	220	190	530	530	470	440	460	490	482	490	460	470	470	450	460	470	460	470	440	440	480	500	500
JAMAICA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	148	0
LIBERIA	0	0	0	0	0	0	0	0	0	0	0	0	0	229	0	0	0	0	0	0	0	0	0
MARTINIQUE	270	580	300	400	300	300	301	352	327	331	295	259	199	366	395	395	750	700	700	890	890	540	540
MEXICO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NETH.ANT	0	0	0	55	55	55	55	55	55	55	55	60	60	70	70	70	60	60	65	60	50	45	45
ST.LUCIA	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	17	14	13	16	82	47	35	40
ST.VINCENT	0	0	0	0	0	0	0	0	0	0	0	0	0	19	15	38	11	7	53	19	20	18	22
U.S.A	0	0	0	0	0	0	139	41	7	0	11	32	44	154	87	80	111	126	508	492	582	446	547
VENEZUELA	0	0	0	0	0	0	0	0	0	0	0	947	1448	1240	652	1150	1598	2148	1222	13	621	788	788
BLT- *Auxis rochei*	0	0	0	0	0	0	0	0	0	0	0	2	0	357	723	3634	2171	814	70	100	100	0	464
Atlantic																							
RUSSIA FED.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2171	814	70	100	100	0	464
U.S.A	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
U.S.S.R	0	0	0	0	0	0	0	0	0	0	0	0	0	357	723	3634	0	0	0	0	0	0	0
BON- *Sarda sarda*	15609	15989	20676	17273	19971	31733	40053	43687	42837	22505	25433	21990	30252	46901	30062	28940	34389	22298	30709	21918	21393	25779	24485
Atlantic	9571	9490	11977	7854	6485	12568	10760	12169	6840	6849	6946	5892	7395	22353	17766	6843	8301	6902	4587	5807	6228	7862	10326
ANGOLA	38	831	938	531	251	377	196	253	124	225	120	101	144	180	168	128	102	4	49	20	9	39	32
ARGENTINA	200	283	2026	1746	1288	2600	846	1775	310	2058	1399	699	1607	2794	1327	1207	1794	1559	434	4	138	0	0
BENIN	0	0	0	0	13	19	32	36	16	25	30	6	3	4	7	0	0	0	0	0	0	0	0
BRASIL	0	0	0	0	0	0	0	0	0	187	179	523	345	214	273	226	71	86	142	142	137	0	0
BULGARIA	191	32	37	22	0	75	8	23	46	0	0	2	0	0	3	0	0	0	0	0	0	0	0
CUBA	0	0	0	0	0	0	0	0	0	0	0	0	23	173	26	28	0	0	0	0	0	0	0
ESPANA	4819	4379	1978	1919	717	220	589	434	414	173	398	145	41	91	57	18	8	39	5	3	2	2	1
ESTONIA	0	0	0	0	0	0	0	0	0	0	0	0	0	668	859	187	8	0	0	0	0	0	0

EX-SMT-Table 1. Reported landings of small tunas (MT) in the Atlantic Ocean and Mediterranean Sea

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
FRANCE	0	0	0	0	0	8	0	0	2	17	1	0	0	0	0	0	0	0	52	0	0	0	0
GEORGIA	0	0	0	0	0	0	0	0	0	0	0	0	0	39	54	0	0	0	0	0	0	0	0
GERMANY D.R	0	0	0	0	0	288	440	146	274	26	40	23	1	0	0	0	0	0	0	0	0	0	0
GERMANY F.R	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GERMANY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	53	0	0	0	0	0	714	0
GHANA	20	0	9	9	0	77	5	71	13	8	10	0	943	0	0	0	0	0	0	0	0	0	0
GRANADA	200	200	136	157	53	52	61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	6
GREECE	0	0	0	30	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GUADELOUPE	360	340	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
JAMAICA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0
LATVIA	0	0	0	0	0	0	0	0	0	0	0	0	0	1191	1164	221	7	4	0	3	19	301	**
LITUANIA	0	0	0	0	0	0	0	0	0	0	0	0	0	1041	762	162	11	10	0	0	0	0	0
MAROC	322	303	131	171	196	312	477	535	561	310	268	251	241	589	566	492	794	1068	1246	584	699	894	2483
MARTINIQUE	384	549	510	400	500	500	502	587	545	552	491	431	331	395	427	430	820	770	1000	990	990	610	610
MEXICO	446	237	81	59	174	271	408	396	567	744	212	241	391	356	338	215	200	657	779	674	1144	1312	1312
POLAND	30	30	177	44	32	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	225	0
PORTUGAL	0	0	0	0	6	13	31	55	86	56	50	168	371	377	80	202	315	133	145	56	78	83	49
RUMANIA	291	79	139	19	0	64	81	249	192	8	32	71	3	255	111	8	212	84	0	0	0	0	0
RUSSIA FED.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	948	29	6	0	0	0	0
SENEGAL	40	164	614	523	159	140	1327	202	497	200	495	510	463	2066	869	558	824	378	227	600	354	570	570
SIERRA LEONE	0	0	0	0	0	57	30	5	5	5	10	10	10	10	10	10	4	6	0	0	0	0	0
SOUTH AFRIC	5	0	2	16	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ST.LUCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	3	3	4	1	1	1	0
TOGO	0	0	0	0	0	0	0	0	0	0	254	138	245	400	256	177	172	107	311	254	145	197	197
TRIN& TOBAG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	703	750	750	750
U.S.A	117	23	268	224	502	198	333	209	253	217	110	84	130	89	278	298	468	497	170	127	116	155	182
U.S.S.R	1542	1281	4164	1602	2125	6433	4559	6329	2375	1290	2073	1085	1083	8882	7363	706	0	0	0	0	0	0	0
UKRAINE	0	0	0	0	0	0	0	0	0	0	0	0	0	1385	985	0	0	25	0	0	0	342	2786
UNITED KING	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	287	0
URUGUAY	4	3	0	0	16	3	1	0	1	0	0	3	0	0	0	0	26	0	0	0	0	0	0
VENEZUELA	562	756	767	382	443	861	833	864	554	748	774	1401	1020	1153	1783	1514	1514	1443	0	1646	1646	1348	1348
Mediterranean	6038	6499	8699	9419	13486	19165	29293	31518	35997	15656	18487	16098	22857	24548	12296	22097	26088	15396	26122	16111	15165	17917	14159
ALBANIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0
ALGERIE	140	143	206	196	515	640	740	860	867	874	880	459	203	625	1528	1307	600	600	596	847	351	351	351
BULGARIA	0	40	44	11	1	13	191	4	24	1	1	0	13	0	0	17	17	20	8	0	25	33	0
CROATIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	49	128	6	70	0	0	0
CYPRUS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	648	0
EGYPT	3	0	1	17	10	3	2	23	14	48	62	68	35	17	358	598	574	518	640	648	828	985	0
ESPANA	329	397	610	711	713	480	710	990	1225	984	1045	729	51	962	609	712	686	228	200	344	632	690	628
FRANCE	0	0	0	0	0	0	0	0	33	16	0	0	0	10	0	1	10	5	6	0	0	0	0
GREECE	658	511	550	610	712	809	1251	1405	1367	1732	1321	1027	1848	1254	2534	2534	2690	2690	2690	1581	2116	1752	0
ITALY	959	955	1533	1378	1403	1180	1096	1102	1806	2777	1437	1437	2148	2242	1369	1244	1087	1288	1238	1828	1512	2233	2233

EX-SMT-Table 1. Reported landings of small tunas (MT) in the Atlantic Ocean and Mediterranean Sea

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
LIBYA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	71	70	0	0	0	0
MALTA	5	1	2	2	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	7
MAROC	135	630	456	128	155	62	309	71	92	75	57	51	127	108	28	69	69	31	25	93	37	67	45
NEI-2	0	0	0	0	0	295	274	276	452	694	359	359	537	561	342	311	311	311	300	300	300	300	**
RUMANIA	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TUNISIE	429	619	768	791	865	700	381	748	600	600	482	504	500	600	422	488	305	643	792	305	413	560	611
TURKEY	3371	3178	4503	5536	9082	14910	24300	25978	29485	7818	12809	11426	17333	18133	5008	14737	19645	8863	19548	10093	8944	10284	10284
U.S.S.R	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
YUGOSLAVIA	9	23	26	39	29	72	39	61	31	37	34	38	62	36	98	79	45	0	3	2	6	10	0
BOP- *O. unicolor*	84	212	456	970	492	698	1448	584	38	49	133	87	564	1482	1116	457	551	515	453	672	601	2070	302
Atlantic	84	212	321	817	464	698	1448	584	38	49	124	86	538	1474	1109	420	537	474	399	649	578	2057	299
BENIN	0	0	0	0	1	1	2	2	1	1	1	3	1	2	1	1	1	1	1	1	1	1	0
MAROC	4	132	231	727	373	596	968	483	0	0	83	33	487	1422	1058	369	486	423	348	598	524	2003	246
MAURITANIE	80	80	90	90	90	101	478	99	37	40	40	50	50	50	50	50	50	50	50	50	53	53	53
PORTUGAL	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0
Mediterranean	0	0	135	153	28	0	0	0	0	0	9	1	26	8	7	37	14	41	54	23	23	13	3
LIBYA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	40	0	0	0	0
MAROC	0	0	135	153	28	0	0	0	0	0	9	1	26	8	7	37	14	1	14	23	23	13	3
BRS *-Sc. brasiliensis*	5039	2272	3188	3484	3722	5617	5841	6019	6632	8129	3501	6549	6212	9510	10778	7698	8856	6051	8049	7161	7320	8997	8435
Atlantic																							
BRASIL	2664	283	986	1522	1191	2826	3466	4342	4511	6259	1504	5011	4741	5063	5927	2767	1437	1149	842	1149	1308	3047	2125
GUYANE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	211	571
TRIN & TOBAG	0	0	0	0	0	0	0	0	0	0	0	0	0	2704	2864	2471	2749	2130	2130	2130	2130	2130	2130
VENEZUELA	2375	1989	2202	1962	2531	2791	2375	1677	2121	1870	1997	1538	1471	1743	1987	2460	4670	2772	5077	3882	3882	3609	3609
CER- *Scomb. regalis*	620	565	629	698	586	604	628	687	677	680	574	500	392	219	234	225	375	390	450	490	429	279	279
Atlantic																							
DOMINICAN R	110	105	119	98	86	104	106	76	110	106	63	52	48	57	59	50	45	79	50	90	29	29	29
GUADELOUPE	250	240	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MARTINIQUE	260	220	510	600	500	500	522	611	567	574	511	448	344	162	175	175	330	310	400	400	400	250	250
ST.LUCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0
ST.VINCENT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
FRI- *Auxis thazard*	10530	9747	20020	8343	12575	20912	14058	25240	21690	25903	22876	20306	23406	25151	21416	23333	13129	7001	5382	10516	10533	12488	10089
Atlantic	7886	6457	16611	4776	8868	16960	10380	19197	15870	19566	17636	15249	19666	19025	15029	14973	6732	2370	2703	5699	5515	5869	7236
ANGOLA	535	27	197	357	357	256	351	515	212	256	90	21	115	20	70	28	1	0	4	6	21	29	12
ARGENTINA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BARBADOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BENIN	0	0	0	0	25	37	64	72	32	49	50	1	3	6	3	0	0	0	0	0	0	0	0

EX-SMT-Table 1. Reported landings of small tunas (MT) in the Atlantic Ocean and Mediterranean Sea

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
BRASIL	0	0	0	0	0	0	0	72	11	634	623	941	1260	1904	700	592	746	291	608	906	558	527	215
BULGARIA	0	0	0	0	0	3	3	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CAP-VERT	0	0	0	0	0	0	0	0	0	0	0	0	2	86	105	75	135	82	115	86	13	1	0
ESPAÑA	289	418	574	1249	1211	6260	5295	3128	2691	5746	3702	3164	4538	3938	1877	2240	642	354	122	752	450	1395	641
ESTONIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	198	0	0	0	0	0	0
F.I.S	0	0	0	0	0	0	1	1984	2800	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FRANCE	0	0	0	0	0	0	0	0	0	640	416	1904	3392	3392	3008	3872	0	119	63	104	126	161	146
GERMANY D.R	0	0	0	0	0	0	0	106	55	40	0	3	0	0	0	0	0	0	0	0	0	0	0
GHANA	6001	4311	13914	1047	4286	7566	2048	6062	5632	4530	4500	3256	4689	0	0	0	0	0	0	0	0	0	0
GRANADA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
JAPAN	20	14	89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LATVIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	243	0	0	0	0	0	0
LITUANIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	290	0	0	0	0	0	0
MAROC	48	272	688	770	694	968	1267	1126	1271	198	424	302	465	194	599	1045	1131	332	274	122	645	543	2614
NEI-1	0	0	0	0	0	0	0	0	333	46	0	0	17	381	155	237	244	37	160	412	392	41	523
PORTUGAL	0	0	0	0	0	0	0	0	0	14	30	32	1	2	4	26	3	0	0	0	0	0	1
RUMANIA	0	0	0	0	0	0	0	0	0	0	0	51	15	0	0	0	0	0	0	0	0	0	0
RUSSIA FED.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1078	627	150	405	404	46	36
SAO TOME & P	0	0	0	0	0	0	0	0	0	32	0	0	0	0	0	0	0	0	0	0	0	79	0
SENEGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	810	784	1082	311	201	309	309	309	**	**
TRIN & TOBAG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	0	0	0	0
U.S.A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
USSR	0	162	242	803	450	694	407	5623	1655	5903	6055	3465	2905	5638	5054	2739	0	0	0	0	0	0	0
VENEZUELA	993	1253	907	550	1845	1176	944	509	1171	1478	1746	2109	2264	2654	2670	3037	1710	327	881	2597	2597	3047	3047
Mediterranean	2644	3290	3409	3567	3707	3952	3678	6043	5820	6337	5240	5057	3740	6126	6387	8360	6397	4631	2679	4817	5018	6619	2853
ALGERIE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	947	947	**
CROATIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	21	52	22	28	26	0
CYPRUS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESPANA	1389	1635	1184	1676	1771	2120	1700	1935	2135	2301	2047	1555	631	2669	2581	2985	2226	1210	648	1124	1472	2296	604
FRANCE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	4	0	0	1	0	0
GREECE	0	0	0	0	0	0	516	2192	1887	2060	1419	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1426	1426
ITALY	939	912	1147	1177	1342	1376	1193	1299	1494	1610	1344	1344	906	609	509	494	432	305	379	531	531	229	229
MALTA	18	15	9	33	11	18	4	9	11	4	1	13	5	8	18	21	20	11	10	1	2	3	6
MAROC	0	357	234	69	73	10	14	77	57	52	48	175	178	811	1177	2452	1289	1644	170	1726	621	1673	562
TUNISIE	282	353	811	589	493	409	237	517	218	294	367	538	606	588	660	985	985	35	20	13	14	13	26
YUGOSLAVIA	16	18	24	23	17	19	14	14	18	16	14	32	14	41	42	23	13	1	0	0	2	6	0
KGM- *Scomb. scrulla*	9886	8795	9203	7193	11647	15870	18852	18432	14627	13667	9986	12336	12151	13529	10940	12363	11755	12794	14781	14376	14884	17569	17481
Atlantic																							
ANTIGUA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
ARGENTINA	0	466	988	379	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

EX-SMT-Table 1. Reported landings of small tunas (MT) in the Atlantic Ocean and Mediterranean Sea

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
BRASIL	2185	546	790	845	848	1598	1612	1929	2695	2588	806	2890	2173	2029	2102	2070	962	979	1380	1365	1328	2887	2398
BRASIL-ESP.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BRASIL-TAIP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
CHINESE TAIP	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DOMINICAN R	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GRANADA	0	0	162	175	73	25	30	43	40	19	0	0	0	20	29	33	34	47	52	0	0	0	0
GUYANE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4
MEXICO	1354	1497	1331	1535	2249	1946	2740	4409	2874	2164	2303	2643	3067	3100	2300	2689	2147	3014	3289	3097	3214	4661	4661
ST.LUCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4
TRIN & TOBAG	0	0	0	0	0	0	0	0	20	43	11	38	82	752	541	432	657	0	1192	0	0	0	0
U.S.A	3095	4053	3837	2507	6292	10726	12565	9863	7068	7444	6011	5683	5628	5807	4363	5939	6502	7091	7747	6922	7345	7051	7926
VENEZUELA	2388	1731	1624	1328	1988	1361	1566	1905	1910	924	833	933	940	1330	1500	1069	1228	1307	800	2484	2485	2139	2139
KGX- *Scomb. spp.*	838	502	471	424	197	214	339	283	20	485	22	149	261	491	105	131	225	356	320	508	512	824	79
Atlantic																							
BARBADOS	184	220	135	157	0	0	0	0	0	0	0	138	159	332	68	51	45	51	55	36	42	49	0
BRASIL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COLOMBIA	412	133	108	92	54	73	160	80	20	485	22	11	102	159	37	25	7	12	21	148	111	539	**
GABON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	140	145	79	79
GRANADA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GUADELOUPE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MARTINIQUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MEXICO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PUERTO RICO-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RUSSIA FED.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	53	84	86	134	106	**
ST.LUCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	0	0	0	0
ST.VINCENT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	55	79	150	141	98	80	50	0
TRIN& TOBAG	242	149	228	175	143	141	179	203	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
UKRAINE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	94	90	0	0	0	0	0
LTA- *E.alletteratus*	9043	10401	8344	17633	14673	19214	13847	15839	22214	20625	12895	8809	19741	25135	29855	29850	22717	21524	11556	11198	11517	12096	12394
Atlantic	7657	8373	5845	15138	11803	16440	12401	13359	20653	18975	10855	6643	17317	22730	27820	26214	19893	19845	10785	10452	10167	10531	11371
ANGOLA	449	10	1326	826	646	1328	1171	1734	1632	1632	1433	1167	1345	1148	1225	285	306	14	175	121	117	235	51
ARGENTINA	0	0	0	0	0	0	0	36	0	0	11	2	2	0	1	1	0	0	0	0	0	0	0
BENIN	0	0	0	0	16	24	40	45	20	31	30	90	14	7	43	66	61	49	53	60	58	58	58
BERMUDA	7	16	9	7	7	11	11	4	5	5	7	13	13	17	14	8	10	11	5	6	6	7	5
BRASIL	0	0	0	0	0	0	45	10	0	765	785	479	187	108	74	685	779	935	985	1225	1059	834	507
BULGARIA	8	0	1	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CANADA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CAP-VERT	0	0	0	0	0	128	236	258	34	16	160	29	14	1	18	65	74	148	17	23	72	63	63
COLOMBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COTE D'IVOIR	860	400	431	38	57	177	0	0	0	0	0	20	5300	38	4900	2800	100	142	339	251	253	250	250

EX-SMT-Table 1. Reported landings of small tunas (MT) in the Atlantic Ocean and Mediterranean Sea

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
CUBA	0	0	0	0	0	131	53	77	6	15	16	24	55	53	113	88	63	33	13	15	27	23	0
ESPANA	5	6	33	56	4	485	7	3	2	27	34	12	11	7	11	55	55	1	296	0	0	0	0
ESTONIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	66	0	0	0	0	0	0
FRANCE	0	0	0	0	0	0	1098	1120	0	0	0	0	0	0	195	0	61	11	8	53	59	22	215
GABON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	182	**
GERMANY D.R	0	0	0	0	0	0	0	397	543	99	40	10	2	0	2	0	0	0	0	0	0	0	0
GERMANY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	0	0	0	0	0	0	0
GHANA	4656	6044	1185	6049	5547	4134	3287	2141	5009	5966	901	649	5551	11588	12511	14795	11500	11608	359	994	513	113	2025
ISRAEL	0	0	0	0	0	227	203	640	282	271	76	0	0	0	0	0	0	0	0	0	0	0	0
ITALY	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LATVIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	65	0	0	0	0	0	0
LITUANIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0
MAROC	58	31	15	21	289	16	19	26	19	15	447	47	108	49	14	367	57	370	44	43	230	588	195
MAURITANIE	50	50	50	50	50	31	86	77	54	60	60	50	50	50	50	50	50	50	50	50	53	53	53
NEI-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	72	21	53	0	0
NEI-28	0	125	0	3	2	58	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
POLAND	2	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0
PORTUGAL	0	0	0	0	5	121	8	0	0	0	0	80	21	86	91	2	61	73	45	72	72	218	320
RUMANIA	46	10	86	2	17	9	12	291	216	266	126	81	7	88	0	0	0	0	0	0	0	0	0
RUSSIA FED.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	617	306	265	189	96	49	0
SAO TOME & P	0	0	0	0	0	0	0	0	0	101	0	0	0	0	0	0	0	0	0	0	0	40	0
SENEGAL	1092	705	1540	1446	1697	2444	1586	5017	5623	8408	4566	2392	2985	6343	6512	4775	3767	4088	4883	4072	4072	3773	3773
ST.LUCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
ST.VINCENT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
U.S.A	67	5	53	113	12	88	97	87	107	41	73	104	118	204	129	173	228	597	1286	1142	1312	2183	2014
U.S.S.R	0	470	690	6127	2184	6307	3615	1085	6528	613	1040	271	61	1707	543	667	0	0	0	0	0	0	0
VENEZUELA	357	501	426	390	1270	721	791	311	573	644	1050	1123	1467	1236	1374	1294	1963	1409	1889	2115	2115	1840	1840
Mediterranean	1386	2028	2499	2495	2870	2774	1446	2480	1561	1650	2040	2166	2424	2405	2035	3636	2824	1679	771	746	1350	1565	1023
CROATIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	2	15	15	0	0
CYPRUS	7	7	18	11	17	17	22	33	17	31	32	13	25	41	20	23	25	21	11	23	10	19	19
ESPANA	732	1134	1059	1192	993	800	6	705	0	32	12	5	0	5	0	0	0	0	0	0	15	18	0
FRANCE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ISRAEL	200	300	300	200	170	105	35	110	35	60	259	284	273	135	124	129	108	126	119	119	215	119	119
ITALY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LIBYA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45
MALTA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	1	8	8	8	3	3
MAROC	63	4	4	0	6	0	61	12	0	1	0	0	0	12	0	16	0	0	0	0	1	0	1
NEI-2	0	0	0	0	0	0	0	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
OTHERS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	90	0
SYRIA	0	102	105	109	89	80	73	90	80	96	95	73	121	99	121	127	110	156	161	156	155	270	270
TUNISIE	364	479	1009	983	1595	1772	1249	1330	1228	1224	1441	1590	1803	1908	1566	3132	2366	1172	242	204	696	824	366

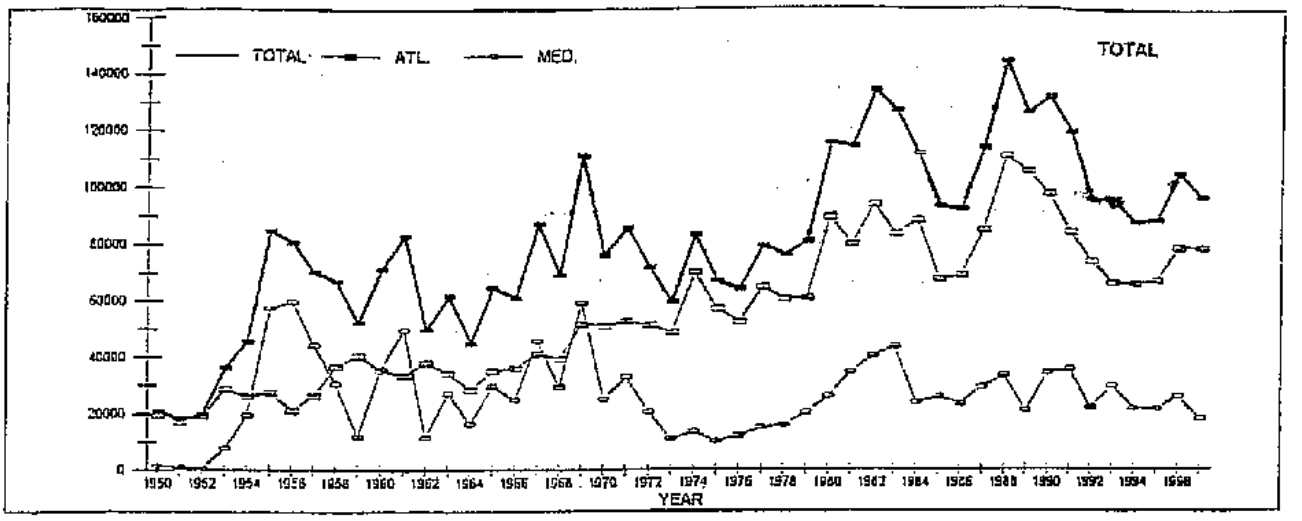
EX-SMT-Table 1. Reported landings of small tunas (MT) in the Atlantic Ocean and Mediterranean Sea

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
YUGOSLAVIA	20	2	4	0	0	0	0	0	1	6	1	1	2	5	4	9	5	0	28	21	35	22	0
MAW - *Scomb. tritor*	1140	1901	2572	6716	4167	4921	3156	5312	4716	4498	3989	3292	1799	3915	2934	5610	4025	1437	1775	1270	1264	1316	1264
Atlantic																							
ANGOLA	0	0	20	81	24	70	68	138	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BENIN	0	0	0	0	23	35	60	68	30	46	50	104	17	13	334	211	214	202	214	194	188	188	188
ESTONIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	49	0	0	0	0	0	0
GERMANY D.R	0	0	0	0	0	0	0	851	537	33	1	0	0	0	0	0	0	0	0	0	0	0	0
GHANA	598	555	720	771	1569	4412	1983	2982	2225	3022	3000	1453	0	1457	1457	1500	2778	899	466	0	0	0	0
LATVIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	208	34	0	0	0	0	0	0
LITUANIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	52	4	0	0	0	0	0
RUSSIA FED.	0	0	0	0	0	0	0	0	0	0	0	0	0	143	195	1032	242	0	19	0	0	44	0
SAO TOME & P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0
SENEGAL	314	1270	1188	1054	1112	404	1045	671	754	1174	732	1516	1754	2159	753	1419	656	332	1076	1076	1076	1076	1076
U.S.S.R	228	76	644	4810	1439	0	0	602	1170	223	206	219	28	143	195	1240	0	0	0	0	0	0	0
SSM - *Sc.maculatus*	13058	12307	12218	11528	10899	13945	11164	13633	9574	11362	11590	14117	14531	12712	13946	14500	15546	16346	16231	14777	13857	16725	14895
Atlantic																							
COLOMBIA	393	245	283	228	199	213	408	8	10	77	101	81	72	151	112	76	37	95	58	69	69	0	0
CUBA	600	500	400	600	400	578	657	476	689	544	443	621	1606	803	746	665	538	611	310	409	548	613	613
DOMINICAN R	292	253	174	317	415	479	503	384	168	1058	1267	1271	1321	1415	1401	1290	728	735	739	1330	2042	2042	0
GRANADA	0	0	10	2	0	1	1	1	1	1	4	17	0	0	1	3	0	0	1	2	2	0	0
MEXICO	4794	3380	4414	5138	5751	5908	5908	7799	5922	5777	5789	6170	6461	5246	7242	8194	8360	9181	10066	8300	7673	11050	11050
ST.LUCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRIN & TOBAG	1691	1544	1484	1933	1208	1337	939	1218	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U.S.A	5288	6385	5453	3310	2926	5429	2748	3747	2784	3905	3986	5957	5071	5097	4444	4272	5883	5724	5057	4667	3523	3020	3232
WAH - *A.solandri*	326	379	393	452	760	610	2920	2280	2366	2159	920	1150	1235	1612	1507	1470	1687	1805	2570	2100	2359	2522	2589
Atlantic																							
ANTIGUA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
ARUBA	100	100	100	115	115	115	115	115	115	115	115	120	90	80	80	70	60	50	50	125	40	50	50
BARBADOS	0	0	0	0	189	116	144	219	222	219	120	138	159	332	51	51	60	51	91	82	42	35	47
BENIN	0	0	0	0	1	1	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
BERMUDA	14	20	35	23	33	46	24	40	49	46	46	65	43	61	63	74	67	80	58	50	93	115	103
BRASIL	3	9	3	6	69	1	1	0	0	0	21	141	133	58	92	52	64	60	33	26	1	16	58
BRASIL-HOND.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
BRASIL-TAIP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0
BRASIL-USA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CAP-VERT	0	0	0	0	0	24	2307	1464	1588	1365	142	205	306	340	631	458	351	350	326	361	408	503	503
DOMINICA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	43	59	59	59	58	58	58
DOMINICAN R	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	6	9	13	7	0	0	0	0
ESPANA	0	0	0	0	0	0	0	0	0	0	4	9	9	32	18	23	28	32	22	20	15	25	25
GRANADA	0	0	0	35	31	25	23	41	94	50	51	82	54	137	57	54	77	104	96	46	49	56	54

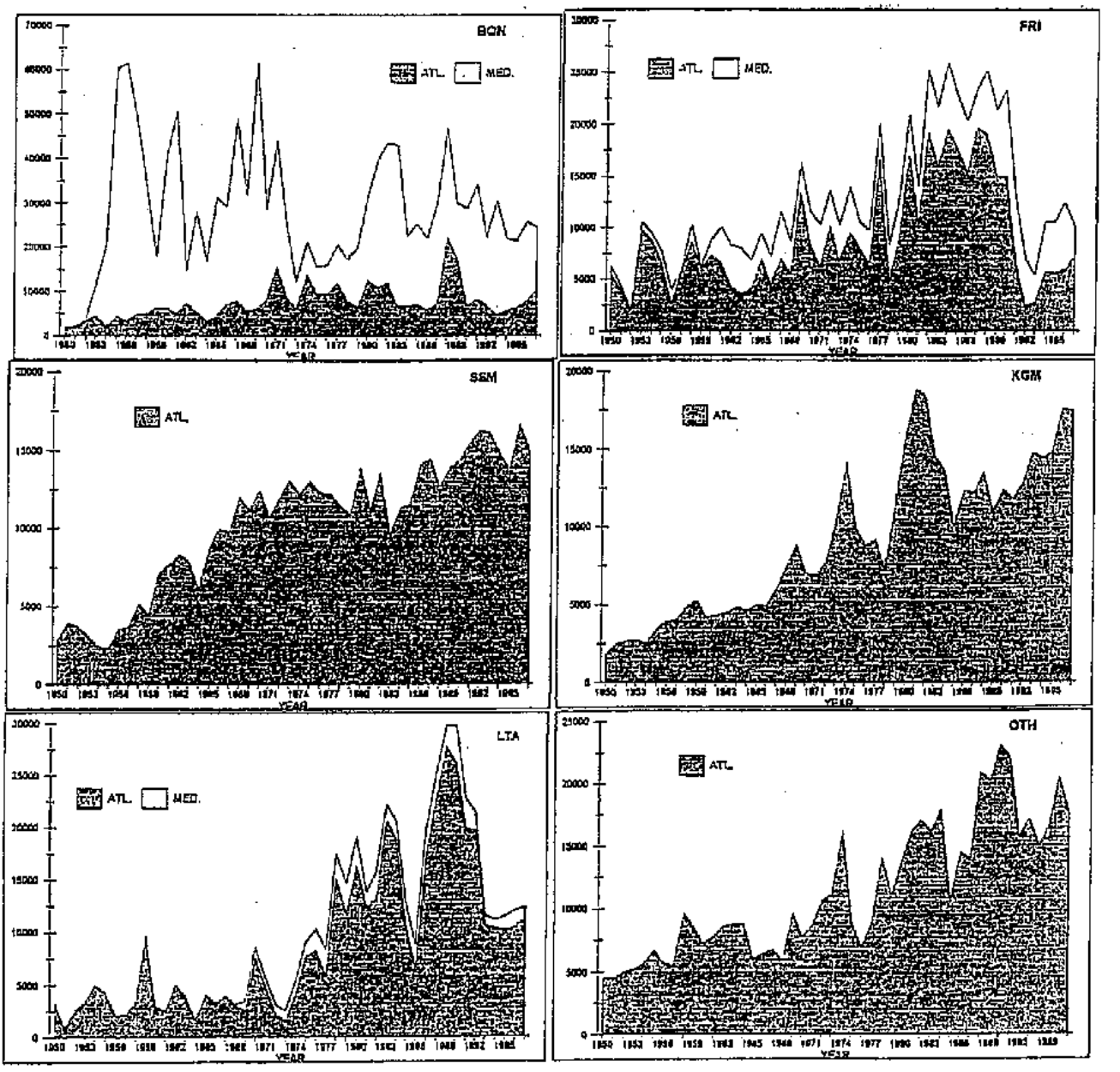
EX-SMT-Table 1. Reported landings of small tunas (MT) in the Atlantic Ocean and Mediterranean Sea

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
NETH.ANT	178	178	178	215	215	215	215	215	215	215	245	250	260	280	280	280	250	260	270	250	230	230	230
SAO TOME & P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	0
SENEGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ST. HELENA	4	5	6	4	7	10	12	9	16	23	15	15	18	18	17	18	12	17	35	26	25	23	0
ST.LUCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	77	79	150	141	98	80	221	223
ST.VINCENT	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	28	33	33	41	28	16	23	10
TRIN & TOBAG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	118	1	0	0	0	0	0
U.S.A	0	0	0	0	0	0	0	0	0	0	13	12	57	128	110	82	134	203	827	391	764	608	749
VENEZUELA	27	67	71	54	100	57	77	175	66	125	147	113	106	141	101	159	302	331	513	538	538	479	479

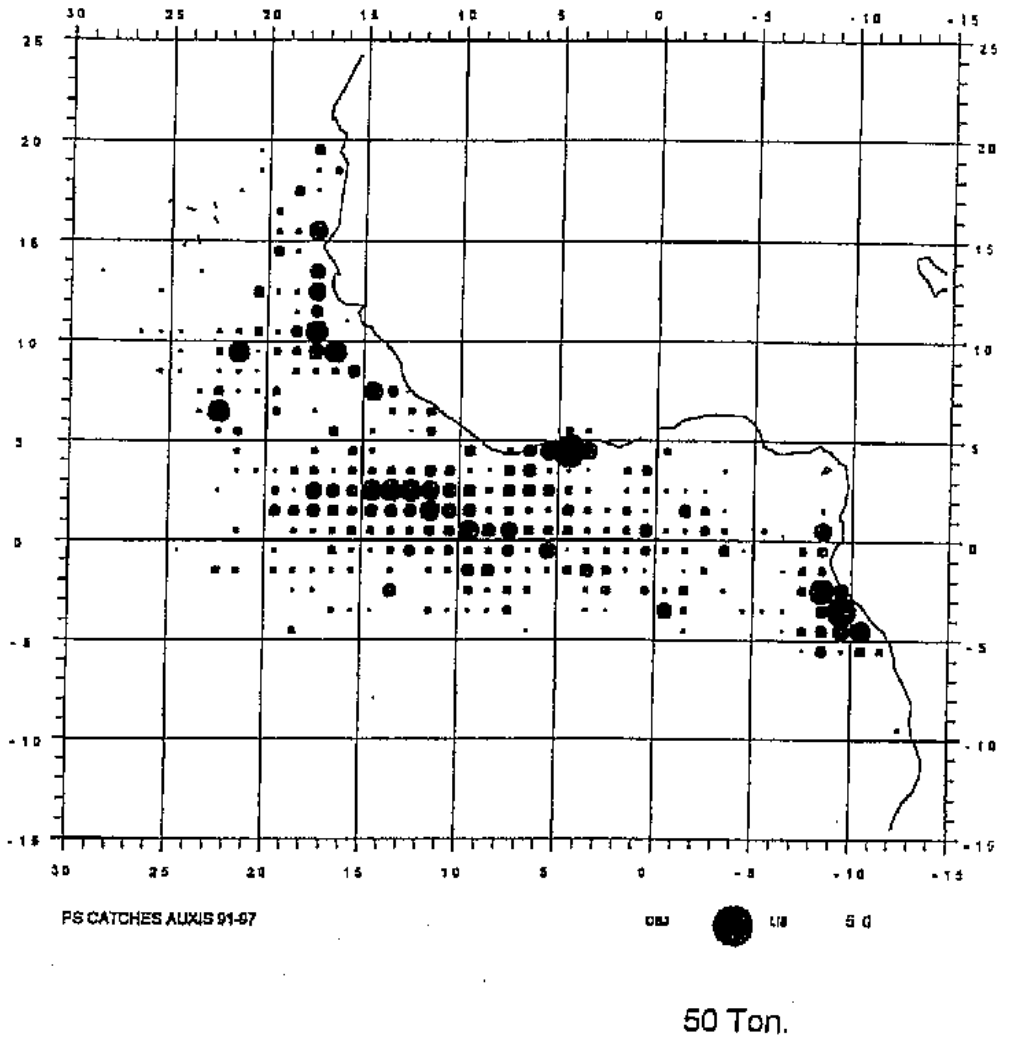
Barbados WAH catches include KGX



SMT-Fig. 1. Reported landings (MT) of small tunas, all species combined, in the Atlantic and Mediterranean, 1950-1997. (1997 data are very incomplete.)



SMT-Fig. 2. Total cumulative landings (MT) of major species of small tunas in the Atlantic Ocean and Mediterranean Sea, 1950-1997. (1997 data are very incomplete.)



SMT-Fig. 3. Frigate tuna *(Auxis thazard)* catches reported in logbooks from purse seiners (Spain, France and NEI) operating in the tropical Atlantic during 1991-1997.

SCRS ITEMS (Continued)

14. Report of the Sub-Committee on Environment

14.1 The Report of the Sub-Committee on Environment was presented by the Group's convener, Dr. Alain Fonteneau (EC-France). The Committee reviewed the report and adopted it and reiterated all the recommendations contained therein (and which are also included under item 19).The Report is attached as **Appendix 8.**

15. Report of the Sub-Committee on Statistics and review of Atlantic tuna statistics and data management system

15.1 The Report of the Sub-Committee on Statistics was presented by the Sub-Committee Convener, Dr. Steve Turner (USA). The report was reviewed and adopted and is attached as **Appendix 9**. The Committee reiterated the recommendations made by the Sub-Committee (which are included in item 19).

16. Report of the Sub-Committee on By-Catches

16.1 Dr. H. Nakano presented the report of the Sub-Committee on By-catches. This report was reviewed by the Committee and adopted (attached as **Appendix 10**). The Committee also reiterated the recommendations made by the Sub-Committee (which are included under item 19).

17. Review of ICCAT scientific publications

17.1 In discussing this Agenda item, the Assistant Executive Secretary reiterated the list of scientific publications published in the past year and noted that the current SCRS policy regarding publications was considered adequate.

17.2 Dr. Miyake, presented the progress report sent by Mr. Jim Beckett, the Editor contracted for the Symposium publication, in which the reasons for the delay in the publication process were explained. It is expected that the enhanced edition of the Symposium will be ready by the time of the Commission Meeting in November.

18. Consideration of other SCRS activities

– Organization of the SCRS

18.1 It was noted that a working group had met prior to the SCRS plenary sessions and prepared a report for this meeting. The report was presented by the group's Convener, Dr. Jerry Scott (USA), who referred to the group's terms of reference, which in essence were to study ways to re-structure the SCRS for the future with a view towards enhancing the credibility of the Commission's scientific work.

18.2 One of the major recommendations made by this Working Group was to establish an "Advisory Committee" consisting of all the SCRS Officers, the SCRS Chairman, and a professional population dynamics expert. It was noted that the major task of this Advisory Committee would be to review the both SCRS reports on species (Detailed Reports and Executive Summaries) for consistency and to modify the scientific advice to the Commission accordingly. Dr. Scott outlined other functions of the Committee

18.3 Another proposal by the Working Group called for the establishment of a "Working Group on Assessment Methods", whose major tasks would involve, among others, conducting performance evaluations of the assessment methods, provide advice and guidelines on the methodologies, and to normalize such among between the different species groups. In order to achieve this objectives of the two groups mentioned above, the Working Group on SCRS Organization recommended that a new position at the Secretariat for a highly qualified population dynamics scientist (or analyst) is essential.

18.4 The Working Group also made several recommendations concerning professional staff requirements at the Secretariat to assist in identifying inconsistencies in the currently available data base and to increase the Secretariat's efficiency.

18.5 In response to some lengthy discussion on an adequate number of members on the Advisory Committee (SCRS Officers currently total 16), the authority such a Committee would have, whether an outside review would be more effective, possible conflict of interest of the members of the Advisory Committee, the need for and the timeliness of critical reviews,

etc, the SCRS Chairman pointed out that the Advisory Committee would be a committee of the SCRS, with review capacity, that would report to the SCRS and hence any final decisions will still be made by the Committee.

18.6 The ICCAT Executive Secretary commented briefly on the financial implications of hiring two professional staff members and pointed out such proposals with budgetary considerable repercussions usually require their being presented at least one year before making such decisions. While he recognized and agreed with the need for additional manpower at the Secretariat, he felt that a solution should be sought for the interim period He also believe that the Secretariat should prepare a paper to be presented to the Commission and which included a summary of the financial implications of these proposals.

18.7 Dr. Scott also pointed out that there were some recommendations contained in the Working Group report that did not require Commission action, such as the overall organization within the species groups, and proposals for the improvements to the species groups' current reporting system. An important proposal was that each species groups prepare a "work plan", specifically outlining their data processing requirements, which should be forwarded to the Secretariat well in advance an assessment session, data preparatory meeting or species group meeting.

18.8 Since it was felt that the Committee needed more time to study and discuss the proposal to establish an Advisory Committee, it was agreed that this remain as an *ad hoc* group for the next year, while not losing its momentum for actions next year. This Ad Hoc group will decide the terms of reference for the Advisory Committee as well as the structural enhancements within the Commission.

18.9 The Report of the Working Group on SCRS Organization is attached as **Appendix 11.**

– Inter-sessional scientific meetings proposed for 1999

18.10 The SCRS proposed the following inter-sessional meetings for 1999:

1) BETYP Preparatory Meeting (Madrid - January-February)
2) Sub-Committee on By-Catch (5 days in April or May)
3) Skipjack Tuna Stock Assessment Session (Madeira - last week of June or first week of July)
4) South Atlantic Swordfish Data Preparatory Meeting (Brazil - early 1999)
5) Swordfish Stock Assessment Session (Madrid - September 21 to 28)
6) Inter-sessional meeting of the Sub-Committee on Statistics (Madrid - 4 to5 days, prior to the species groups)
7) Workshop on the Precautionary Approach (Dublin, Ireland - 5 days, prior to July)

18.11 The dates, duration of the meetings, and venues will be decided after the SCRS meeting in consultation with the SCRS Chairman, and the Conveners and/or Chairmen of the various groups. The Secretariat will inform the Committee of the definitive 1999 SCRS inter-sessional meeting schedule as soon as possible.

19. General recommendations and responses to the Commission

– Voluntary measures taken by tropical purse seiners

19.1 The Committee responded to the specific request from the Commission to review the effect on the stocks of the voluntary measure enforced for French and Spanish purse seine fleets, prohibiting the use of artificial floating logs or auxiliary vessels in the protection area from 1 November 1997 to 31 January 1998 and to review the results of the observer program for bigeye tuna adopted in 1996 for all tropical tuna fleets. The Committee also reviewed the results of the voluntary Details of the Committee's response to the Commission are included as **Appendix 12**.

Management recommendations

19.2 The management recommendations are included at the end of the Executive Summaries of each species section. The Committee requested the Commission to give due attention to these recommendations when considering the management of stocks.

– Other species questions asked, particularly relative to bluefin tuna

a) The SCRS view on the request for bluefin tuna rebuilding programs can be found in the Bluefin Executive Summary and the Detailed Report.

b) The Committee attempted to address possible changes in the dates of the existing purse seine closure in the Mediterranean. However, insufficient size and catch and effort data did not allow this. Details are found in the Report of the Fourth Ad Hoc GFCM/ICCAT Joint Meeting on Stocks of Large Pelagic Fishes in the Mediterranean, the Bluefin Detailed Report and the Bluefin Executive Summary.

c) The response to the request for improvement of Task I statistics in relation to the NEI category can be found in the above-mentioned GFCM/ICCAT Report, the Bluefin Detailed Report and the Executive Summary.

19.2.1 **TROPICAL TUNAS**:

(1) The Group considers it important to collect more comprehensive data on searching time, handling time, set duration, and discards, using logbook, observer and dockside interview programs, in order to estimate increases in fishing efficiency since these have a substantial influence on the assessment results. By this means, it may be possible to gather information on vessel and gear characteristics that are important determinants of efficiency; for example, net dimensions, electronic devices in use and their detection range, and average numbers of logs used. Observer coverage of vessel and fishing activities should be conducted at a level and frequency adequate to provide statistically valid data on fishing operations.

(2) In 1994, the SCRS maintained and reinforced the recommendation of the Working Group on Yellowfin Tuna about the need for tagging programs for juvenile fish in the eastern Atlantic, to test the hypothesis developed by the Group on yellowfin stock structure and to quantify the mixing rates. Tagging programs are essential for determining the east-west migration of pre-adult yellowfin, and the relationship of the Venezuelan and Brazilian fishing areas in this migration scheme. During the inter-sessional workshop on abundance indices in May 1998, the importance of tagging studies for obtaining information on stock size and fishing mortality was reiterated; in addition tagging studies could be used to examine the rate of accumulation of fish around logs. Although the Committee noted that this recommendation has a higher priority for bigeye than for yellowfin, in view of the increase in fishing mortality on this species in recent years, the tagging program proposed for bigeye should take this recommendation into account and anticipate the tagging of juvenile yellowfin in the eastern Atlantic during bigeye tagging, since both species are frequently associated in mixed schools. Although costly, tagging studies are considered high priority because of the quality and reliability of the results they yield.

(3) Detailed analyses of the 1973 ICCAT recommendation for a 3.2 kg minimum size for yellowfin with 15% tolerance should be conducted in order to (a) fully investigate the yield per recruit and spawning biomass per recruit implications of this and alternative minimum sizes, and (b) to determine the feasibility of this and alternative minimum sizes, given the multi-species nature of the tropical tuna fisheries (applies to bigeye as well).

(4) Since 1984, no assessment has been carried out on skipjack. Given the important changes which have occurred in the fishery, it is essential that an assessment of the state of the stocks of this species be carried out, including calculations with current species compositions. This assessment should be made using specific methods which can be applied to stocks with the characteristics of skipjack. This assessment should be carried out the SCRS sessions since there is insufficient time during the SCRS to assess all three tropical tuna species (skipjack, yellowfin and bigeye).

19.2.2 **BLUEFIN TUNA**

Issues associated with spawning site fidelity, migration paths, and mixing are amongst the most important of the uncertainties in the assessment and management of Atlantic bluefin tuna. The committee therefore endorses the research recommendations of the BYP and encourages continued and enhanced co-operation among scientists conducting research on the east and west stocks, in order to collaborate on tagging experiments, and to collect and analyze samples for genetics and microconstituents studies. The Committee suggests that priority be given to the tagging of spawning fish on the Gulf of Mexico and Mediterranean spawning grounds, the collection and exchange of tissue samples for genetic analysis from small juveniles or spawning fish from these spawning grounds, and the collection and exchange of tissue and otolith samples from young-of-the-year (preferably) or one year-old fish for analysis.

19.2.3 **ALBACORE**

The degree of uncertainty in the assessments conducted for the albacore stocks, especially for the southern stock, urged the Committee to make the following research recommendations:

(1) Progress has been made in the application of length frequency analysis for the southern stock. However, further research is needed, especially on the achievement of reliable and validated growth estimates. The presence of important amounts of small albacore in the length distributions in recent years may facilitate proper estimations of growth and hence catch-at-age. Research effort for future computation of age composition based on length frequency analysis is recommended.

(2) The criteria used for reading dorsal fin spines of northern and southern albacore should be compared. Exchange of samples from both stocks is strongly recommended. Moreover, recent utilization of otoliths for age determination of Pacific albacore has revealed as an alternative approach. The possible use of these structures for age reading should be investigated.

(3) Experiments on tagging using tetracycline in the South Atlantic are highly recommended.

(4) According to the results obtained on a possible association between North Atlantic albacore dynamics and indicators of climatological changes, it is strongly recommended that this kind of analysis be continued, in carrying out analyses of state of the stocks of albacore, taking into account the climatological indicators specific to the Atlantic Ocean.

(5) The Committee recommended that the basis for different assumptions about recruitment of North Atlantic albacore be examined carefully during the next assessment. It is possible that a longer time history of observed stock-recruitment values will shed some light on this problem. for this reason, the Committee recommends that an attempt be made to utilize stock assessment methods that can make better use of the historical data while taking their relative precision into consideration.

(6) The Committee also recommended the inclusion of historic data, at least the period 1970-1974, in the set of years to be analyzed in future assessments of northern albacore.

19.2.4 **SWORDFISH**

In 1999, a full stock assessment will be conducted for Atlantic swordfish. Prior to conducting the 1999 swordfish assessment, for the south Atlantic, it is recommended that a 6-day inter-sessional be held in early April 1999 in Brazil to review and compile in a near-final form the data inputs (coverage of size sampling and CPUE), and to establish the type of analyses to be used to determine the status of the south Atlantic swordfish stock. For the north, national scientists will require a considerable amount of time and support between January and September 1999 to prepare the sex-specific catch-at-size and CPUE data in anticipation of the 1999 assessment which will take into account the differential growth of male and female swordfish. The Atlantic Stock Assessment Session (north and south) should be held as an intersessional in late September/early October, probably at the Secretariat.

In addition, it is recommended that studies be carried out aimed at clarifying the criteria to follow in assigning to the North or South stock of the Mediterranean catches taken by those fleets that fish in the areas close to the Strait of Gibraltar.

19.2.5 **BILLFISH**

(1) The Committee feels that the earliest updating of marlin assessments that could allow the examination of the effects of the 1997 Commission resolution for reducing marlin landings by 25% from 1996 levels (to be fully implemented by the end of 1999) would be when the 1999 data are available in the year 2000. Therefore, the Committee recommends that updating marline assessments should be conducted during an intersessional meeting held during 2000.

(2) The Committee recommends that problems with incomplete billfish landings, for example Gabon, as well as non-reporting of billfish landings, be actively pursued by Program Coordinators, and the ICCAT Secretariat, to ensure the greatest opportunity for meaningful updated marlin assessments in the year 2000.

(3) The Committee recommends that the Enhanced Research Program for Billfishes be continued and expanded in critical areas.

(4) The Committee recommends that additional detailed analyses of the available data be conducted and that alternative assessment methodologies, which make use of all available information (particularly size frequencies, for both commercial and recreational fisheries, and environmental data) be explored for application to marlins.

19.2.6 **SUB-COMMITTEE ON BY-CATCH**

Since ICCAT has started to collect catch information, the CPUE of pelagic sharks were reviewed for some Atlantic fisheries. It is likely that review of collecting statistics and CPUE of pelagic sharks are necessary. The Committee recommends to hold inter-sessional meeting on the reviewing CPUE for pelagic shark species in May, 1999.

(1) The Committee also recommend member nations to submit scientific reports on the observed levels of seabird by-catch in their fisheries, if information to quantify this level exists.

19.2.7 **SUB-COMMITTEE ON STATISTICS**

Further study should be made on the revisions to Ghana size data and Turkish Task I data.

(1) The bibliographic data base of all ICCAT scientific papers be completed and disseminated by 31 March 1999.

(2) An *Ad Hoc* Working Group on Data Management be established

(3) More personnel be hired at the Secretariat's Statistics Department, according to the recommendations of the Working Group on SCRS Organization.

(4) Each species group draw up an annual plan of data needs which should be submitted to the Secretariat well in advance of the species group meetings.

(5) All data emanating from ICCAT financed programs, be reported annually to the Secretariat.

(6) The Assistant Executive Secretary attend the 1999 meeting of the Co-ordinating Working Party on Statistics and the FAO Consultation on the Precautionary Approach.

19.2.8 **SUB-COMMITTEE ON ENVIRONMENT**

(1) It is recommended that the SCRS consider aspects relating to the environment in its assessments and seek formulas for their integration. Especially in those aspects which are related to the definition of boundaries between stocks, as well as the methods and interpretations of the processes of CPUE standardization.

(2) The SCRS recommends that the one of tasks of the proposed Advisory Committee be that of validating the ecological assumptions made by each Species Group, and the form in which the environmental indicators are considered in the assessments.

(3) It is proposed that the first priority of the Working Group on Methodologies be that of determining the ways of integrating the environmental indicators in the assessment process.

19.2.9 **BIGEYE YEAR PROGRAM (BETYP)**

The SCRS requested that the total Program proposed in 1996 and revised in 1997 considered seriously and substantial funding made available (see **Appendix 5**).

19.2.10 **BLUEFIN YEAR PROGRAM (BYP)**

The left over funds from 1997 and 1998, together with a similar level of funding by the Commission for 1999 would make it possible to set up a sampling center on the eastern side of the Atlantic. The new budget can be found in **Appendix 4**.

It is recommended that the Commission grant exceptions to prohibitions on catch and Bluefin Tuna Statistical Document regulations in order to obtain and transport tissues for bluefin stock structure research.

19.2.11 It is noted that there are other recommendations found elsewhere in this Report, in the Detailed Reports and in the GFCM/ICCAT Report, and the SCRS requests that the Commission review and verify them.

20. Collaboration with non-contracting parties, entities or fishing entities and other fisheries organizations

20.1 It was noted that there was considerable collaboration with non-contracting parties, entities and fishing entities, and well as with other international fisheries organizations, notably FAO SPC, IATTC, ICES, CCAMLR, during 1998, particularly concerning areas in which the regional agencies have common interest (e.g. fishing capacity, sharks, etc.)

20.2 The Executive Secretary noted the positive feedback from Panama, Namibia and Chinese Taipei, in response to the Commission's in its efforts to cooperate with the Commission's conservation efforts. He believed that considerable positive progress had been made during the last year in this aspect and that this would be discussed in depth at the November Commission meeting.

21. Date and place of the next meeting of the SCRS

21.1 The Committee confirmed that the 1999 SCRS should meet at least three weeks before the Commission meeting and thus recommended that the 1999 SCRS meet, in principle, starting the week of October 18, in Madrid, with the Species Groups to start the preceding week. It was understood that the dates of the 1999 SCRS are tentative, pending the Commission's decision on its meeting dates.

22. Other matters

22.1 No other matters were discussed.

23. Adoption of Report

23.1 The Report, together with all the recommendations contained therein, was adopted by the Committee. It was agreed that all the changes presented by the scientists at the time of adoption would be incorporated to the Report by the Secretariat and that the Report, in the three language versions, would be available on the ICCAT web page within the next few days. At this time, hard copies will be mailed only to those participants who do not have an electronic mail address. Hard copies will also be forwarded to Head Commissioners. It should be noted that in order to expedite inasmuch as possible the posting/mailing of the 1998 SCRS Report, a thorough checking of the translations could not be done at this time, but will be done later by the Secretariat. Hence, only minor editorial work has been done.

24. Adjournment

24.1 The 1998 Meeting of the Standing Committee on Research and Statistics (SCRS) was adjourned on Friday, October 23, 1998.

APPENDIX 1

1998 SCRS AGENDA

1. Opening of the meeting
2. Adoption of Agenda and arrangements for the meeting
3. Introduction of Contracting Party delegations
4. Introduction and admission of observers
5. Admission of scientific documents
6. Review of national fisheries and research programs
7. Review of the ICCAT Bluefin Year Program (BYP) - activities, progress & future plans
8. Review of the ICCAT Bigeye Year Program (BETYP) - activities, progress & future plans
9. Review of the ICCAT Program of Enhanced Research for Billfish - activities, progress & future plans
10. Reports of SCRS inter-sessional meetings
11. Reports of scientific meetings where ICCAT participated as observers
12. Report of the *Ad Hoc* Working Group on the Precautionary Approach
13. Executive Summaries on species:
    YFT-Yellowfin, BET-Bigeye, SKJ-Skipjack, ALB-Albacore, BFT-Bluefin, BIL-Billfishes,
    SWO-Swordfish, SBF-Southern Bluefin, SMT-Small Tunas
14. Report of Sub-Committee on Environment
15. Report of the Sub-Committee on Statistics and review of Atlantic tuna statistics and data management system
16. Report of the Sub-Committee on By-catches. Future plans for the collection of by-catch statistics
17. Review of ICCAT scientific publications
18. Consideration of other SCRS activities
    – Organization of the SCRS
    – Inter-sessional scientific meetings proposed for 1999
19. General recommendations and responses to the Commission
20. Collaboration with non-contracting parties, entities or fishing entities and other fisheries organizations
21. Date and place of the next meeting of the SCRS
22. Other matters
23. Adoption of Report
24. Adjournment

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APPENDIX 3

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SCRS/98/2	Tentative Agenda of the Sub-Committee on Statistics
SCRS/98/3	Tentative Agenda of the Sub-Committee on Environment
SCRS/98/4	Tentative Agenda of the Sub-Committee on By-Catches
SCRS/98/5	Organization of the 1998 SCRS Meeting and Guidelines for SCRS Documents
SCRS/98/6	Tentative Agenda of the *Ad Hoc* Working Group on Precautionary Approach
SCRS/98/7	Procedures used for updating catch at size of swordfish and a comparison between Task I catch and estimated weight from catch at size - ICCAT Secretariat
SCRS/98/8	Atlantic bluefin tuna : proposed changes to historic catch data and unreported catches - ICCAT Secretariat
SCRS/98/8	*Appendix Tables* : Procedures adopted for creating bluefin catch at size (up to 1997) which were used in bluefin stock assessment session of SCRS, 1998 - ICCAT Secretariat
SCRS/98/9	*(COM/98/9)* Report on Statistics and Coordination of Research in 1998
SCRS/98/10	*(COM/98/10)* Report of the Preparatory Meeting for the ICCAT Bigeye Year Program (BETYP) (ICCAT, Madrid, Spain, 24-25 March, 1998)
SCRS/98/11	*(COM/98/11)* Meetings of General Fisheries Commission of the Mediterranean Sea - Miyake, P.M.
SCRS/98/11b	*(COM/98/11bis)* Report of the Fourth *Ad Hoc* GFCM/ICCAT Joint Working Group on Stocks of Large Pelagic Fishes in the Mediterrean Sea (Genoa, Italy, 7-12 September 1998)
SCRS/98/12	*(COM/98/12)* Report of the Technical Working Group on Sharks (Tokyo, Japan, 17-21 April, 1998) - Miyake, P.M.
SCRS/98/13	*(COM/98/13)* Report of FAO Technical Working Group Meeting on Reduction of Incidental Catch of Seabirds in Longline Fisheries (Tokyo, Japan, 25-27 March, 1998) - Uozumi, Y.
SCRS/98/14	*(COM/98/14)* Report on attendance at the Technical Working Group on Fishing Capacity (La Jolla, California, USA, 15-18 April, 1998) - Miyake, P.M.
SCRS/98/15	*(COM/98/15)* Preparatory Meeting for the Consultation on the Management of Fishing Capacity, Shark Fisheries and Incidental Catch of Seabirds in Longline Fisheries (Rome, Italy, 22-24 July, 1998) - Miyake, P.M.

SCRS/98/16 Data preparations made by the Secretariat for 1998 SCRS Tropical Tuna Stock Assessment Session - ICCAT Secretariat

SCRS/98/17 Data preparations made by the Secretariat for the 1998 SCRS Albacore Assessment Session - ICCAT Secretariat

SCRS/98/18 Report of the ICCAT Meeting for the Developement of Standardized Methods for Estimating Swordfish Catch at Age by Sex (Hamilton, Bermuda, 21-27 January, 1998)

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APPENDIX 4

-BLUEFIN YEAR PROGRAM (BYP): PROGRESS ACHIEVED & FUTURE PERSPECTIVES

PROGRESS ACHIEVED

Following the points of the modified Bluefin Year Program plan prepared by ICCAT and according to the conclusions of the Messina meeting (Italy, June 23-24, 1997) the major progress achieved by the different member countries within the framework of the BYP are summarized in this report. Details on the activities, by each country, are also found in the national reports of the SCRS in the section on research activities.

The major progress achieved within the framework of the BYP in the eastern Atlantic and in the Mediterranean has come about through programs partially financed by the European Union and through the COPEMED Program. The Joint GFCM/ICCAT meetings are also an opportunity to discuss activities carried out relative to bluefin tuna and aimed at achieving the objectives of the BYP.

1. Statistics

East Atlantic

All the countries that collect data on catch, effort and size of bluefin tuna (Task I and II) have continued these activities in recent years. During the last Joint GFCM/ICCAT meeting (Genoa, Italy - September 7-12, 1998) many countries of the Mediterranean area (Croatia, France, Greece, Italy, Morocco and Tunisia) presented important revisions to their catch data for the 1990s. Other countries expressed their intention to carry out these revisions, and the group recommended that they be done for all the countries and for a longer period of time. These revisions considerably decreased the catches classified as NEI, based on the statistical documents, where the exports to Japan are quantified.

The more specific activities in the area of statistics are those concerning the continuation in 1998 of the study on the landings data on the Community fleets in Spain through a program financed in part by the European Union (Spain, France, Greece, Italy). These activities are carried out by the scientists and the administrations in order to monitor the amount and the origin of the exports to Japan, thus improving the catch statistics. The national programs continued to collect basic statistical data (Italy) as well as specific sampling programs in new fisheries (Morocco), initiated in 1997. Although the landings are not totally covered, efforts have been made to collect catch and catch data on the major fishing gears. In addition, Spain measured 29,000 fish in the Mediterranean and in the Atlantic in 1997.

West Atlantic

Catch data collection activities using both census and surveys combined with estimation methodologies continued in the west Atlantic. It was noted that for the first time in several years, Canada reported estimates of bluefin tuna dead discards (less than 10 mt).

2. Stock structure

2.1 Tagging

2.1.1 Conventional tags

East Atlantic

Tagging cruises using conventional tags have been organized by various countries in recent years: Spain (1997) 401 juveniles were tagged in the Gulf of Valencia; Italy (1997), 548 fish were tagged.

The recoveries from these cruises and those from previous campaigns continued to enhance information on stock structure and on the mixing rate between the west and the east Atlantic stock.

West Atlantic

Participants in the U.S. Southeast Fisheries Science Center's Cooperative Tagging Center tagged and released 2,635 bluefin tuna in 1997. From those and earlier releases 136 bluefin were recaptured in 1997. Additional releases and recaptures were made of releases from other programs, particularly the Billfish Foundation in the U.S. (including 51 recaptures).

From the catch and release fishery primarily for medium and giant bluefin off the coast of North Carolina during the winter months, 48 bluefin were tagged and released in 1994, 803 in 1995, 2,974 in 1996, and about 2,436 in 1997 (these include both NMFS and The Billfish Foundation tagging data which have been reported to ICCAT). Only 155 bluefin tuna were tagged off Hatteras, North Carolina, during the winter/spring of 1998 because of the very low amount of fishing in the area which apparently related to unusual water temperature patterns in the area. To date, about 193 of the releases from the Hatteras fishery have been recaptured, and of those11 have been recaptured in the east Atlantic and Mediterranean Sea.

2.1.2 Electronic tags

East Atlantic

Considerable progress has been made in the field of electronic tags (archival and pop-up tags). This technique has been put into practice within a program partially financed by the European Union to tag large bluefin tuna (Spain, Greece, Italy). The objectives of this tagging are to determine migration between the east and west Atlantic, to compile supplemental information on the spawning areas and the movements within the Mediterranean. As of now, 11 spawning tunas have been tagged in Sardinia (Mediterranean) and in Spain (Atlantic). Three of these tags have been recovered.

West Atlantic

In 1996 and 1997 170 bluefin were released off Cape Hatteras, North Carolina in the U.S. with implanted archival tags and to date (mid October 1998) 11 have been recovered (all from the 160 fish released in 1997). Nine of those recoveries came from off the northeast North America. Unfortunately, two archival tags released by the United States and recovered in the Strait of Sicily were thrown into the sea by the fishers.

Researchers from two research groups in the U.S. released 57 satellite pop-up tags (designed to transmit little more than pop-off location) in 1997, and data were received from 52 of them. Both groups successfully tested pop-up satellite archival tags (PSAT, designed to transmit substantially more information including movement path) on bluefin tuna in the late summer to early fall of 1998. The expansion of one of the groups to include Canadian fisheries group and Canadian scientists resulted in the release of tagged fish from new areas.

2.1.3 Tag recovery network

A tag recovery network through the ICCAT correspondents was set up in 1997, with a view towards giving as much publicity as possible to the on-going tagging operations. Posters have been printed in various languages explaining the different types of tags inserted, and these have been widely distributed by the ICCAT correspondents. Information on tagging activities has continued to be provided by fishing sector professionals fishers, by word of mouth and through distribution of the posters at the ports and at those locations where tuna are caught or processed for sale.

2.2 Biological sampling for Stock Structure Research

In the east in 1997, 98 samples collected by different organizations in the Mediterranean, and these were sent to at least one of multiple laboratories conducting research on bluefin genetics in the United States. Additionally in 1998 at least another 91 fish were sampled for this cooperative project.

During 1997 and 1998 west Atlantic sampling of landings of bluefin tuna for research on bluefin population genetics and for studies of otolith microconstituents concentrated on 0-3 year old bluefin; substantially more than 250 fish were

collected each year (most of sizes which correspond to ages 2-3). Additionally in 1998 samples were obtained from approximately 100 fish in the 1 year old size range.

2.3 Genetics research

Research has been carried out on nuclear and mitochondrial DNA. This research has been done or is being done on both sides of the Atlantic Ocean and in Japan. The exchange of samples between the east and west will greatly increase the applicability of those studies. Different techniques are used on the samples collected.

A study has been carried out, within a Community program to study the biology and fishing of juvenile age 0 bluefin tuna in the Mediterranean and in the eastern Atlantic. A total of 371 fish were examined by electrophoresis for proteins and 197 using the sequential mitochondrial DNA technique. In these two analyses, comparisons were made of fish from five locations in the Mediterranean (Spain: Gulf of Valencia; Italy: Ligurian Sea, Tyrrhenian Sea, Ionian Sea; Greece: Aegean Sea) and one site from the western Atlantic coast. Important differences were observed between the Mediterranean and the western Atlantic. These differences were found in the frequencies of the alleles from two allozyme loci (G6PDH and SOD). No difference was detected between the different Mediterranean locations. The phylogenetic analysis of the mtDNA data reveals two groups identified in the Mediterranean while only one has been found in the western Atlantic. The comparison of the Mediterranean frequencies of the halotypes do not show any heterogeneity. This genetic difference should be studied further by comparing a greater number of samples, which could serve to determine the existence of different stocks of Atlantic bluefin tuna..

Another set of samples was used for a preliminary study (SCRS/98/78) of mitochondrial DNA from west Atlantic, Mediterranean and Pacific samples; that set included 67 fish from the west Atlantic and 73 fish from a variety of locations in the Mediterranean Sea. The report indicated that sufficient heterogeneity existed between east and west for future testing, and the results might be interpreted as suggesting that differences might exist.

2.4 Micro-constituents in the otoliths

Research on the feasibility of using otolith microconstituents to distinguish bluefin stocks was initiated in 1998. To date that research has emphasized quality control and decontamination techniques using yellowfin tuna otoliths (yellowfin were used because of their much greater availability than bluefin otoliths).

3. Abundance indices

East Atlantic

As is the case for catches, several countries are working to improve the abundance index series by means of standardization, and including variations due to geographic location, season, environment, and the changes in fishing methods. Spain has revised the trap data, by fishing operation between 1982 and 1997, in order to a standardize the CPUEs of this gear. Italy is carrying out a historical revision of catches and effort of the purse seiners and traps to obtain an index for small and large fish. France is trying to incorporate technological changes in its CPUE series for purse seiners.

A feasibility study being carried out by France using aerial surveys for the distribution of catches and fishing effort, could lead to catch taking in account other parameters in the CPUEs.??

West Atlantic

The United States continued to conduct ichthyoplankton surveys in the Gulf of Mexico during the spawning season for use in the only fishery independent index of abundance available for bluefin. A pilot survey to study the feasibility of conducting aerial surveys for juvenile bluefin tuna was conducted off the northeast U.S. in the early summer of 1997.

Experiments on detecting bluefin tuna (and other species) using synthetic aperture radar from satellites LIDAR aboard aircraft were also conducted to determine the feasibility of using such tools in the future for additional fishery independent indices.

4. Biology

4.1 Growth, length-weight relationships, feeding

A number of countries around the Mediterranean have continued to collect data on growth and the length/ weight relationship on bluefin tuna. This has been done by Croatia, Italy, Spain and Turkey. Emphasis has been placed on the growth of juveniles, through a project partly financed by the EU (Greece, Italy and Spain). The aim is to study, from histogram trends, tags and recoveries, and the micro-structures in the otoliths and bones, growth during the early years of life of bluefin tuna, in relation to the sampling sector, environmental factors, feeding, etc.

The study of stomach contents is also underway in several countries, mainly on small individuals.

4.2 Larval distribution

Studies are underway on the relationship between the larval distributions and environmental factors using the data collected in the 1994 larval surveys carried out by Japan, the United States and the European Union in the Mediterranean.

East Atlantic

An ichthyoplankton survey of bluefin and tuna-like species was conducted in Turkish waters in the Aegean Sea and the Sea of Marmara.

West Atlantic

During 1998 surface ichthyoplankton samples were taken off the southeast United States outside of the western wall of the Gulf Stream from about 30° to about 35°N. At those months average water temperatures in that area are similar to temperatures in bluefin spawning areas around the world during spawning seasons. Once sorted these samples should provide additional information whether spawning occurs outside of known spawning areas.

4.3 Reproduction

Research projects are being conducted in both the east and the west on the biology of bluefin reproduction, particularly on the variation in the degree of sexual maturity of females based on the sexual hormones present in the blood and muscle tissue. The eastern study is within the framework of a project financed by the European Union (France, Germany, Greece, Italy and Spain) and the western study by the United States. Other nations, including Canada and Bermuda are also collaborating in these projects (not only for bluefin tuna but also for swordfish and billfish).

Within the framework of the same project, Spain is measuring the gonad-somatic indices from the French, Italian and Spanish purse seine fleets that operate in the spawning area around the Balearres Islands. Measures of this index were obtained from Sardinian traps (Italy), at the same time that hormonal studies on age of first sexual maturity were carried out.

A research project on bluefin tuna reproductive biology in the north Aegean Sea was conducted by Turkey. Gonadal-somatic indices, age of first spawning, and sex-ration at size were studied. Additional research on bluefin biology in Turkish waters continues.

Lastly, studies on bluefin sex ratio by size class are continuing. Spain has sexed more than 700 fish in the Atlantic traps, and 800 fish caught by purse seiners and longliners in the Mediterranean.

5. Environment

A large number of countries are carrying out environmental observations during research cruises or during bluefin tuna fishing. In recent years, some ICCAT publications include information on the relationship between these observations and the data collected (catch, distribution of the abundance of juvenile or adult larvae). Specific studies are currently on-going on environmental conditions prevailing during the spawning phase or in the areas where juvenile fish are found.

6. Other activities

The following meetings on bluefin tunas were held during 1997 and 1998:

- National Bluefin Day (M'Diq, Morocco, July 14, 1997) on research being carried out, with the presentation of the latest results.
- COPEMED meeting (Tunis, Tunisia, May 4-6, 1998), to examine the ICCAT recommendations and their application in north African countries, and to design a program of activities, under the sponsorship of COPEMED (SCRS/98/23).
- GFCM/ICCAT Joint Working Group (Genoa, Italy, September 7 to 12, 1998) to collect all the information on the Mediterranean fisheries (SCRS/98/11 bis).

All these meetings served to update statistics and research activities on bluefin tuna, in relation to the objectives of the BYP.

II. Outlook

Unfunded Research Priorities

Several programs or activities concerning subjects of interest for the BYP should be initiated or continued in 1999:

- Tagging program using pop-up tags, financed in part by the European Union. It is expected that 120 tags will be inserted at three sites (40 in the Strait of Gibraltar, 40 in the Tyrrhenian Sea and 40 in the Aegean Sea).
- Possible tagging experiments using pop-up tags in France.
- Program to improve knowledge on bluefin tuna in the Mediterranean (Germany, Spain, France, Greece, Italy), partially financed by the European Union. These improvements are already described in preceding paragraphs concerning the fisheries, statistics and biology.
- Exchanges of samples between both sides of the Atlantic in relation to these programs and also other on-going studies on genetics or micro-constituents of otoliths.
- A CD ROM project, concerning management of the fisheries, could be initiated by the Aquarium of Genoa, and collaboration of ICCAT might be requested. Bluefin tuna could serve as an example.
- Conventional tagging cruises should be conducted in the Mediterranean in 1999.
- Research to provide more accurate methods on calculating the total weight and size composition at capture of cultured fish.

It is convenient that these programs include an intensification of the exchange of tagging information by the administrators and the fishery sector professionals and an improvement in the sample exchange network samples. The priorities of financing of all these activities should be established in consultation with the scientists working on bluefin tuna on both sides of the Atlantic.

Primary Plans (funded)

Considering that stock structure is a priority for the BYP, the Committee decided to place primary emphasis on collecting biological samples for developing tests for differences between east and west. The plan calls for examining samples which have had a low probability of crossing the Atlantic Ocean. A primary component of the 1999 plan is to establish a European center of archiving and handling samples. Such a center exists in the west and the Committee feels that such a center in Europe will greatly facilitate collection and coordination

The Committee proposes to establish the European center at the University of Girona in Spain where an interested scientist is willing to oversee the logistical support.

As in 1998, emphasis will be placed on collecting fish of age 0 in the east (with a backup plan for obtaining age 1 if sufficient age 0 can not be obtained). In the west age 0 bluefin are almost never observed; therefore in the west emphasis will be placed on obtaining age 1 fish with a backup plan for obtaining 2 and 3 year olds. When possible tissues will be obtained for various types of genetic analyses as well as otoliths for microconstituent analyses. At least 100 samples (of age 0, 50 if age 1 because of much higher costs) will be obtained from multiple locations (Turkey, Croatia, Italy, Tunisia, Morocco and Spain) in the east and 125-200 per age class from a more limited area in the west where small bluefin are known to occur.

It is recommended that the Commission grant exceptions to prohibitions on catch and Bluefin Tuna Statistical Document regulations in order to obtain and transport tissues for bluefin stock structure research.

A proposed budget for establishing the European center, for the 1999 sampling and related costs is attached.

PROPOSED BUDGET FOR THE 1999 BYP

		US$	Pts
1.	European storing center		
	Equipment	15,000	1,950,000
	Labor	12,000	1,560,000
	Trip to train technician in removing otoliths from heads	2,000	260,000
2.	Procurement of samples		
	Age 0 sampling		
	-- Purchase of 100 samples from 4 locations (500US$/100fish)	2,500	325,000
	-- Trips for collecting samples (9 trips)	3,900	507,000
	Age 1 sampling		
	-- Purchase of 50 samples from 5 locations (1000US$/50fish)	5,000	650,000
	-- Trips for collecting samples (15 trips)	6,500	845,000
	Transport of samples	8,000	1,040,000
TOTAL		**54,900**	**7,137,000**

APPENDIX 5

BIGEYE TUNA YEAR PROGRAM (BETYP): RECOMMENDED FRAMEWORK AND BUDGET*

1. Overview

A spectacular and uncontrolled increase in bigeye tuna catches has been observed during recent years, mainly by the purse seine and longline fisheries, which may significantly endanger the management and conservation of bigeye tuna. Scientific research efforts on bigeye have always been at a very low level in ICCAT, resulting in poor knowledge on the basic biology, stock structure, migration, and dynamics of this species. The analyses carried out in 1997 by the SCRS confirm that there are serious uncertainties about the state of the stock and a danger that the stock may face a risk of recruitment over-fishing.

Given the present high level of catches, an intensive research program, coordinated by ICCAT, is necessary to determine whether the present catches are sustainable or whether they will drive the stock towards a serious decline.

Considering the present status of the stock, the high level of catches, and the value of bigeye tuna, the proposed Bigeye Tuna Year Program (BETYP) is a necessary investment in the context of responsible fishing, and requires that a large scale research program be started as soon as possible.

The costs of such a Program are fully justified by:

- the very high value of the present bigeye catches, especially those of the longline fisheries, which take large amounts destined for the lucrative sashimi market;
- the unknown, but probably serious, risks of recruitment over-fishing which currently threatens the long-term viability of the bigeye stock because of the dramatic increase in catches by purse seiners (juveniles) and by longliners (spawners); and
- the almost complete lack of baseline research on bigeye tuna (growth, stock structure, spawning, dynamics etc.).

This research program should be:

- Urgently conducted, because of the potentially critical situation of the stock.
- Very large and ambitious, given the lack of basic knowledge on most of the parameters. The high budget can be considered as a minimum investment in view of the high value of the bigeye landings (US$ 600 million in 1994).
- Primarily conducted by all those involved in the bigeye fisheries: Japan, Uruguay, Chinese Taipei, and others that have longline fisheries, EU countries (Spain, France, Portugal) for purse seine and baitboat fisheries, Ghana for the equatorial baitboat fishery, etc. Active research must be conducted simultaneously on both the longline and surface fisheries, and must cover the entire area of distribution of the species.
- The ICCAT Secretariat should play an active role in every stage of this Program (as during the International Skipjack Year Program). An *ad hoc* BETYP Coordinator should be recruited for the duration of the Program. This expert will be in charge of the various coordination aspects necessary for such a large-scale Program (data collection, data analysis, working groups, tagging and recoveries, etc.). An ICCAT BETYP Budget, to be funded by the Commission or other sources, (such as a landing tax on every Atlantic bigeye landed), should be established.
- The ICCAT Secretariat should also organize, during this Program, various working groups, as follows:

* As revised by the SCRS in 1997.

- A Working Group should be established for the organization and planning of the BETYP, once the source of financing for the BETYP has been identified.
- Several technical Working Groups will be responsible for specific bigeye research, such as: genetics, tagging, ageing, modeling.
- A large scale, comprehensive Bigeye Symposium.
- ICCAT should be responsible for the publications from the BETYP research.

2. Necessary research operations and estimated budget

Tagging is one of the major activities of the BETYP. Carried out with conventional tags with archival tags, and pop-up tags, it is in effect a high priority item within the BETYP. This is the most expensive activity, but on the results are essential to the success of the Program. If this activity is not fully supported, the BETYP will not fully achieve its objectives.

The objectives of the tagging program should also include stock structure, growth, stock size and natural mortality at different ages.

2.1 ICCAT coordinating actions and budget

The Bigeye Year Program requires special ICCAT funds of about US$ 2.2 million, over a period of four years (year 1 to year 4):

		Total Budget (US $)
1	Recruitment of a BETYP Coordinator & secretariat services during 4 years	300,000
2	Normal operating expenses of the BETYP	100,000
3	Organization of various working groups and the Symposium	200,000
4	Coordination & research expenses for which the ICCAT central office will necessarily be in charge (tags, awards, mailing, manipulation of samples	100,000
5	Costs of necessary research for the Program, whose planning depends on ICCAT financing	110,000
6	Costs of conventional tags and archival tags	500,000
7	Costs of chartering a purse seiner for 6 months for tagging	800,000
8	Editing and publication of the BETYP results	50,000
9	Other expenses	50,000
10	**Total**	**2,210,000**

Annual Budget (in US $)

	1st year	*2nd year*	*3rd year*	*4th year*	*Total*
Coordinator & Secretariat	75,000	75,000	75,000	75,000	300,000
BETYP Coordination	40,000	20,000	20,000	20,000	100,000
Working Groups	30,000	30,000		30,000	90,000
Symposium				110,000	110,000
Coordination & research by ICCAT Secretariat	25,000	25,000	25,000	25,000	100,000
Cost of research activities	90,000			20,000	110,000
Tags	500,000				500,000
Boats for tagging	600,000	200,000			800,000
Publications			20,000	30,000	50,000
Other	12,500	12,500	12,500	12,500	50,000

2.2 National research

Various research activities should be conducted at the national level; the corresponding costs (manpower and laboratory costs) to be covered by the countries participating in the Program.

For this research sources of financing should be sought at the national level.

1) **Improved bigeye statistics:**

Obtaining improved bigeye statistics for all the fleets (purse seine, baitboat and longline; particularly intensive size sampling covering a full year and all fisheries), with multiple trips at sea and observers on-board all fleets that catch significant amounts of bigeye, and an in-depth analysis of the data on this species (to obtain an index of bigeye abundance for juvenile bigeye). The planned activities are specifically:

- To place five permanent observers on-board the longline fleets (12 months x 5 observers in order to conduct this intensive sampling).

- To employ temporary technicians to increase the sampling of bigeye taken by the surface fleets at all the landing ports during an entire year, and observers being placed on a significant portion of the purse seine fleet. The increase in fishing power on small bigeye is clear but not well documented (the fishery on logs explains part but not all of the increase in catches). The observer program should then be developed on the purse seiners catching bigeye to carry out sampling in order to understand the basic technological or behavioral reasons explaining the increase in purse seine fishing power on this species. One of the parameters that should be measured is the current extent of the purse seine closure. The goal is to cover 40 observer trips on-board purse seiners. This action is partially being carried out on purse seiners of the European Union in 1997 and 1998.

- To employ temporary technicians to sample landings at the major ports where longline landings or transshipment occur.

2) **Tagging:**

- Intensive tagging of bigeye, targeting growth, stock structure and stock size, should be developed. All the sizes caught and all major fishing zones should be covered. This tagging program should use all the models of tags available: conventional, archival, and pop-up tags (for which the initial results, obtained in 1997, are very encouraging).

A significant amount of tagging should be carried out using tetracycline injections in order to validate simultaneous growth studies.

At this stage the following tagging activities should be planned:

- Conventional tagging in the nursery area: chartering of a Tema baitboat during a four-month period (November to February) to carry out intensive tagging of small bigeye (and yellowfin). (Goal: 20,000 tagged bigeye, 5% with tetracycline).

- Conventional tagging of medium and large sized bigeye taken by surface gear in the north temperate waters: chartering of a baitboat during a one-month period in the Canary Islands (Goal: 1,000 tagged bigeye), in Madeira and Azores (Goal: 1,000 tagged bigeye). (Estimated cost: US$ 300,000 for the charter of the northern baitboats (3-month period) and US$ 500,000 for the charter of a Tema baitboat).

- Opportunistic tagging of large bigeye taken by longline, using conventional tags, conducted by trained scientific observers: a significant number of large bigeye should be tagged in all the major fishing zones (feeding areas and spawning areas of the north and south Atlantic). Goal: 500 bigeye in each of the seven longline strata (i.e., a total of 3,500 large bigeye tagged).

- Archival and pop-up tags on medium and large bigeye; the goal is to tag 500 tunas, using the best tags available; those tags should be released in diverse well-selected areas (feeding and spawning strata), for a better understanding of bigeye migrations, (e.g., between nurseries and between spawning and feeding areas).

To guarantee the complete success of this fundamental activity, all the costs of chartering the baitboats, purchasing the tags, paying the recovery rewards, the organization and publicity for the recoveries should be allocated to ICCAT and included in the BETYP budget.

3) Genetics:

- Full use of the various modern genetic analytical techniques should be developed and applied to bigeye in order to evaluate the heterogeneity of the potential bigeye sub-populations in the Atlantic. Significant sampling should be carried out in all the major fishing strata and on all the sizes caught by the various fisheries (see attached map of the major bigeye fishing areas).

- The genetic samples should be analyzed in a simultaneous, independent but coordinated manner, by various laboratories using various analytical methods. The costs of analyzing the genetic samples will be covered by the countries participating in the Program (ICCAT will finance the sampling and the dissemination of the samples with an *ad hoc* limited budget of US$ 10,000).

4) Growth:

- Bigeye growth will be studied from tagging and tag recovery results, and from hard part readings. Samples of the hard parts (otoliths and vertebrae) should be collected from the various areas and on diverse sizes of bigeye. Goal: to collect 500 samples and to analyze them independently by two different laboratories. The costs of reading the samples for age determination should be assumed by the countries that participate in the program (ICCAT will finance the sampling and the dissemination of the samples with an *ad hoc* limited budget of US$ 10,000).

5) Natural mortalities and population size of juvenile:

- The natural mortality of bigeye tuna is a parameter which is essentially unknown, but is of key importance for the assessment of sustainable fishing mortality and the state of the stock, and determining the relative impact of high catches of juveniles. The potential negative consequences of increases in purse seine catches of juveniles will be relatively minor if the natural mortality of juveniles is very high. On the other hand, if juvenile mortality is low, the current over-exploitation of bigeye could have very serious consequences.

This research on the natural mortality of juveniles should simultaneously cover various fields:

- Eco-physiology of juvenile bigeye aimed at determining the fragility of juvenile physiology (according to their habitat)
- Study of predators of juvenile and adult bigeye;
- Direct (use of modern sonar techniques) and indirect study (comparative analysis of the population sizes estimated from sequential population analysis of various species and from the numbers of juvenile tunas caught at sea in the nursery) in order to better measure the population size of juveniles.
- Analysis of tagging and recovery of tags in the nursery area.
- The development of models allowing better evaluation of juvenile natural mortality (e.g., using methods similar to those used by the South Pacific Commission for the analysis of tag/recapture data).

6) Reproductive biology:

Intensive sampling should be conducted to obtain a large number of bigeye gonads from all major bigeye areas, with more intensive sampling of gonads in the spawning areas. Those samples should be analyzed in order to determine the spawning potential of bigeye as a function of its sizes and age.

- A limited sampling of 1,000 gonads should be carried out in each of the four northern and southern bigeye areas (i.e., 4,000 gonads) in order to calculate the monthly gonad index by area every year for three years.
- Intensive sampling of gonads should be conducted, every year for three years, by observers in each of the three inter-tropical areas of the central eastern Atlantic (see map): 5,000 gonads in each of the three areas (for a total of 15,000 gonads) in order to calculate the gonad index, to count and measures the eggs of the pre-spawning females, and to study the physiology of maturity and the genetics of the contents of the gonads (using standard procedures).

7) Ethology and technology

Ethological research aimed at a better understanding of the behavior of bigeye in multi-species schools associated with floating objects should be developed. Combined with technological research on purse seiners, this could eventually lead to a reduction in fishing mortality of juvenile bigeye.

8) Modeling of bigeye stock assessments: building a comprehensive bigeye model

- The management of bigeye tuna should preferably be conducted using an comprehensive model, which takes into account the biological peculiarities of the species (complexity of its stock structure and its migrations) and the major economic factors of the various fisheries (sashimi vs canning fisheries). This model should take the multi-species nature of the fishery into account. Such a complex model should be developed by a specialist in such methods contracted by ICCAT, and assisted by an expert in the development of this type of model. A working group should be established to finalize the model. A cost of US$ 20,000 should be included in the budgetary provisions for this highly technical activity.

2.3 Overall organization of the BETYP

A scientist specialized in bigeye should be designated to coordinate the BETYP. This scientist should work in close collaboration with the ICCAT Secretariat and the fishery biologist recruited to manage the Program at the ICCAT level.

A selected scientist should be designated to coordinate and promote the research activities of each activity (statistics, tagging, genetics, growth, natural mortality, reproductive biology, and modeling).

3. Conclusions

In the context of responsible fishing, it is now an obligation for ICCAT countries to develop, immediately, intensive research on the Atlantic bigeye, due to the lack of research done in the past on this highly valuable stock and because of the very serious risk of recruitment over-fishing presently faced by this stock. The high costs requested for this four-year research program are, in fact, quite reasonable, compared to the extremely high economic value of this fishery (more than US$ 500 million yearly; the US$ 2.3 million requested for four years only represents 0.5% of the annual landing value of the catches) and the critical lack of research on this stock in the past. This expensive research program is in fact an economic investment which is presently necessary for the rational management and conservation of the bigeye stock. In the absence of this intensive research program, a drastic reduction in fishing effort and catches should be implemented immediately on all fleets fishing this species. The decision to carry out this Program cannot be delayed due to the present state of the bigeye stock. ICCAT research should be coordinated with other research programs which are planned world-wide on bigeye tuna because of the increasing risk of over-exploitation now faced by this species in most oceans.

Considering the critical situation of the bigeye stock and the urgent need for a full research program, any limited research program will not be able to provide the information necessary for the management and conservation of the Atlantic bigeye tuna stock.

4. Planned activities of the Bigeye Year Program

- ♦ November, 1997: approval of the BETYP by the Commission.

Year 1: study the financing and operational organization of the BETYP.

-- Technical working group to establish the details of the content and the structure of the Program;
-- Recruitment of a scientist at the ICCAT Secretariat to coordinate the activities of the BETYP;
-- Designation of the scientists responsible for the research activities.

- ♦ Year 2: Carrying out research activities

- ♦ Year 3-4: Analysis of the data and samples; various working groups by research activity.

- ♦ End of Year 4: Celebration of the BETYP Symposium

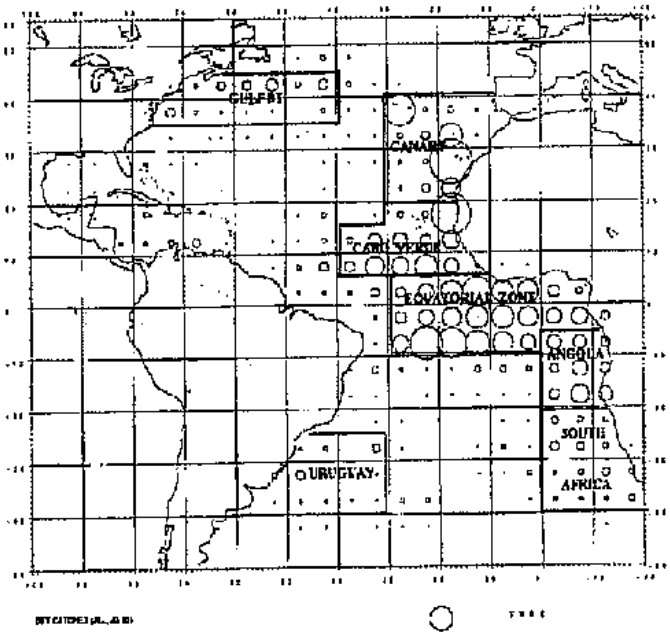
- ♦ Year 6: Publication of the results of the BETYP.

5. Budgetary requirements for 1998 and 1999

The Committee requested "seed money" for initial funding of the BETYP (i.e., US$ 50,000 in 1998 and US$ 50,000 in 1999). Such minimal funding would clearly demonstrate the Commission's interest in and stress the importance of this Program. At the same time, such seed money might encourage contributions from other sources.

These ICCAT funds are needed to initiate the BETYP program, and will be allocated to the following chapters:

1998	US$ 10,000	Activities undertaken by the Executive Secretary to seek funds for the BETYP
	US$ 15,000	Opportunistic tagging (Tema, Dakar, Canaries, Madeira, Azores)
	US$ 10,000	Essential biological studies
	US$ 10,000	Working Group on detailed planning of BETYP
	US$ 5,000	BETYP/ICCAT coordination expenses
1999	US$ 5,000	Coordination expenses
	US$ 10,000	Essential biological studies
	US$ 5,000	BETYP missions undertaken by the Secretariat
	US$ 3,000	Opportunistic tagging



Map of bigeye fisheries (all catches, for the period 1993-1995), and fishing zones used to plan the Bigeye Year Program research plan. (map provisional)

Addendum 1 to Appendix 5

REPORT OF PREPARATORY MEETING FOR
THE ICCAT BIGEYE YEAR PROGRAM (BETYP)
(ICCAT Headquarters - Madrid, Spain - March 24 & 25,1998)
(COM-SCRS/98/10)

1. Opening, election of Chairperson, meeting arrangements

A group of scientists met at the Commission Headquarter on March 24 and 25, 1998 , to review the funding situation for the BETYP in 1998 and to discuss the short-term and long-term program. The meeting was opened by the SCRS Chairman, Dr. J. Powers (U.S.A.) who was also elected unanimously to chair the entire session . Scientists representing Cote d'Ivoire, EC (France, Portugal and Spain), Japan, the Executive Secretary and Secretariat staff attended the meeting (the List of Participants is attached as **Appendix 2**). Dr. P. Miyake (Secretariat) was assigned as rapporteur.

2. Adoption of Agenda

The Tentative Agenda, prepared by the Secretariat, was adopted (**Appendix 1**).

3. Review of the funding available

The group reviewed the current funding situation. The BETYP was first proposed by the SCRS to the Commission in 1996, but it did not receive general support at that time. However, the revised Program with a four-year total budget of US$2,210,000 was proposed again at the 1997 Commission meeting by the SCRS. In this proposal, the SCRS also included an alternative budget request for seed money for 1998 amounting to $50,000, in case that the Commission did not fund the Program in its entirety.

The Commission, at its 1997 meeting, supported the Program and approved $60,000 as initial funding. Out of this amount, $10,000 will be covered by the member contributions, while $50,000 will be covered by special contributions from Contracting and non-contracting parties, entities or fishing entities.

The current Commission budget allocated for this item is 8,700,000 pesetas (equivalent to $60,000 at the exchange rate of the time of adoption) and that amount is now equivalent to $57,237 at the current exchange rate. The group of scientists considered that one of the most important terms of reference given to this group was to study the funding situation and adjust activities in 1998 accordingly.

4. Review of the overall ICCAT Bigeye Year Program (activities & budget)

The group reviewed the revised Program Plan proposed by the SCRS and adopted by the Commission at the 1997 meeting. The Group decided to prioritize of some budget items and a more detailed definition of the priority activities should be carried out at this time by the group.

Tagging

The group considered that tagging activities are still the first priority item in the Program. The tagging objectives were discussed and the conclusions reached are summarized in **Appendix 3**.

Since such tagging activities are very costly, it is essential to develop a statistical design for cost effective and useful tagging activities. At the same time, logistics and the feasibility of tagging must be studied to develop an adequate tagging program with a suitable budget. The group considered these studies should be the priority items in 1998 and should be adequately covered by the 1998 budget, provided that the Program starts in 1999. A sub-contract with experienced experts in these fields would most likely be the best solution.

The group also considered that a pilot opportunistic tagging program might also be started in 1998 for which a more specific program can be designed.

Biological studies

Since observer programs for sampling and statistics have been already started by the EC for the purse seine fleet and by Japan for the longline fleet, the second priority would be the biological studies, such as growth with hard parts in conjunction with the tagging program, maturity, feeding, fish behavior, etc.The group also recognized that the observer program would serve as a good source for biological sampling and that tagging is essential for growth studies. Initial studies should be conducted in 1998 using samples collected by observers.

Funding possibilities

The group discussed the possibility of funding by the Commission and/or other sources. Some offers from the private sector have already been received, but the major part of the funding has to depend on the Commission itself or on special contributions by its Contracting Parties who are the biggest users of this resource (e.g. EC and Japan). It seems that the latter would be most justified way for the contributions, i.e. that the major users of the resource provide the funds to carry out intensive research on bigeye, in order to provide better management advice. This funding could be further enforced with special contributions from non-contracting parties, entities or fishing entities, and the private sector.

The EC scientists informed the group that the Community would most likely provide the necessary funds, as long as the program is well organized and well planned, and assuming that Japan, a major user of the stock, makes appropriate contributions towards this Program. The funding procedures have to be studied further, but these should be established by well defined research items, and not as a whole package. The funds transmitted to the ICCAT would be easier to administrate more effectively and quickly, thus giving us more administrative flexibility. The EC scientists agreed to study the logistics further and the way in which the funds can be applied. The EC scientists offered to assist he Secretariat in preparing the necessary application forms.

In this respect, it was recognized that if things proceed by normal channels, the request for 1999 this additional special funding could be completed by the end of May and hence ICCAT should move quickly to complete the necessary procedures.

The Japanese scientist considered that the special contributions for a significant amount money for this Program would be difficult. However, contributions in terms of vessel-days or man-days (e.g. sending a fishery research vessel to the Atlantic) might be possible. He agreed to study this possibility at home with the proper authorities. The group considered that a visit by the Executive Secretary to Japan might promote such a possibility and cooperative research for BETYP.

5. Review of 1998 Bigeye Year Program Plan (activities & budget)

The group reviewed the initial funding (seed-money) proposed by the SCRS in 1997 and actual funding provided by the Commission. The attached table shows the original proposed budget for seed money and the adjusted budget prepared at this meeting. The group considered that three items should be given some primary consideration in 1998 activities: (1) pilot opportunistic tagging; (2) improvement of Ghanaian statistics; and (3) analyses of existing biological samples.

Tagging can be conducted, possibly using one of the fishing vessels in three island areas (Azores, Canaries and Madeira), with the possible funding assistance from Regional Autonomous Governments, and the ICCAT seed money. The arrangements have to be made quickly because the major fishing season in these island areas is in spring. Due to the high cost of the materials, tagging with pop-up or archival tags would not be appropriate for this year.

Another possibility is to encourage the on-going opportunistic tagging made from Dakar-based French baitboats. Also, a similar program from Tema-based baitboats can be planned.

Activities undertaken by the Executive Secretary to seek funds ($6,000):

This amount includes a trip to three island areas to request collaboration from the local governments, as well as the private sector. The group also considered including a trip to Japan (see Item 5), but recognizing that the Executive Secretary has been invited to visit Chinese Taipei, he might have a chance to visit Japan as well on the way. The group considered that it important to request Japan to support this Program with further funds or contributions in kind, either from governmental sources and/or from the private sector.

Opportunistic tagging ($18,000)

As mentioned above, materials such as tags, needles, posters, rewards etc. should be prepared and stocked at the Secretariat. $3,000 is allocated for this purpose.

$10,000 has been allocated for assistance in developing tagging cruises in the island areas. Dr. J. Pereira (EC) was asked to coordinate this activity, with the collaboration of the Executive Secretary. Funds can be transferred to him for his flexible application, as long as all the corresponding receipts and/or documentation is submitted to the Commission once the activity has terminated.

$5,000 is allocated to promote opportunistic tagging in Dakar. Since this activity has been carried out in the past and at present, it is hoped that these funds will promote more of such activities in the immediate future. Drs. J. P. Hallier and T. Diouf were asked to be responsible for these activities.

For organization of tagging activities in Tema,, see next budget item, since funding is allocated together.

Improvement of statistics in Tema, Ghana ($9,000)

The group considered that recovering or processing of past catch data, logbook information and size data collected by Tema scientists is one of the first priority activities. It was proposed that one person, either from Secretariat staff or contracted by the Secretariat, visit Tema and work on this problem. The same person can also develop some opportunistic tagging, similar to that conducted in Dakar. About $7,000 is needed to cover trip and other expenses.

At the same time, the current difficult conditions in sampling in Tema port, due to the lack of funds, personnel and computer equipment were recognized. In order to improve the current sampling activities, it was agreed that $2,000 be allocated for this item. These funds should be made available to hire part-time sampling staff, with the condition that the data be made available to the Commission, either in original form or in processed form.

It was also noted that Japan may have an overseas aid program in Ghana and, if that is the case, perhaps Japan could provide a computer and perhaps a car to the Fisheries Research Unit (FRU) in Tema, which would improve sampling, to a great extent. The Japanese scientist agreed to investigate this possibility.

Essential biological studies ($6,000)

It was noted that a substantial amount of stomach and gonad samples will become available from the EC observer program within a short time. The CRO in Abidjan agreed to analyze these samples but for that some funding will be needed to hire part-time staff.

In addition, some biological studies are planned by the IEO Tenerife and the NRFSF in Shimizu. However, costs for those studies will be assumed by national funding arrangements.

Working Group on Detailed Planning of BETYP (10,000)

As discussed under the Agenda item 4, it is essential that tagging activities be well planned, based on statistical design, and feasibility and logistic studies. A contract should be made to carry out these studies with an expert with statistical back ground and who is familiar with tagging program design. Currently $8,000 is allocated for statistical design and $2,000 for logistics and feasibility studies. However, this can be combined into one contract, if it proves to be more effective.

Coordination - Contingency (previously BETYP/ICCAT coordination expense) ($10,237)

As the budget is in pesetas while most of the expenses will be in other international currencies, fluctuations in currency exchange rates may affect allocated funds. The Coordination-Contingency funds will assume these effect as well as some operative funds of the Secretariat. At the same time, the budget has to be somewhat flexible to be executed more effectively.

6. Recommendations for the future

The group restated the importance of the Program for proper management of Atlantic bigeye stocks based on sound knowledge and information. Therefore, it urges that the users of Atlantic bigeye resources financially support this BETYP, which fully complies with the spirit of the Code of Conduct or Responsible Fishing. The group requests that scientists and the Secretariat explore extensively the support for the Program by the two major users, namely the EC and Japan.

The following steps are proposed:

1. Feasibility and design studies of tagging to be concluded very promptly in the early half of 1998.
2. EC scientists explore the procedures to request additional EC funding.
3. Executive Secretary and Japanese scientists make efforts to request Japan to support the Program either in terms of funds or contributions in kind.
4. Complete detailed program plan(s) according to the results of 2 above, and prepare and send the application for EC funds.
5. Start logistics for carrying out the Program, in case funds become available in 1998.
6. If it is affirmed that the funding will become available, hire a Coordinator at the Secretariat.
7. The four-year program should start in 1999.

7. Other matters

No other matters were discussed.

8. Adoption of Report

The draft Report was adopted with some modifications. The group discussed how to deal with this report since it will not be formal until it is submitted to the SCRS, endorsed and forwarded to the Commission and then adopted by the Commission. However, realizing the urgency of applying the recommendations included herewith, particularly relative to 1998 activities, the scientists cannot wait until all the formal procedures are complete. On the other hand, it was noted that this group was entrusted by the SCRS, and consequently by the Commission, to make realistic application of the 1998 budget, by adjusting the 1998 Program plans. All the Contracting Parties involved have been invited to this meeting and the meeting did not go beyond its terms of reference. The budget is within that approved by the Commission approved and adjustments to the allocations are very minor.

The group considered that all the recommendations concerning 1998 activities can be carried out without any further formal actions, although the report will be circulated to the SCRS and the Commission as soon as possible and will be discussed at its annual meetings.

9. Adjournment

The meeting was adjourned.

Agenda of BETYP Preparatory Meeting

1. Opening, election of Chairperson, meeting arrangements
2. Adoption of Agenda
3. Review of the funding available
4. Review of the overall ICCAT Bigeye Year Program (activities & budget)
5. Review of 1998 Bigeye Year Program Plan (activities & budget)
6. Recommendations for the future
7. Other matters
8. Adoption of Report
9. Adjournment

Coordinators:

Pilar Pallarés (purse seine fishery)
Joao Pereira (baitboat fishery)
Naozumi Miyabe (longline fishery)

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BETYP: MAJOR GOALS OF BIGEYE TAGGING

The Group considered that tagging activities are a first priority item in the BETYP. The tagging should have four major objectives to determine natural mortality rates, growth, movement/stock structure and behavior of bigeye tuna around floating objects.

Tags can be classified as those which involve conventional tags and those which involve the newer technology tags, such as archival tags and pop-up tags. The studies that are being planned for BETYP will include a combination of the two. However, initially the focus of conventional tagging will be more on determining natural mortality and growth, and the focus of archival and pop-up tagging will be on movement/stock structure and behavior around floating objects.

The four tagging objectives are summarized as follows:

• **Natural mortality:** The results of the tagging program, in conjunction with the analysis of catch and effort data, should permit us to determine if the natural mortality of juvenile bigeye is similar to, or higher than, that of adult bigeye. A natural mortality of juvenile bigeye, which was estimated in the western Pacific by the SPC from tagging, indicated that the natural mortality rates of juveniles were very high. If similar results occur in the Atlantic, this could have serious impact on the analytical stock assessment and on the potential interaction between the fisheries that target large and small bigeye tuna. This question is presently a major uncertainty in bigeye stock assessment and management.

•**Growth:** The tagging program should provide good knowledge of bigeye growth, especially for medium and large-size bigeye, in a size range for which the growth is poorly known. This improved knowledge on growth would be obtained by analyzing the tag recoveries of medium and large-size bigeye, and from otolith age reading of recoveries of bigeye injected with tetracycline.

• **Movement/stock structure:** The tagging program should provide good knowledge of bigeye movement and stock structure in the Atlantic. The age-specific mixing rate of bigeye between the various fishing zones of the Atlantic should be examined from tag release-recovery data, in conjunction with the catch-by-size and effort data. Special attention should be given to evaluating a possible heterogeneity between two potential segments of the bigeye stock exploited in the northern and southern Atlantic in relation with the two spawning zones presently identified North and South of the Equator, in the central and eastern Atlantic. The potential vertical heterogeneity of the bigeye stock and the potential interaction between surface and longline gears should be better evaluated.

• **Behavior of bigeye and floating objects:** The tagging program should provide knowledge on the behavior of bigeye around floating objects, because the recent increase in the catches of small bigeye is due, to a large extent, to the typical behavior of bigeye associated with floating logs. Thus, the tagging program should, in conjunction with other field activities, show the specific behavior of bigeye associated with floating objects. The present paradigm that bigeye tunas under logs swim deeper than other tunas, and that large bigeye are found deeper than small bigeye, should then be tested.

To obtain those four objectives at the end of a successful tagging program would provide a major input for the future management and conservation of BET.

REVISED BUDGET FOR 1998 BETYP ACTIVITIES

Items	*Budget requested by SCRS*		*Revised 1998*	
	US$	*Pesetas*	*US$*	*Pesetas*
Activities undertaken by the Ex. Sec. to seek funds	10,000	1,450,000	6,000	912,000
Opportunistic tagging	15,000	2,175,000	18,000	2,736,000
Materials (tags, needles, posters) and reward			3,000	456,000
Islands areas (Azores, Madeira and Canarias)			10,000	1,520,000
Assistance for tagging in Dakar			5,000	760,000
Organization for tagging in Tema*			*	
Improvement of statistics at Tema	0	0	9,000	1,368,000
Historical data recovery*			7,000	
Assistance for current logbook collection and sampling			2,000	
Essential biological studies	10,000	1,450,000	6,000	912,000
Assitance for stomach and gonad analysis in Abidjan			6,000	912,000
Working Group on detailed planning of BETYP	10,000	1,450,000	10,000	1,520,000
Sub-contract for statistical tagging design			8,000	1,216,000
Logistics and feasibility of tagging			2,000	304,000
Coordination - Contingency	5,000	725,000	8,237	1,252,024
TOTAL	50,000	7,250,000	57,237	8,700,000

* These two missions in Tema will be combined.

Addendum 2 to APPENDIX 5

PROGRESS REPORT ON THE BIGEYE YEAR PROGRAM (BETYP)

During the Preparatory Meeting for the ICCAT Bigeye Year Program (BETYP), which was held in Madrid on March 24 and 25, 1998, several recommendations were made which included actions to be taken by the Executive Secretary during the year to seek funds for the program, particularly with regard to tagging activities. Following these recommendations, the Executive Secretary made several trips, namely to the Azores, Madeira, the Canary Islands, the European Community, Chinese Taipei and Japan.

Azores and Madeira: During his visit the Executive Secretary made several contacts with the Autonomous Governments and with fisheries organizations to discuss the issue of the tagging program. Attempts to obtain funding had limited success for two main reasons. The first of these is that the cost of hiring a fishing vessel in these areas is very high, and while the Autonomous Regional Governments of the Azores and Madeira were able to donate some funding to the BETYP (Azores: 2,000,000 Pts, Madeira: 1,500,000 Pts), this level of funding was not sufficient to cover this expense. The other reason is that, at the time of the visit, the main fishing season for bigeye was already well advanced. Attempts to carry out some tagging have been made in the Madeira area using a recreational fishing vessel.

Canary Islands: The Executive Secretary's visit to the Canary Islands was more successful, as in principle there was agreement that the *Consejeria de Agricultura y Pesca del Gobierno de Canarias* would finance a campaign for a value of 8,966,000 Pts, which would include the cost of the necessary equipment and personnel. This project was proposed by the *Centro Costero de Canarias* of the Spanish Oceanographic Institute (IEO). However, at this time the project has not yet been initiated.

Chinese Taipei: The Executive Secretary met with several representatives from the fisheries authorities, as well as the industry. All of those to whom he spoke expressed their concern for the state of the bigeye tuna stocks in the Atlantic, and showed a very positive inclination towards future financing of the BETYP. As a matter of fact, Chinese Taipei already contributed financially to this program.

Japan: Mr. I. Nomura, ICCAT Head Delegate of Japan, arranged the Executive Secretary's visit to Tokyo, where he met with representatives from the Japanese fisheries authorities and industry. They all supported the aims of the BETYP, and were also positive about future funding. Although Japan may be able to contribute for the 1999 budget additional expense in an amount similar to the 1998 level (i.e. about 2 million yen), its main contribution will probably be in kind. They plan to provide scientific cooperation and a research vessel which will be used at the disposal of the BETYP, subject to certain constraints in terms of operation area and period associated with availability of the vessel. The research vessel they have in mind is *Shoyo-Maru*, whose activities were highly appreciated by all ICCAT scientists for the 1994 cruise of the Bluefin Tuna Year Program. *Shoyo-Maru* was completely replaced in May this year with a new vessel with 2,118 GRT and state-of-art electronic equipment. It has been given the same vessel name (*Shoyo-Maru*) as the vessel replaced, and is designed to conduct specialized tuna research activities. Scientists from other countries will be able to board the vessel and carry out research program from it. M. Nomura indicated that dispatch of *Shoyo-Maru*, if welcomed by ICCAT, to the ICCAT area is more likely to take place in the year 2000, although the possibility of the 1999 dispatch is not completely excluded. It is estimated that this contribution will cost approximately the equivalent of a few US$ millions. This high cost, mainly for fuel and personnel, is due to the vessel being fully dedicated to the program for that particular year.

European Community: The Executive Secretary also established contacts with the European Community, mainly with the EC Head Delegate to ICCAT, Mr. E. Mastracchio, who informed that the EC had a very positive attitude towards the BETYP and was planning to offer financial support, but the amount of this support is not yet known. The Executive Secretary informed Mr. Mastracchio of the outcome of his visits to the Azores, Madeira, the Canary Islands, Chinese Taipei and Japan.

Conclusions: The Executive Secretary is optimistic that funding will be made available in the future from the sources mentioned above. However, given the high cost involved in carrying out tagging campaigns, it would be better to wait until we have sufficient approved funding before attempting any large-scale tagging program, as small-scale tagging efforts will not be effective.

APPENDIX 6

REPORT OF THE 1998 CONTRIBUTIONS/EXPENDITURES OF THE ICCAT ENHANCED RESEARCH PROGRAM FOR BILLFISH

The ICCAT Enhanced Research Program for Billfish, which began in 1987, continued in 1998. The Secretariat served as the coordinator for transferring funds and distributing tags, information, and data. The billfish data base is maintained at the NMFS Southeast Fisheries Science Center (Miami, Florida) and at the ICCAT Secretariat. This report represents a summary of the contributions and expenditures for the ICCAT Enhanced Research Program for Billfish during 1998.

The General Coordinator of the Program is Dr. J. Powers (USA); the East Atlantic Coordinators are Dr. T. Diouf (Senegal) and Mr. P. Banner man (Ghana), while the West Atlantic Coordinator is Dr. E. Prince (USA). During the 1997 Commission meeting, there was a proposal that at least some ICCAT funding be approved for the Enhanced Research Program for Billfish (see 1997 ICCAT biennial report, STACFAD item 9.3). The STACFAD approved the proposal, which specified that the Commission should make at least a symbolic contribution (US$ 10,000) to the Enhanced Research Program for Billfish starting in 1998 (1997 STACFAD, item 9.5 and 9.9). This new development also required that the Program be fully coordinated by the Secretariat in consultation with area coordinators and member countries .

Table 1 shows the income received at the Secretariat towards the Billfish Program, expenses for 1998, and the balance of Billfish Program funds (as of October, 1998). At the start of Fiscal Year 1998, there was a balance of US$ $11,032.87 in the Billfish Program account. Income received in 1998 included a total of $10,000 from the Commission budget, $5,000 from Chinese Taipei, and $25,000 from The Billfish Foundation (total 1998 income of $40,000). The Western Atlantic Coordinator determined that there was an unused balance in the CARICOM budget relative to billfish that had been carried over from previous years. The delegate from CARICOM agreed to determine the amount of this balance and inform the Western Atlantic Coordinator accordingly. Starting in 1996, FONAIAP (Venezuela) has continued to provide personal and other resources as in-kind contributions to the at-sea sampling program, thereby reducing the amount of funds for this activity from the ICCAT billfish account. In addition, the INSTITUTE DE PERCA and ILAMA (Brazil) also provided in-kind contributions by covering 55% of the cost of the first at-sea observer sampling program initiated in 1998 in this location. The US National Marine Fisheries Service assumed the costs of coordination travel for the west Atlantic as an in-kind contribution to the Billfish Program for 1998 (see SCRS/98/118 for details). It should also be noted that $4,000 was contributed by The Billfish Foundation in 1996 towards the hard cover publication of the billfish report resulting from the Third ICCAT Billfish Workshop, but these funds will not actually be spent until early 1998. Overall, the Program Plan for 1998 was successfully carried out in a timely manner.

Table 2 shows the Billfish Budget and expenditures as of October, 1998. Several additional expenditures are expected to be incurred before the end of 1998 and into the first quarter of 1999, such as payment of observer coverage in Venezuela and Brazil, as well as related insurance in Brazil. Therefore, there is a need to carry over the balance in the Billfish account into 1999, as has been the practice for this and other special programs in previous years. Several budgetary items show a zero expenditure and this is due to the fact that authorization of some budgetary expenditures of the 1998 Budget was dependent on the sufficiency of funds, while in other cases no request for funding was submitted to the Program Coordinator.

Progress of research carried out during 1998 is summarized in SCRS/98/100, SCRS/98/117, SCRS/98/118, and SCRS/98/174 for the west Atlantic and in SCRS/98/24, SCRS/98/139, and SCRS/98/154 for the east Atlantic. Additional documents involving billfish submitted to the 1998 SCRS included SCRS/98/120, SCRS/98/121, and SCRS/98/122.

Table 1. Funds received in 1998 for the ICCAT Enhanced Research Program for Billfish (up to October 16, 1998)

SOURCE	*AMOUNT (in US $)*
Starting Balance (1998)	11,032.87
Contributions: ICCAT Budget	10,000.00
Chinese Taipei	5,000.00
The Billfish Foundation	25,000.00
TOTAL FUNDS AVAILABLE IN 1998	51,032.87
TOTAL EXPENDITURES IN 1998 (see **Table 2**)	31,841.33
BALANCE IN BILLFISH FUNDS (as of Oct. 16, 1998)	**19,191.54**

Table 2. Budget & Expenditures of the Enhanced Research Program for Billfish (as of Oct. 16, 1998) (US$)

	Amount Budgeted	*Expenditures*
AGE AND GROWTH: Purchase of hard parts	500.00	0.00
TAGGING:		
Tag rewards	1,000.00	652.50
Lottery rewards	500.00	0.00
Hard part rewards	500.00	0.00
Printing posters and recapture cards in Japanese/Chinese/Portuguese	0.00	0.00
Tags and tagging equipment	2,000.00	1,884.80
STATISTICS & SAMPLING ENHANCEMENT		
-- *West Atlantic shore-based sampling:*		
Bermuda tournaments	0.00	0.00
Barbados	0.00	0.00
Brazil tournaments	0.00	0.00
Cumaná, Venezuela	300.00	225.00
Puerto La Cruz, Venezuela	240.00	180.00
Juangriego, Venezuela	864.00	648.00
Playa Verde, Venezuela	500.00	375.00
Playa Grande Marina, Venezuela	1,680.00	1260.00
Venezuela tournaments in Puerto Cabal and Falcon	760.00	570.00
Grenada 1,000.00	0.00	
Jamaica 1,000.00	0.00	
Martinique	1,500.00	0.00
Trinidad & Tobago	1,000.00	0.00
St. Maarten Netherlands Antilles	1,500.00	0.00
U.S. Virgin Islands	2,000.00	2,000.00
-- *West Atlantic at-sea sampling:*		
Venezuela	22,300.00	17,412.50
Insurance for Venezuelan Observers	1,250.00	1,250.00
Telemetry/Hook timer studies (travel)	2,000.00	0.00
Brazil	4,000.00	0.00
-- *East Atlantic shore-based sampling:*		
Dakar, Senegal	1,500.00	1,500.00
Côte d'Ivoire	1,500.00	0.00
Ghana	1,500.00	0.00
Canary Islands	400.00	0.00
COORDINATION:		
Travel by Coordinators	14,000.00	2,400.00
Mailing & miscellaneous--East Atlantic	100.00	0.00
Secretariat support	1,000.00	1,324.50
Bank charges on Billfish account	250.00	159.03
GRAND TOTAL	**66,644.00**	**31,841.33**

APPENDIX 7

1999 PROGRAM PLAN FOR THE ICCAT ENHANCED RESEARCH PROGRAM FOR BILLFISH (INCLUDING 1998 DETAILED REPORT FOR BILLFISH)

PROGRAM OBJECTIVES

The original plan for the Enhanced Research Program for Billfish (SCRS 1986) included the following specific objectives: (1) to provide more detailed catch and effort statistics, and particularly size frequency data; (2) to initiate the ICCAT tagging program for billfish; and (3) to assist in collecting data for age and growth studies. The plan was initially formulated in 1986 and implemented in 1987 with the intention of developing the data necessary to assess the status of the billfish stocks. Efforts to met this goal have continued through 1998 and are highlighted below.

PROGRAM HIGHLIGHTS

The goals of the Program were at least partially fulfilled with the exploratory stock assessments for blue marlin(SCRS/92/69) accomplished at the Second ICCAT Billfish Workshop in July, 1992, and later with refined blue marlin and white marlin assessments submitted to the 1992 SCRS (SCRS/92/128 and SCRS/92/129). In addition, further progress was made at the 1993 SCRS meeting with the submission of the assessment for west Atlantic sailfish (SCRS/93/99) and improvements in the data base for east Atlantic sailfish reported to the 1994 SCRS (SCRS/94/150, SCRS/94/155, and SCRS/94/156). An exploratory stock assessment for east Atlantic sailfish was submitted to the 1995 SCRS (SCRS/95/105). More recently, updated assessments for blue marlin and white marlin were accomplished at the Third ICCAT Billfish Workshop (COM-SCRS/96/19, SCRS/96/159). Estimated parameters from these recent marlin assessments were used to make future projection of relative biomass and relative fishing mortality and these projections were submitted to the 1997 SCRS (SCRS/97/71). Some progress was also made at the 1997 SCRS concerning standardization for east Atlantic sailfish CPUE (SCRS/97/53, SCRS/97/68, and SCRS/97/52), but problems with this assessment persist.

A study reviewed during the 1998 SCRS demonstrated that spatial and temporal variability in the species composition of U.S. longline catches could be exploited to reduce marlin catches with less than equal effect on the target species (SCRS/98/122). The Committee felt that similar analysis should be performed for the Atlantic basin as a whole. Progress was also made during the 1998 SCRS in evaluating the robustness of the non-equilibrium production model used to assess the stock status of blue marlin populations (SCRS/98/121). The study used an age and length structured blue marlin simulation model to generate time-series of catch and CPUE data similar to that available from the actual fishery. These data were analyzed using ASPIC to estimate the status of the simulated stock, and the results were compared to the known conditions from the simulations. The study concluded that ASPIC estimates of fishing mortality were slightly optimistic and estimates of current stock status were slightly pessimistic, but the error was small for reasonable biological representations of the blue marlin population. Further, the greatest source of potential error in the current assessment is undoubtedly associated with uncertainty in the actual catch and CPUE data used in the assessment, not with the use of the production model itself. The Committee recommends continued examination of the robustness of ASPIC and other alternative assessment schemes that may be applied to blue marlin and other billfishes in the future. The Committee also recommends that the Enhanced Research Program for Billfish be continued and expanded in critical areas, as recommended by the Second and Third ICCAT Billfish Workshops (SCRS/92/16, COM-SCRS/96/19), as many of the data acquisition problems for all billfish species remain, including landings and CPUE data identified above as the greatest sources of potential error in assessments. In addition, maintenance of important elements of the billfish data bases, to insure uninterrupted time series, also requires the Enhanced Research Program for Billfish to be continued and expanded.

PROGRAM COORDINATION AND PROTOCOLS

It was confirmed that Drs. J. Powers and E. Prince (U.S.A.) will continue to function as the General Coordinator and West Atlantic Coordinator, respectively. Dr. T. Diouf (Senegal) and Mr. P. Bannerman (Ghana) will act as Co-Coordinators for the east Atlantic Ocean. Research results (SCRS/98/24, SCRS/98/100, SCRS/98/117, SCRS/98/118, SCRS/98/120, SCRS/98/121, SCRS/98/122, SCRS/98/139, SCRS/98/154, SCRS/98/174,), Executive Summaries for each species, as well as a financial summary for 1997 were presented to the 1998 SCRS and Commission meetings.

The summary of the 1999 proposed budget is attached as **Table 1**. Highlight reports of research activities will be

provided to interested parties annually. In addition, names and addresses of individuals receiving the reports and those involved or interested in the research program will continue to be made available upon request. Projected funds for future research activities will be available in subsequent annual plans.

All agencies and/or personnel receiving funding from the special Billfish Program account are required to summarize annual expenditures of funds to the Commission and research activities, either in the form of a working document to the SCRS or a report to the Program Coordinators. Due to new changes in the financial structure of the ICCAT Billfish account, all participating cooperators in this Program are now required to request the release of funds (via fax or email) directly from the ICCAT Secretariat, as well as General Program Coordinator and area Coordinators. In other words, the release of Program funds are not automatic, even if expenditures are described in the Program Plan-- release of funds are contingent upon requests being received by the ICCAT Secretariate and Program Coordinators. In addition, program participants are required to submit data collected in previous years to area Coordinators or directly to the ICCAT Secretariat.

STATISTICS AND SAMPLING

a) Shore-based sampling

West Atlantic

Bermuda. Shore-based sampling of the annual billfish tournament will be conducted in Bermuda in 1999. Dr. Brian Luckhurst of the Department of Agriculture and Fisheries of Bermuda will coordinate this activity, and no funds will be required. Bermuda proposed to initiate a pilot study using pop-up satellite tags to evaluate the post-release survival of blue marlin caught in the Bermuda recreational fishery in 1999. Bermuda will provide financial and logistical support for this research, which will also require some travel to Bermuda by the western Atlantic coordinator to facilitate this study.

Brazil. Shore-based sampling of selected billfish tournaments will be continued in Brazil for 1999. in the general vicinity of Santos, as well as other locations. Dr. Alberto Amorin, *Instituto de Pesca*, will coordinate tournament sampling activities. It is not anticipated that this activity will require funds in 1999.

Cumaná, Playa Verde, Puerto La Cruz, Juangriego, Venezuela. Shore-based sampling of size frequency data for billfish carcasses off-loaded from industrialized longline boats at the port of Cumaná will be continued in 1999. Funding will be $300 since some of this activity occurs on weekends and after normal working hours. Sampling industrialized longline boats and artisanal fisheries in Puerto La Cruz, Juangriego, and Playa Verde will be conducted in 1999 and the requested funding for these segments is as follows: Puerto La Cruz $240; Juangriego $864; and Playa Verde $500. Trips by the West Atlantic Coordinator or his designee may be necessary to organize sampling, collect data, and transport biological samples to Miami in 1999. In addition, the amount of $500 will be required for tag rewards in Venezuela for 1998 that are made by FONAIAP staff (this budget item is identified in the Section on Tagging).

La Guaira, Venezuela. Shore-based sampling and detailed analysis of the recreational fishery (centered in La Guaira, Venezuela) will be continued in 1999. This sampling includes coverage of four recreational billfish tournaments held in Puerto Cabello and Falcon. Requested funding for this activity in 1999 is $760 since much of this sampling is conducted on weekends and some travel expenses are incurred while attending these events. Also, shore-based sampling, including documentation of the catch and effort statistics for the central Venezuelan coast, such as the important fishery at Playa Grande Marina, will be accomplished by contracting a technician on a part-time basis for 12 months. Funding for this activity in 1999 is $1,680. Shore-based sampling in all Venezuelan locations, as well as at-sea sampling (see next section) in Venezuela will be coordinated by Mr. L. Marcano of FONAIAP.

Grenada. Shore-based sampling of size frequency and total landings from the artisanal and recreational fishery for billfish will be continued by the Ministry of Agriculture, Lands, Forestry, and Fisheries (coordinated by Mr. C. Isaac and Mr. P. Phillip) in 1999. Shore-based sampling activities will start in early November, 1998, to coincide with the start of the pelagic fishery at this location. This activity will also include sampling of the Spice Island Billfish tournament. Requested funding for 1999 is $1,000.

Jamaica. Shore-based sampling of the size frequency, total landings, and catch and effort statistics from the recreational fishery will continue in 1999. Efforts will also be made to obtain these data from the artisanal canoe fishery as well. Requested funding for 1999 is $1,000.

St. Maarten, Netherlands Antilles. Shore-based sampling of size frequency data for off-loaded billfish carcasses from

longline vessels will be continued in 1999 through the Nichirei Carib Corporation. Requested funding for this in 1999 is $1,500. Shore-based sampling of the annual recreational billfish tournament, initiated in 1992, may be continued in 1999 by the West Atlantic Coordinator or his designee (if time permits). Since this tournament normally contributes air fare and hotel accommodations for the week of the tournament, the West Atlantic Coordinator may also assist Nichirei Carib employees in sampling during his stay on the island. Thus, funds for this latter activity will not be required from the Program.

Uruguay. An evaluation of the historical billfish landings and CPUE data base from Uruguay will be conducted by Olga Mora, *Instituto Nacional de Pesca* (INAPE) in order to assess the possibility of recovering historical landing statistics in the necessary formats required for Task I and Task II reporting. A report will be submitted to the 1999 SCRS concerning this activity but will not require funding in 1999.

U.S. Virgin Islands. Shore-based sampling of recreational billfish tournament and non-tournament fishing in the U.S. Virgin Islands will be continued in 1999 by the Virgin Islands Big Game Fishing Club in St. Thomas. Requested funding for 1999 is $2,000.

Trinidad and Tobago. Shore-based sampling of size frequency data for off-loaded billfish carcasses from China-Taiwan and longline vessels from Trinidad may be re-initiated in 1999. This work, if conducted, will be supervised by Ms. C. Chan A Shing of the Ministry of Food Production and Marine Exploitation (Fisheries Division). At least one trip by the West Atlantic Coordinator, or his designee, will be necessary to review the research plan and organize field research activities. Requested funding for 1999 is $1,000.

East Atlantic

Dakar, Senegal. Shore-based sampling of the Senegalese artisanal, recreational and industrial fisheries for billfish size frequency, sex determination, and catch and effort data will be continued in 1998 by Dr. T. Diouf, the East Atlantic Coordinator. Requested funding for 1999 is $1,500. The East Atlantic Coordinator will travel to Gabon, Ghana, Sao Tome & Principe, and other West African countries in late 1998 or early 1999 to verify species identification of recent reported landings. Travel funds for this purpose were previously released to the East Atlantic Coordinator in the second quarter of 1998.

Côte d'Ivoire. Abidjan shore-based sampling of the artisanal and recreational fisheries for billfish will be continued and directed by Mr. N. Nestor of CRO in 1999. Funding for 1999 will be $1,500.

Ghana. Shore-based sampling of size frequency and sex determination, and catch and effort of the artisanal gillnet fisheries for billfish will be continued in 1999 by Mr. P. Bannerman. Funding for 1999 will be $1,500. At least one coordination trip by Dr. T. Diouf will be required to accomplish this task in 1999.

Canary Islands. Shore-based sampling of size frequency of off-loaded billfish carcasses from Chinese Taipei longline vessels may be continued in 1999. Requested funding for 1999 is $400.

Morocco. Inquires will be made by Abdella Srour, *Institut National de Recherche Halieutique*, to improve the knowledge of the recreational fishery for billfish in Morocco and for establishing a sampling program in 2000. Funding for this activity in 1999 is not anticipated.

b) At-sea sampling

West Atlantic

Venezuela. At-sea sampling out of the port of Cumaná, Puerto La Cruz, Carúpano, and Juangriego will be continued in 1999. A total of about 15 tuna trips ($9,000), 15 swordfish trips ($9,000) on mid-sized industrial longline vessels will be made in 1999. In addition , two long-range trips on large Korean-type vessels ($2,300), and eight trips on smaller longline vessels ($2,000) will be made in 1999. Therefore, the total west Atlantic at-sea sampling for 1999 will be $22,500. In addition, insurance for at-sea sampling for 1999 will be $1,250.

Brazil. At-sea sampling on Brazilian, Spanish, and U.S. longliners will be continued in 1999. Dr. A. Amorim from the *Instituto de Pesca* and Dr. J. H. Meneses de Lima from IBAMA will direct these research activities. Independent funding of this activity from Brazil in the amount of $4,000 is planned to cover at least five trips. Likewise, funding from the ICCAT Billfish Program is intended to match this effort, with a proportionate increase in the total number of trips that can be accomplished in Brazil during 1999. The Western Atlantic Coordinator will travel to Brazil in early spring of 1999 to train observers and assist in initiating this program. Insurance for Brazilian observers are estimated at $35 per 30 day trip. Total insurance is about $350 if 10 trips are accomplished. Requested funding for 1999 will be $4,000 for

sea pay and $350 for insurance.

Bermuda. At-sea sampling of home based longline vessels targeting pelagic species will be initiated in 1999 by the Department of Agriculture and Fisheries, provided this fishing activity takes place. In addition to implementing ICCAT at-sea sampling activities, possible biological sampling opportunities will also be assessed. ICCAT funding of this research activity is not required in 1999.

Hook Damage Studies. A proposal was submitted to the western Atlantic Coordinator in November, 1997, by the Virginia Institute of Marine Science to evaluate the hook damage (circle vs J hooks) on billfish caught off longline vessels. However, it was not possible to implement this project through October 1998, although one cruise aboard a Venezuelan industrial longline vessel is planned for November, 1998. This project is independently funded but will require funding of air faire for a graduate student to travel to Cumaná in late 1998 or 1999, in the amount of $2,000.

Uruguay. At-sea sampling aboard home based longline vessels was initiated in 1998 by the *Instituto Nacional de Pesca* (INAPE) of Uruguay, but no detailed data are collected on billfish, except for measuring length. Starting in 1999, Ms. Olga Mora of INAPE has agreed to initiate detailed data collection for billfish (as required for other at-sampling in the Billfish Program) from the existing observer program on a trail basis. This activity will involve four trips of about 20 days duration each during the 1999 sampling season. A portion of the costs of observers will be covered by the ICCAT billfish program budget ($10 per day) but this expenditure will be limited to a total of $500 for 1999.

TAGGING

The following conventional tagging activities and expenditures are proposed. Tags and tagging equipment for east Atlantic billfish tagging in 1999, distributed to participants by the ICCAT Secretariat, are not anticipated in 1999 because substantial tagging equipment purchases were made in 1998. The total for tag rewards (including the $500 needed in Venezuela) will amount to $1000 for 1999. A lottery reward of $500 will also be necessary for 1999.

AGE AND GROWTH

Requested funding for biological samples from juvenile and very large billfish, as well as tag-recaptured billfish, is $500 for 1999.

COORDINATION

e-1 Coordination (on-site training of samplers, collection of statistical and biological samples)

Experience in the west Atlantic (COM-SCRS/90/20, COM-SCRS/91/18, COM-SCRS/92/24, COM-SCRS/93/102, COM-SCRS/94/147, COM-SCRS/95/107, COM-SCRS/96/90, COM-SCRS/97/67, COM-SCRS/98/118) continues to indicate that it will be necessary to make a series of trips to specific Caribbean island locations, and occasionally to west Africa, Madeira (Portugal), Bermuda, and Brazil, to maintain quality control of on-going research. The purpose of this travel will be to train samplers in data collection, pick up data, assist in pop-up tagging and data analysis, hand-carry frozen biological samples back to Miami, monitor the rapidly changing pelagic fisheries, and maintain contacts with project cooperatives. The travel to west Africa will be to assist the East Atlantic Coordinators in refining sampling programs, particularly to encourage tag release and recapture activities. Funding for 1999 will be $14,000. Travel may include the following areas:

West Atlantic

-- Cumaná, Margarita Island, Caracas, and La Guaira (Venezuela)
-- Grenada
-- Santos and Recife (Brazil)
-- St. Maarten (Netherlands Antilles)
-- St. Vincent
-- Trinidad and Tobago
-- Cancún and Cozumel (Mexico)
-- Bermuda
-- Other Caribbean countries

East Atlantic

-- Dakar (Senegal)
-- Abidjan (Côte d'Ivoire)
-- Ghana
-- Madeira (Portugal)
-- Other west African countries

e-2 Miscellaneous/Mailing

The requested funding for 1999 for east Atlantic miscellaneous and mailing is $100. Similar needs for the West Atlantic Coordinator are covered by the U.S. domestic budget.

e-3 Secretariat

Funding for mailing, shipment of specialized materials and samples, and for miscellaneous expenses and contingencies for 1999 is $1,000.

e-4 Bank charges

Bank charges for maintenance of the ICCAT Billfish special account, (if necessary) for 1999, are estimated at $250.

Because of unforeseen changes in the fisheries and opportunities for sampling, it may be necessary for the ICCAT Secretariat and the General Coordinator to make adjustments in budgeted program priorities. These changes, if any, will be duly transmitted to the area Coordinators. Also, the proposed budget for regular Program activities in 1999 is attached as **(Table 1)**. The expansion or reduction of expenses will depend, to a large degree, on the available funds. It should be noted that the regular Program activities will be implemented based on receipt of sufficient funds and the carry-over of unused funds from 1998 (see **Appendix 6**, Billfish financial report).

Table 1. 1999 Budget for the ICCAT Enhanced Research Program for Billfish (US$). (The release of funds is contingent upon conditions described in the Program Plan text.)

Budget Chapters	*Amounted budgeted*
STATISTICS & SAMPLING	
-- *West Atlantic shore-based sampling:*	
Bermuda tournaments	0
Brazil tournaments	0
Venezuela (Cumaná, Puerto La Cruz, Juangriego, Playa Verde, La Guaira, Venezuelan tournaments in Puerto Cabello and Falcon)	4,344
Grenada	1,000*
Jamaica	1,000*
St. Maarten, Netherlands Antilles	1,500*
Uruguay	0
U.S. Virgin Islands	2,000*
Trinidad & Tobago	1,000*
-- *West Atlantic at-sea sampling:*	
Venezuela (Cumaná, Puerto La Cruz, Carúpano, Juangriego)	22,300
Brazil	4,000*
Bermuda	0
Hook Damage studies (Travel only)	2,000
Uruguay	500
Insurance for Venezuelan Observers	1,250
Insurance for Brazilian Observers	350
— *East Atlantic shore-based sampling:*	
Dakar, Senegal	1,500
Côte d'Ivoire	1,500
Ghana	1,500
Morocco	0
Canary Islands	400*
TAGGING:	
Tag rewards	1,000
Lottery rewards	500
Hard part rewards	500
Printing posters and recapture cards in Japanese, Chinese, and Portuguese	0
Tags and tagging equipment	0
AGE AND GROWTH:	
Purchase of hard parts	500*
COORDINATION:	
Coordination (on site training of samplers, collection of statistical and biological samples)	14,000*
Mailing & miscellaneous-East Atlantic	100
Secretariat support (mailing, miscellaneous expenses, contingencies etc.)	1,000
Bank charges	250
GRAND TOTAL:	**$ 63,994**

* Authorizing these expenditures depends, in part, on additional funds being available.

APPENDIX 8

REPORT OF THE MEETING OF THE SUB-COMMITTEE ON ENVIRONMENT

1. Opening of the meeting

The meeting of the Sub-Committee on Environment took place on October 21, 1998, in the hotel Reina Victoria, Madrid. Dr. A. Fonteneau (EC-France), Convener of the Sub-Committee, chaired the session and welcomed all the participants.

2. Adoption of the agenda and meeting arrangements

The Agenda was adopted and is attached as **Addendum 1 to Appendix 8**. Mr. J. Santiago (EC-Spain) was nominated Rapporteur.

3. Review of contribution papers

Before proceeding to the presentation of the various documents, the Chairman of the Sub-Committee expressed his opinion on the importance of the environment in tuna dynamics and on the approach which the SCRS takes to the role of the environment.

The Chairman of the Sub-Committee stressed the need for knowledge on the laws of the environment, its effects on tuna dynamics and on the mode of integrating this information into the work of the SCRS. Spawning, genetic and trophic migrations, and multiple aspects of the life cycle of tunas which are strongly affected by the environment; in particular, the bio-ecology of the oceans, governed to a certain extent by the distribution of plankton, and considered on a three-dimensional level, must be key references for the work of the SCRS.

The Chairman of the Sub-Committee also focused on the importance of the environmental cycles, and he referred to the effects on both catchability and recruitment of oscillations such as ENSO and NAO. He finished by reflecting that the Bakun triad clearly effects recruitment and that its variations could result in a variable MSY, dependent on the environment (temperate tunas are one example of this).

Following this introduction, six papers relating to the work of the Sub-Committee on Environment were presented, i.e. documents SCRS/98/106, 197, 111, 135, 146 and 147.

Document SCRS/98/135 was presented first. This paper analyzed the hydro-climatic changes observed in the Atlantic since 1950, and the possible impacts on the tuna stocks and their exploitation. The role of the environment on two specific tuna stocks was analyzed; yellowfin in the equatorial Atlantic and bluefin tuna in the north Atlantic. Taking the Cury and Roy environmental window as a reference, applying non-lineal regression techniques, the turbulence explains between 47 and 53% of the variability of CPUE in ages 0 and 1 yellowfin. An effect on the catchability of adults is also observed, with CPUE decreasing with the depth of the thermocline. As regards bluefin tuna, the author demonstrated the association between the Norwegian catches and the evolution of the North Atlantic Oscillation (NAO). The effects of the oscillation in the zooplankton population, and consequently on the abundance of small pelagics (such as herring in the North Sea, which collapsed in the 1950s), could result in a decrease in the availability of food for bluefin tunas in Nordic areas, associated with recruitment fluctuations induced by NAO variability.

Document SCRS/98/147 consisted of a brief note which is a continuation of the work presented to the Sub-Committee on Environment in 1997 on the possible relationship between large scale climatic variations and the recruitment of eastern bluefin tuna. Highly significant correlations were observed between the recruitment of this stock and the in the surface sea temperature in the spawning area-season of the western Mediterranean. In this case there also appears to be a significant relationship with the NAO index. The presentation finished with a series of diagrams illustrating the extreme contrast in the conditions of surface temperature which have existed in the western Mediterranean over the last 27 years.

Document SCRS/98/106 analyzed historic indicators in the surface fishery targeting albacore in the north Atlantic; the period considered goes back to the beginning of the century. This work was carried out with the aim of extending the analyses of the relationship between environmental conditions and recruitment of this stock to periods prior to 1975. It reflects the difficulty in identifying, in catch rates recovered from historical records, the effects caused by an abundance of the resource, by variations in catchability or by technological developments. It was recommended that the historical period from 1975 usually studied for albacore by the SCRS be extended back at least to 1970, the period for which catch-at-size data are available.

Document SCRS/98/146 analyzed the changes in the fishing pattern of the baitboat and purse seine fisheries off the west of Africa in 1997 and 1998, in an area between 10°N and 22°N. The weak Senegalese upwelling of the last two years could be responsible for the displacement of the resource and, as a result, of the fleets, to less usual areas. Possible relationships between the Senegalese upwelling and large scale climatic variations were hypothesized.

Document SCRS/98/111 dealt with showing the coincidence between fluctuations in the NAO index and the changes in the CPUE index of age 1 swordfish in the north Atlantic, from 1983-1997. This index is considered more appropriate than those indices derived from VPA-type analyses, given that it is based on intensive sampling, almost a census of individuals caught, and lacks the bias sometimes derived from this type of analysis. For the available series, the NAO index explains 67% of the CPUE variability, coinciding with the low levels of recruitment derived from high NAO index situations, and vice versa. Hypothesis were made in relation to the incidence of large scale climatic variations on the physiology and incidence of swordfish, not only in the definition of recruitment in early stages, but also in the definition of potential time-area spawning windows.

Finally, document SCRS/98/107 presented the results of the comparison of thermal anomalies and the albacore fishery in the southwest tropical Atlantic.

4. Anomalies in oceanographic conditions affecting tuna catches

This topic had been dealt with during the presentation of documents. There were several works which pointed towards possible impacts of anomalies at diverse time-area strata on aspects of the population dynamics and the catchability of tunas and related species.

It was noted that the recent North Atlantic Oscillation (NAO) anomaly in 1996 could be a good opportunity to have available contrasts in several of the series which were presented to the Sub-Committee. In that year the third lowest value of this climatic index had been reached this century, after an almost continual period of high indices during the last twenty years.

It was also noted that the typology of the anomalies is clearly different in the temperate and tropical areas, these latter being of additional complexity not found in the former.

5. Ecology of tunas

Various topics were discussed under this agenda Item. Firstly, it was considered appropriate, whenever possible and when the quality of the data permitted, to work with information on indices which come directly form the fishery rather than those derived from assessment methods. It was noted that on some occasions the information entered in the models was not the most adequate in terms of reliability. This detracts from the results obtained and makes it impossible to make any comparison or contrast with environmental variability.

The dangers inherent in finding spurious correlations in correlation analyses were also noted. There are many examples in the literature on how easy it is to find the most diverse correlations, and on how easily they can be corrupted. The Sub-Committee was unanimous in recommending caution in these types of analyses. Five adequate step were proposed as necessary for planning this type of study:

-- the scale of the work should be defined, as this conditions the type of base data, whether fishery or environmental.
-- hypotheses should be supported by known eco-physiological bases.
-- significant auxiliary variables be identified in relation to the eco-physiological processes selected.
-- non-linear methods be used where possible, given that this is the nature of many ecological relationships and;
-- carry out comparative studies with other species and other oceans.

The importance of considering the size of the spawning stock was also pointed out.

6. Review of studies on the effect of the environment on tuna ecology and the conclusions of international meetings on the environment

The Sub-Committee was informed about various meetings which will be held on the Environment and fisheries. Unfortunately, none of these were in relation to tunas, and therefore the Sub-Committee did not deal with this issue any further.

7. Working plan for the Sub-Committee

Following the introduction by the Chairman of the Sub-Committee on Environment on the definition, not always appropriate, of the boundaries between stocks and the Longhurst eco-biological areas, etc., specific proposals were made in relation to the work of the SCRS in relation to the environment.

He stressed the need for the SCRS to consider the environment in its assessments. The role of the environment is a key one in aspects such as obtaining standardized abundance indices or even making forecasts about future levels of recruitment. It was felt that it would be appropriate that the detailed reports include a section relating to the environment and biological characteristics.

It was also suggested that an "auditor"on environmental aspects in the SCRS who would contribute by verifying the general ecological assumptions made by the various species groups.

The SCRS Chairman pointed out the importance of environmental factors in the dynamics of tuna resources. He called attention to the fact that when abundance indices are analyzed during assessments, it is usually "population indicators" which are given exclusive attention, and in general the "environmental indicators" are usually forgotten. He highlighted the importance of finding mechanisms to integrate this type of indicator into SCRS assessments.

The Sub-Committee expressed its concern over various aspects of the methodology used in the process of standardization of abundance indices which may lead to an incorrect focus on possible environmental effects. In this regard, two cases were mentioned; the consideration of only lineal effects on the standardization models; or the arbitrary definition of time-area strata in these models, without taking into account the ecological aspects of the resource. It was pointed out, by way of example, that the decline of albacore in the north Pacific seems to be related to natural fluctuations related to environmental conditions. Through tag-recovery programs, fishing mortality was estimated to be notably lower than those derived through adjusted VPAs.

As regards the "auditor", it was considered more appropriate to integrate these functions to the members of the Advisory Committee in charge of revising the detailed reports, the establishment of this Committee being recommended by the SCRS.

It was also recommended that the Working Group on Methodology be charged with the task of determining the means of integrating the environmental "indicators" in the stock assessments. It was considered that this should be a priority for this Working Group.

8. Date and place of the next meeting of the Sub-Committee on Environment

The next meeting of the Sub-Committee will be held at the same time and place as the next meeting of the SCRS.

9. Other matters

No other matters were discussed.

10. Adoption of the Report

The Report was adopted.

11. Adjournment

The 1998 meeting of the Sub-Committee on Environment was adjourned.

Addendum 1 to Appendix 8

Agenda
of the Sub-Committee on Environment

1 Opening of the meeting
2 Adoption of the Agenda and meeting arrangements
3 Review of contribution papers
4 Anomalies in oceanographic conditions affecting tuna catches
5 Ecology of tunas
6 Review of studies on the effect of the environment on tuna ecology and the conclusions of international meetings on the environment
7 Working plan for the Sub-Committee
8 Date and place of the next meeting of the Sub-Committee on Environment
9 Other matters
10. Adoption of the report
11. Adjournment

APPENDIX 9

REPORT OF THE SUB-COMMITTEE ON STATISTICS

1. Opening of the meeting, adoption of Agenda and arrangements for the meeting

Dr. S. Turner (United States), Convener of the Sub-Committee on Statistics, opened the meeting. Dr. Turner suggested the addition of Item 4 (b) "*ICCAT Program Data Reporting*" be added to the agenda. With this modification, the agenda was adopted and is attached as **Addendum 1 to Appendix 9.** The ICCAT Secretariat was requested to serve as rapporteur.

2. New developments in statistics

a) Timeliness of reporting

The Assistant Executive Secretary introduced the Report on Coordination of Research (SCRS/98/9). Table 1of this document showed the progress made by the Secretariat in the collection of 1997 data, submitted by the national offices. While few data were submitted by the original deadlines, the Secretariat had received, by the ultimate deadlines imposed later, most of the necessary data required to create the catch-at-size files of albacore, yellowfin, bigeye and swordfish in advance of the SCRS, with the exception of the tropical tuna species in the western Atlantic.

b) Major revisions of statistics in 1998

Several countries requested revisions to historical data, particularly bluefin tuna data. In 1997, Croatia had proposed revised bluefin tuna data since 1991, and the SCRS had recommended that a member of the Secretariat visit Croatia to study the available data. The Assistant Executive Secretary accordingly visited Croatia to work with Croatian scientists. The results of this work are presented in SCRS/98/45, and the revised statistics presented in 1998 have been accepted by the SCRS. Several other countries (France, Greece, Italy, Morocco, Tunisia and Turkey) also proposed revisions to bluefin tuna data prior to or during the Ad Hoc GFCM/ICCAT Joint Working Group on Large Pelagic Stocks in the Mediterranean Sea. These proposals had been studied at that meeting and accepted, with the exception of Greece and Turkey. The Italian data had been accepted on the condition that a more detailed explanation would be presented before the Commission meeting. Greek data was later reviewed by the Assistant Executive Secretary who visited Greece, and the results of the revisions were presented in SCRS/98/90, and accepted by the sub-Committee. The proposal to revise Turkish catch statistics was presented in document SCRS/98/178, but the Sub-Committee considered that the document provided insufficient justification for the proposed changes, and that further review was needed. However, it was recognized that Turkish catch data may have been under-reported in the past, but considered that the documentation for the revised estimates was inadequate. Therefore, the Sub-Committee requested that Turkey make further analyses and present an improved report as soon as possible. The Secretariat was requested to assist in this process, if feasible.

Revised data for tropical tunas had also been received from Ghana, following a visit to Ghana by the ICCAT Systems Analyst. While these changes were accepted in principle, there was some doubt as to the reliability of the size frequency data, which needed further clarification and verification. It was agreed that these data be subject to further revision by the Ghanian scientists, with assistance from external scientists if necessary.

Both France and Spain had submitted new data series, including Task I, catch and effort and catch at size data for their tropical fleets for 1991-1997, and also for the NEI fleets operating in the eastern tropical area. These revisions are a result of the application new statistical methodologies used . Explanations for these changes were presented in documents SCRS/98/97 and SCRS/98/141 respectively, and had been adopted by the SCRS.

Some concern was expressed about changes being accepted without being sufficiently justified and documented, and that many of the revised time series being too short, and that there was a need to review the series over a longer time period. The hope that similar care in reporting future data would be taken was also expressed.

c) Estimation of mis-reporting or non-reporting

The Assistant Executive Secretary presented SCRS/98/8 which showed the Secretariat's estimates of unreported catches of bluefin tuna. The majority of these estimates were based on the excess of imports over reported catches, based on the Bluefin Tuna Statistical Document Program. It was noted, however, that many of the revisions to historical data made during the GFCM/ICCAT Joint Working Group had effectively reduced most of the estimates relating to Contracting Parties to zero, with the exception of Equatorial Guinea. However, many estimates for non-contracting parties still remained, including Belize, Panama and Honduras, although it was noted that many vessels which previously used the flags of these countries for convenience are now changing to other flags as a result of the trade measures taken by ICCAT.

The observer from Panama informed the sub-Committee that his country was making every effort to eliminate boats which did not conform to ICCAT regulations from its register, but this task was very difficult, due to internal legal aspects. No licences were being given to Panamanian vessels to fish for bluefin tuna in the Mediterranean or Atlantic Ocean, but the problem remained that some vessels continued to use the Panamanian flag, even though they were no longer on the Panamanian register. The list of registered vessels had been sent to ICCAT. The observer from Panama admitted that no data on catches by Panamanian flag vessels had been submitted to ICCAT because such data had not been collected in the past. However, it was hoped that with the new system in operation that data could be sent in 1999.

The EC delegation raised the problem of possible mistakes being made on the Statistical Documents, particularly in relation to gear classification, and it was agreed that the verification of copies of the Documents by the issuing countries themselves should be encouraged. The Observer from CARICOM requested assistance from the United States to help to clarify similar problems arising from import statistics relating to swordfish, particularly in the cases of Barbados and Trinidad and Tobago, as in some cases it appeared that distinction had not been made between transshipments and catches by flag vessels of those countries.

The question of reporting responsibility for foreign flagged vessels fishing in national Exclusive Economic Zones was raised. It was agreed that the criteria followed should be those agreed by the Coordinating Working Party (that, in general, catches should be reported by flag) and applied by all international fisheries organizations, including FAO. These criteria were published as Addendum 3 to Appendix 7 of the Report of the Standing Committee on Research and Statistics 1996.

Ms. O. Mora (Uruguay) presented preliminary information resulting from a monitoring scheme which had come into effect in Uruguay to control landings of foreign flagged vessels unloading in Uruguayan ports. She highlighted the problem that many vessels were continually changing to flags of convenience, which made it difficult to monitor such vessels. The sub-Committee applauded this initiative and hoped that similar schemes would be established in other countries with major transhipment ports, although care should be taken to ascertain in which Ocean the catches were made.

d) Shark statistics

The Assistant Executive Secretary informed the Sub-Committee that the Secretariat had been colleting data on sharks since 1995, but as yet no real data base had been established as it was still unclear what species such a base should contain, a relatively minor amount of data as yet having been collected. It was agreed that further discussion of shark statistics would take place during the meeting of the Sub-Committee on By-Catch.

e) Secretariat data management policy

The Assistant Executive Secretary reported that there had been no major changes in the data management policy of the Secretariat. All data received were converted into the ICCAT format following their verification and made available to ICCAT scientists and/or statistical correspondents on request. It was noted that the Tropical Tuna Species Group had encountered some problems with the data provided by ICCAT, due to some errors being found in the data, and some historical data were still missing from the base. Furthermore, requests by the groups for particular statistics could not be met immediately due to the shortage of personnel in the Statistics Department. It was suggested that a Working Group be established to examine the data management policies of the Secretariat in order to ensure that the necessary and accurate data is made available to the species groups. In connection with this, it was also agreed that the hiring of additional staff at the Secretariat was now imperative, in order to assist with such work.

The possibility of buying a computer with greater capacity in order to allow scientists instant access to the base was proposed, but may be unfeasible due to the complexity of the data. It was agreed that this should be a matter for consideration by the recommended Working Group on Data Management.

It was also agreed that many problems could be overcome if the Species Groups informed the Secretariat of their data requirements well in advance. It was recommended that each Species Group make an annual work plan, which should be communicated to the Secretariat, well in advance of the Species Group meetings.

f) Dissemination and publication of data

The Assistant Executive Secretary informed the Sub-Committee that, in addition to the hard copy Statistical Bulletin and Data Record publications, the software packages "TUNASTAT", containing Task I data and "CATDIS", containing catch data by 5x5° rectangles were available on the ICCAT web page. The CATDIS package had been used by FAO in the publication of its tuna atlas.

3. Special actions taken in 1998 (which are not covered in item 2)

a) Secretariat actions in response to SCRS recommendations

The Assistant Executive Secretary informed the Sub-Committee that FAO had made available that part of the ASFA base relating to ICCAT. This base needed some work in order to make it user-friendly and it was hoped that it would be made available within two-three months. The assistance of FAO in this matter was appreciated by the Sub-Committee, and it was recommended that, as this base starts from 1980, the previous bibliographic information, currently available on paper, should be entered and added to the base. The Sub-Committee stated that the delay in creating this tool was slowing down, and perhaps even inhibiting research, and insisted that progress be made quickly.

b) Improvement of computer facilities and software

The equipment and software bought during 1998 were noted, and the Sub-Committee expressed its appreciation to the Executive Secretary for ensuring that the equipment recommended at the 1997 meeting for the efficient working of the Secretariat was purchased. It was agreed that a small Working Group be formed to consider the equipment and software needed for 1999. The findings of this Group are attached as **Addendum 2 to Appendix 9**.

4. New business

a) Fleet statistics

The Assistant Executive Secretary warned the Sub-Committee that under the new Law of the Sea, the collection of fleet statistics (lists of fishing vessels with particular specifications) may fall within the mandate of regional fisheries bodies, whilst previously this had been the mandate of national administrations. This would be helpful in monitoring those vessels which frequently change their flag of convenience, and for assessing fishing capacity. However, it was considered that such a task would increase the workload of the Secretariat, as well as national scientists, and it was again recommended that more personnel be hired for the Statistics Department. It was pointed out that compiling lists of actively fishing tuna vessels was more complicated than maintaining a list or register of fishing vessels in general. With regard to assessing fishing capacity, the difference in types of tonnage records made this very difficult at present. It was agreed that this task should only be undertaken after the FAO Working Group had established guidelines on measurements of capacity.

b) ICCAT program data reporting

Concern was expressed at the lack of tagging release data held at the Secretariat, particularly from previous ICCAT research programs. It was agreed that data generated by programs funded by ICCAT should be reported to the Secretariat. The problem of reporting tagging data from on-going programs or programs not funded by ICCAT was raised, as although it was desirable for all release data to be held in one base, it may be difficult to ensure that such data is transmitted, before the end of the program, if at all. It was recommended that all data should be reported annually, regardless of whether or not the program was still in progress.

5. Recommendations and future plans

It was recommended that:

1. Further study should be made on the revisions to Ghana size data and Turkish Task I data.

2. The bibliographic data base of all ICCAT scientific papers be completed and disseminated by 31 March 1999.

3. A Working Group on Data Management be established

4. More personnel be hired at the Secretariat's Statistics Department, according to the recommendations of the Working Group on SCRS Organization.

5. Each species group draw up an annual plan of data needs which should be submitted to the Secretariat well in advance of the species group meetings.

6. All data emanating from ICCAT financed programs, be reported annually to the Secretariat.

7. The Assistant Executive Secretary attend the 1999 meeting of the Co-ordinating Working Party on Statistics and the FAO Consultation on the Precautionary Approach.

6. Date and place of the next meeting of the Sub-Committee on Statistics

It was agreed that an inter-sessional meeting of the Sub-Committee on Statistics be held for a four-day period, prior to the 1999 meetings of the Special Groups.

7. Other matters

No other matters were discussed.

8. Adoption of the Report

The Report was adopted.

9. Adjournment

The 1999 Meeting of the Sub-Committee on Statistics was adjourned.

Addendum 1 to Appendix 9

Agenda
of the Sub-Committee on Statistics

1. Opening of the meeting, adoption of Agenda and arrangements for the meeting
2. New developments in statistics
   a) Timeliness of reporting
   b) Major revisions of statistics in 1998
   c) Estimation of mis-reporting or non-reporting
   d) Shark statistics
   e) Secretariat data management policy
   f) Dissemination and publication of data
3. Special actions taken in 1998 (which are not covered under Item 2)
   a) Secretariat actions in response to SCRS recommendations
   b) Improvement of computer facilities and software
   c) Other matters
4. New business
   a) Fleet statistics
   b) ICCAT program data reporting
5. Recommendations and future plans
6. Date and place of the next meeting of the Sub-Committee on Statistics
7. Other matters
8. Adoption of Report
9. Adjournment

Addendum 2 to Appendix 9

REPORT OF THE SMALL GROUP ON SECRETARIAT COMPUTER NEEDS

Following the recommendation of the SCRS in 1997, and given the budgetary provision made in the 1998 budget, the following equipment was purchased during 1998:

6 Desk top computers
1 portable computers
Expanded memory for portable computer
Modem
2 Scanners
5 printers
1 portable printer
1 PCMCIA
7 Corel Suite version 8 para windows 95
2 copies Microsoft Office
6 Language modules
1 translation program

As it was considered that the immediate needs of the Secretariat were close to being covered, it was recommended that 1 desktop computer (350,000 pesetas) with a modem in order to connect e-mail for the Secretariat, 1 printer (50,000 pesetas), 1 CD ROM reusable recorder (150,000 pesetas), GIS software (300,000 pesetas, and other miscellaneous extra items, such as software to permit importing file types into WORD (50,000 pesetas) be bought in 1999. Therefore, the total budget needed for 1999 would be about 950,000 pesetas.

APPENDIX 10

REPORT OF THE SUB-COMMITTEE ON BY-CATCH

1. Opening of the meeting, adoption of Agenda, and arrangements for the meeting

At the request of the Chairman of the SCRS, the Convener of the Sub-Committee on By-Catch, Dr. H. Nakano (Japan) opened the meeting. The Agenda, which was circulated before the meeting, was reviewed and adopted with minor modifications and is attached as **Addendum 1** to this Report. Dr. G. Scott (United States) served as Rapporteur.

2. Review of list of tuna fishery by-catches

The list of species incidentally taken by the fisheries for tunas and tuna-like species in the Atlantic and Mediterranean (Appendix 12 of 1997 SCRS report) was reviewed and updated by participants in the Working Group. Only minor changes were made to the species list based on new information in working papers submitted to the 1998 SCRS meeting. Document (SCRS/98/105) provided information on species caught by the swordfish longline fishery in the Azores. Three species of teleosts, silver scabbard-fish (*Lepidopus caudatus*), bluefish (*Pomatomus saltarix*) and gnelly jack (*Pseudocaranx dentex*), were added on the species list. Dolphin fish (*Coryphaena hippurus*) was also added on the part of bait boat by-catch in the list following the suggestion of participants, and since it is also reported as Task I landings by some nations using this gear type. The Committee decided that the working species list should be maintained by the Secretariat with revision by the Committee. The species list should also include species caught by artisanal and recreational fisheries directed at tuna and tuna-like species when surveys on those fisheries are conducted. For this reason, the Committee recommended that these reports be submitted to ICCAT by Contracting Parties and non-contracting parties/entities/fishing entities as far as possible. When necessary, species codes used for archiving the data should be a combination of the FAO three letter codes with a coding for sex (when available) coded as the forth character.

The Working Group again reaffirmed that the species list gave no indication of the frequency, amount, or disposition of the catch of these species, but merely served as a listing of species observed or believed to comprise some component of the catches made by the Atlantic tuna and tuna-like fisheries. Until appropriate validation is made, such as through scientific observer programs, it will not be possible to quantify the total catch composition and disposition of these fisheries. It is possible that the list includes species that would more frequently be observed in fisheries targeting species other than tunas.

3. Report of the FAO Technical Working Group of shark

The FAO meeting of the Technical Working Group on Conservation and Management of Shark species was held in Tokyo, April 17-21, 1998, under the Chairmanship of Dr. Suzuki (Japan), (COM-SCRS/98/12). There were 30 experts in attendance at the meeting, including observers from ICES, SPC, IATTC, FFA, IOTC and ICCAT. Dr. P.M. Miyake attended the meeting as an observer from ICCAT. Also from ICCAT, Drs. Suzuki, Nakano (Japan) and Mejuto (Spain) participated in the meeting. The aim of the meeting was to establish guidelines for action plans for the conservation and management of shark species and fisheries catching sharks.

The activities of ICCAT on the issue of sharks were reviewed as a model case throughout the meeting, but some criticism was made as to why ICCAT had not given priority to sharks. It was explained that the ICCAT Convention covers only tuna and tuna-like fishes, and sharks are now studied as they are taken as by-catch in the fisheries directed at tuna and tuna-like species. It was also explained that the catches from these do not represent the total catch of sharks since many other fisheries capture sharks.

The Technical Working Group discussed the background documents presented by the FAO to the meeting. Two sub-groups were then formed to discuss guidelines for data and research activities and for management advice. After guidelines from both groups were presented and discussed, the Plan of Action was discussed. Items discussed in the context of a Plan of Action included: minimum data requirements, how to implement them, how to carry out advisory

functions, and how to initiate actions by the FAO. Dr. Miyake stressed that these activities need to be started on a national basis and that national governments should make efforts to implement the program along the guidelines drawn up. These efforts should then be coordinated on a regional basis, using existing bodies or establishing new arrangements. Finally, coordination should take place on a global basis. This latter phase of global coordination should be the main concern of the FAO, but efforts at a national level are required beforehand.

It was the general consensus of the meeting that the extant regional fisheries agencies' responsibilities should be reinforced, either by expanding their mandates or by broadening their interpretation to include shark research.

One interesting and also the most heated issue related to whether finning of sharks should be taken up as a humane/ethical treatment issue, rather than an issue of resource utilization. After long discussions, it was recommended that the fish should be secured dead before any of their parts are removed. However, it is uncertain how this will be reflected in the final draft of the FAO report as the conclusions of the Technical Working Group are only suggestions, the final decisions being a matter for the FAO.

The Draft Plan of Action presented at the Preparatory Meeting for the FAO Consultation on the Management of Fishing Capacity, Shark Fisheries and Incidental Catch of Seabirds in Longline Fisheries, Rome, July 22-24, 1998, which was drafted based on the Reports of the Technical Working Group, is available at the Secretariat for consultation.

4. Report of the FAO Technical Working Group Meeting on Reduction of Incidental Catch of Seabirds in Longline Fishery

The FAO Technical Working Group meeting on reduction of incidental catch of seabirds in longline fisheries was held in Tokyo, March 25-27, 1998, with joint funding support from Japan and the USA (COM-SCRS/98/13). The issues discussed in the meeting are closely related to ICCAT activities, although there were no formal participants or observers from ICCAT at this meeting.

Responding to increasing concern about the incidental take of seabirds in longline fisheries and the potential negative impact on seabirds populations, the 22nd session of FAO COFI agreed to organize an expert consultation on this issue. Following this agreement, it was decided to establish a technical working group of experts, which is charged with the preparation of a draft Plan of Action and draft guidelines for reduction of seabird incidental takes in longline fisheries and submit these drafts to the consultation.

Attending the meeting were 18 experts in the fields of seabird biology, fishing technology and fishery management from Australia, New Zealand, UK, Norway, Japan, South Africa and FAO. Three background papers entitled "A description of pelagic and demersal longline fisheries", "The by-catch of seabirds in specific longline fisheries: A worldwide review" and "A review of longline seabird by-catch mitigation measures and their effects on other marine species" were reviewed in the meeting. Those papers will be published as FAO Technical papers.

Based on the discussions at the meeting, draft Guidelines and the draft Plan of Action were completed. It was agreed that the main contents of the guidelines should be a list of mitigation measures, which are either presently in use or still under development. It was decided that assessment of the effectiveness and costs of implementation would also be described in this document. A total of 16 mitigation measures were reviewed in the guidelines including both technical and operational measures.

The purpose of the Plan of Action is to affirm recommendations for what the international community should do to further implement seabird by-catch mitigation measures. The draft Plan of Action includes not only the recommendation for implementation of mitigation measures, but also recommendations for research, data collection, and education. Furthermore, this draft includes guidelines for national plans of action for reduction of incidental catches of seabirds.

Some concerns were raised relative to the response of ICCAT to the activity of FAO on the seabird by-catch issue. Article IV of the International Convention for the Conservation of Atlantic Tunas states "the Commission shall be responsible for the study of the population of tuna and tuna-like fishes (the Scombriformes with the exception of Trichiuridae and Gempylidae and the genus Scomber) and such other fishes exploited in tuna fishing in the Convention area as are not under investigation by another international fishery organization." Based on this, seabird management issues are not within the terms of reference of the Commission. However, the by-catch issue is important to tuna

fisheries and the "Code of Conduct for Responsible Fisheries" of FAO requires promotion of responsible fishing practices not only for fishing countries but also for fishery management bodies. In Article 6, sections 1 and 2 of "Code of Conduct" comments on conservation of aquatic ecosystems and the responsibility of fishery management for this. The pertinent sections follow:

"6.1 States and users of living aquatic resources should conserve aquatic ecosystems. The right to fish carries with it the obligation to do so in a responsible manner so as to ensure effective conservation and management of the living aquatic resources."

"6.2 Fisheries management should promote the maintenance of the quality, diversity and availability of fishery resources in sufficient quantities for present and future generations in the context of food security, poverty alleviation and sustainable development. Management measures should not only ensure the conservation of target species but also of species belong to the same ecosystem or associated with or dependent upon the target species."

Following those articles, the Committee continues to recommend that ICCAT Contracting Parties collect by-catch information on seabirds and other species taken co-incident to fishery effort directed at Atlantic tunas and tuna-like species to quantify the overall level of interactions. The information available to the Committee from observer programs indicate that this problem is minimal for the majority of the fleets, although quantitative data are not yet available to make general statements about overall interaction levels. The Committee believes that some localized problems could exist. The situation in these areas should not be generalized as an Atlantic-wide problem. The Committee recommends that Contracting Parties encourage national fishery participants to implement, where applicable, recommended mitigation measures for reducing seabird by-catch. The Committee also recommends that national scientists prepare reports on seabird incidental take by tuna fisheries based on available scientific data.

The Report of the Technical Working Group on Seabirds is available at the Secretariat for consultation.

5. Report of the Preparatory Meeting for the FAO Consultation on the Management of Fishing Capacity, Shark Fisheries and Incidental Catch of Seabirds in Longline Fisheries

The meeting was held at Rome, July 22-24, 1998. A total of 49 national delegates and seven observers including Dr. P.M. Miyake from ICCAT, participated in the meeting (COM-SCRS/98/15). The reports of each Technical Working Group (Technical Working Group) on Sharks, Fishing Capacity and Seabirds, which met early in 1998, were presented and the draft Plans of Action were prepared and presented by FAO.

Seabirds: The Technical Working Group had almost agreed on the draft Plan of Action before the meeting, and few problems were anticipated. However, many Latin American countries pointed out that there were no representatives from their area and that the report did not become available until the meeting had started. It was also felt that the action plan should not be globally applied, as it did not take regional differences into account. After considerable discussion, the draft Plan of Action was generally accepted.

Sharks: Considerable discussion took place regarding what should be included in the Plan of Action with regard to the finning of sharks. It was generally agreed that this was an issue relating to better utilization of sharks rather than a moral issue. It was agreed that the draft Plan of Action would be modified and presented at the second preparation meeting for COFI in October, with Guidelines. The Plan of Action was agreed upon, subject to this modification. On the issue of Guidelines, Dr. Miyake stressed that most regional agencies have no mandate on sharks and hence it might be better to include some recommendation which would allow the interpretation of the present Convention to be expected to include research on this subject.

Fishing capacity: This was the main subject of the discussion at this meeting. However, this issue is out of the terms of reference of the Sub-Committee on By-Catch, although the issue is pertinent to the Commission. The report of this meeting is available through the Secretariat.

The Report of the meeting, the final version of which is attached in the report COM-SCRS/98/15, was adopted after a long discussion, with a considerable number of changes. The Plans of Action will be revised according to these opinions and will be made available in October, before the next Consultation, 26-30 October 1998.

6. Report of the 14th Meeting of the CITES Animals Committee

The 14th Meeting of CITES Animals Committee was held in Venezuela, May 25-29, 1998, under the chairmanship of Dr. R. Jenkins (SCRS/98/29). Although the agenda relating sharks strongly links to the FAO and the ICCAT activities, there was no formal participants or observer from the ICCAT. Mr. Matsunaga from National Research Institute of Far Seas Fisheries, Japan attended the meeting.

The agenda items relating to sharks issue in the meeting is "Review the implementation of Resolution Conf.9.17 and progress under Decision 10.73". Three papers were submitted to this agenda item. The participant from the USA introduced the progress on the implementation of Resolution Conf.9.17 on the status of international trade in shark species in the USA. The Chairman of the Animals Committee informed discussion results of the FAO Technical Working Group Meeting on the Conservation and Management of sharks. The observer from TRAFFIC explained their document entitled "A TRAFFIC Network Report to the FAO Technical Working Group on the Conservation and Management of Sharks and to the CITES Animals Committee - TRAFFIC North America".

The observer from the WWF US indicated three points that the Animals Committee should consider as recommendations on which FAO may initiate action. Those are 1) improve the manner in which FAO requests members to record and report data on shark catches, 2) work with the CITES Secretariat and the World Customs Organization to improve the specificity of trade codes, 3) Encourage FAO to commit sufficient resources to finalize and publish the World Catalogue of Rajaformes.

Those elements are contained in both the Decision 10.73 (Decision of COP10) and the draft Plan of Action of the FAO Technical Working Group. The Chairman of the Animals Committee mentioned that he intended to write to FAO to elaborate on the issues raised by WWF US and to ask for copies of all draft documents prepared for the October meeting in advance so that relevant input could be provided by the Animals Committee.

7. Review of other international meetings relative to the Sub-Committee on By-catch

The Third Meeting of Ecological Related Species (ERS) working group of the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) was held in Tokyo, 9-12 June 1988. The topics continually discussed in this group is the reduction of incidental take of seabirds by longline fishery. Although there were no formal participants or observer from ICCAT, the issue discussed at the meeting was closely related to the tuna fisheries and information should be forwarded to ICCAT. ICCAT scientists Drs. Suzuki, Uozumi and Takeuchi (Japan) participated in the meeting. Updated estimates of seabird by-catch by CCSBT longline vessels were presented. Efficiency of mitigation measure against sea bird by-catch, such as *Tori pole line* (bird scaring lines), night setting, etc. were also examined. Because the interaction between CCSBT fisheries and seabirds was the most important issue to be addressed by this working group, the ERS has not yet focused on sharks or other by-catch species issues.

8. Review of the ICCAT statistics on shark and catch information on sharks by the documents submitted

Catch information on sharks submitted to ICCAT in response to ICCAT's request for Task I and Task II reports was reviewed by the Sub-Committee. The ICCAT Secretariat provided an updated summary of the available Task I reports (Table 1). More than 80 Tuna fishing nations/entities/fishing entities were requested to submit Task I data for some or all years during period 1994-1997, but some countries (Brazil, Trinidad and Tobago, Japan, CARICOM) have reported sharks catch in their national reports, but not submitted as Task I data sheet, and some countries provided sharks catch statistics with species combined. The response to the ICCAT requests for data on sharks has been poor. The Committee stressed its previous recommendation that all Contracting Parties and Atlantic tuna fishing nations/entities/fishing entities establish adequate data collection systems for collecting Task I and Task II data for sharks and provide the data in annual reports to ICCAT. However, even those data are included in the national reports, they should be formally submitted to the Secretariat using the standard data reporting form for avoiding the confusion. The Committee also acknowledges that using information on total removals will be critical to future evaluations of shark stock status, and hence reporting discards accurately is essential. In total, 18 of the more than 80 nations, entities, and fishing entities have reported Task I data on sharks to ICCAT. The Committee continues to observe that the data reporting response level is poor and may reflect the relatively low priority various nations/entities/ fishing entities place on monitoring the catches and by-catches of these species.

Regarding Task II data, only 3 nations (Canada, St. Helena on Honduras flag vessels and USA) have submitted Task II data on sharks to the Secretariat in 1998. So far, five nations have submitted Task II data on sharks, but it is obvious the Task II statistics on sharks is still poor. The Committee continues to encourage Contracting Parties to submit Task II data on sharks.

9. Review of additional CPUE data for Atlantic sharks (particularly for tuna fishery by-catch)

The nominal CPUEs for blue and shortfin mako shark and standardized CPUE for blue shark caught by the Portuguese swordfish fishery in the waters around the Azores were reviewed (SCRS/98/168). Catch rates for blue shark and swordfish in Azorean waters exhibit a pronounced seasonal and asynchronic nature. While the highest catch levels for the former species are obtained in the spring, the fishing season for the latter targeted species is from June to December. Standardized catch rate for blue shark in the Azores show a increasing trend during the period of 1993-1997 with decline in 1995. Such a historical increasing tendency suggests an improvement of fishing efficiency and/or a shift to sharks as the target species. The increasing demand for shark products in European markets supports the latter hypothesis. Nominal CPUE for shortfin mako shark exhibit a relatively stable during the period with distinct peak in 1995, which possibly reflects a period of high entrance of the species in the region. It was noted that in more recent years, that these catch rates could also reflect increased market demand for these species.

It was reported to the Committee that off the coast of Brazil and Uruguay, the catches of sharks in the longline fleet are related to fishing strategies, relative abundance of other species, seasonal and environmental effects. These features should be taken into account in attempting to extract relative abundance information.

So far, the historical and partially observed CPUE for Atlantic sharks were reviewed by France, Italy, Japan, Spain and U.S. for their fisheries. The Committee encourages the submission of papers relating shark catch rates.

10. Review of new biological information on Atlantic sharks

Document SCRS/98/144 reviewed information on sharks caught by South African pelagic longline fishery including species composition, treatment, length frequency and distribution. Blue and shortfin mako sharks were the dominant species, blue shark being occasionally caught in substantial numbers in cooler water. Shortfin mako sharks are generally retained whereas blue sharks are discarded. Most of those sharks were small, but there was a higher proportion of larger blue sharks. Blue shark catches are generally not welcome, and usually coincide with cooler water and poor catches of tuna and swordfish. Gear damage caused by these sharks is substantial and fishing positions are generally moved when blue shark catch rates are high.

Document SCRS/98/168 also mentioned separate distribution between blue shark and swordfish observed in the Portuguese swordfish fishery around the Azores. Catch rates for blue shark and swordfish in Azorean waters exhibit a pronounced seasonal and asynchronic nature. While the highest catch levels for the former species are obtained in the spring, the fishing season for the latter targeted species is from June to December. This document also provided a conversion factor from dressed and gutted weight to round weight for blue and shortfin mako sharks.

In Brazil, improvements in species identifications of shark species on logbooks has been good since 1993. In that year, approximately 95% of the logbook reported shark catch was unspecified shark, while by 1997 only 15% of the reported shark catch was unspecified. To deal with shark fin identification, the national report of Brazil (SCRS/98/173) introduced the study on shark fin identification through the examination of morphological characters of shark fin and dermal denticles conducted from landings of the longline fleet based at the port of Natal, Rio Grande do Norte state. These data are to be used to estimate weight and species composition of shark caught and discarded at sea. The results of shark fin identification have shown that silky shark represented about 50% of the samples and blue shark represented 33%. Brazil also reported that recently, the practice of finning sharks is no longer allowed; it is now required that both the fins and bodies of sharks be landed.

11. Reports on national observer programs

Reports on scientific observer activities relating to information of by-catch species were reviewed for Canadian fisheries, France and Spanish purse seine, Japanese longline fishery, U.S. pelagic longline fishery and Venezuelan fisheries. Document SCRS/98/41 described shark catch by Canadian fisheries, management plan for sharks, and

observer activities in Canada. Document SCRS/98/99 reviewed observed number of by-catch species caught by French and Spanish purse seine fishery by operation with floating object and with free swimming school. The document SCRS/98/161 reported observed catch number of elasmobranchs caught by Japanese longline fishery, condition at the retrieved on board (alive or dead), and type of products by species (Fillet, Dressed and fins). Documents SCRS/98/126 introduced national observer program for US pelagic longline fishery and reported overview of the program including the information of coverage and observed number by species caught by the fishery by condition (alive or dead). Documents SCRS/98/113 estimated dead discard for swordfish, billfish, large coastal and pelagic sharks caught by US pelagic longline fishery using mandatory reports from longline vessels, and reports from the national observer program. Document SCRS/98/174 provided information collected by observers of ICCAT billfish program from Venezuelan fisheries. Observed number of catch by fish and number of tag returns by fish including sharks caught by longline, artisanal and sport fisheries were reviewed.

At the ICCAT SCRS 1997, in order to provide updated information on progress made with respect to the Commission's recommendation on the implementation of national observer programs for longliners, purse seiners, and baitboats, which became binding on ICCAT Contracting Parties in 1997, all those attending the Sub-Committee discussions were asked to provide brief reports on the status of national observer programs. In the results of the reports, 11 of 20 nations had observer programs, 9 nations did not, but two nations did not have industrial fishery, and two nations were planning to implementation of scientific observer program in the future. The Sub-Committee asked for updated information on the implementation of scientific observer programs.

The observer from Chinese Taipei updated the report to the 1997 Committee to indicate that starting in October 1998, observers are being placed on Atlantic tuna vessels. EC-Italy reported on two observer programs focusing on longline fishing, one funded by the EC and one funded by Italy, which will continued in 1998 and 1999. UK-Bermuda reported that a 10% sampling fraction observer program for longline vessels will be implemented in 1999. Delegates from the Peoples Republic of China, Russia, and Turkey reported that they had no information on national observer programs available to report. Namibia reported that it has extensive observer programs on all its fleets. and that 100% observer coverage of the longline fleet has been agreed to by this fleet and most of the baitboat vessels have also agreed to observer coverage. EC-Ireland reported that an observer scheme had been implemented for their fleet harvesting tunas (paired pelagic trawls and trolling), with a target sampling fraction of 50%.

12. Future plans & recommendations

Several international meetings relating the activity of Sub-Committee on by-catches will be expected in next year and future. For example, CITES COP-11 will be held in the early 2000 in Sweden. The plan of actions made by FAO Technical Working Group meeting on the Conservation and Management of Shark species and on the reduction of seabirds incidental catch by longline fisheries will be discussed at FAO COFI in next February, 1999. The Committee recommends further collaboration and cooperation between ICCAT and other international organizations (CITES, FAO, ICES, NAFO, GFCM) on the issue relating by-catches and sending ICCAT observer officially for the international meetings relating the subjects.

Since ICCAT starting to collect catch information, CPUE of pelagic sharks were reviewed for some Atlantic fisheries. It is likely that review of collecting statistics and CPUE of pelagic sharks is necessary. The Committee recommends holding an inter-sessional meeting on the reviewing CPUE for pelagic shark species in May, 1999.

The Committee also recommend that Contracting Parties submit scientific reports on the observed levels of seabird by-catch in their fisheries, if information to quantify this level exists.

It was recommended that an ICCAT observer attend and report to the sub-Committee on the upcoming United Nations Environmental Programme Mediterranean Action Plan (UNEP MAP) for Protected Species (monk seals, sea turtles, and cetaceans) meeting in Greece. The delegate from EC-Italy (Dr. A. Di Natale) agreed to attend and report on the activity of this meeting.

13. Other matters

No other matters were brought to the Committee's attention.

14. Date and place of the next meeting of the Sub-Committee on By-catch

It is anticipated that the Sub-Committee on By-catches will hold a five-day, inter-sessional meeting in April or May, 1999, and will hold its regular meeting at the time of the 1999 SCRS. It is also anticipated that the Shark Working Group will meet for 3 days during the 1999 species group meetings.

15. Adoption of report

After review, the report was adopted by the Committee.

16. Adjournment

The 1998 Meeting of the Sub-Committee on By-catches was adjourned.

Addendum 1 to Appendix 10

Agenda of the Sub-Committee on By-catch

1. Opening of the meeting, adoption of Agenda and arrangements for the meeting
2. Review of list of tuna fishery by-catches
3. Report of various international meeting related to the work of Sub-Committee, where ICCAT was represented.
4. Review of the ICCAT statistics on shark and catch information on shark by the document submitted
5. Review of CPUE data for Atlantic sharks (particularly for tuna fishery by-catches)
6. Review of new biological information on Atlantic sharks
7. Reports on national observer programs
8. Future plans and Recommendations
9. Other matters
10. Date and place of the next meeting of the Sub-Committee on By-catches
11. Adoption of Report
12. Adjournment

TABLE 1 TO SUB-COMMITTEE ON BY-CATCH

SHARK BY-CATCH REPORTED FOR 1994 (MT)

	ALV	BTH	BSH	FAL	POR	SMA	OCS	LMA	CCT	CCL	CCS	CCE	DUS	CCP	TIG	SPL	SPK	SPZ	OTH	UNSP	TOTAL
BRAZIL																				2610	2610
CAP VERT			41												284			46	824		1195
CHLTAIP																				851	851
COLOMBIA																				102	102
COTE D'IVOIRE						17												66		13	96
MEXICO		2	2	18		4	2					1			4	3				10	46
USA			8	12	106	310	3	8		119		**	24	135	4					581	1310
US DISC	7	18	572	66	1	18	4	11		1	3	6	246	11		33	4		16	4	1021
TOTAL	0	2	51	30	106	331	5	8	0	119	0	1	24	135	292	3	0	112	824	4167	3600

SHARK BY-CATCH REPORTED FOR 1995 (MT)

	ALV	BTH	BSH	FAL	POR	SMA	OCS	LMA	CCT	CCL	CCS	CCE	DUS	CCP	TIG	SPL	SPK	SPZ	OTH	UNSP	TOTAL
BRAZIL																				2289	2289
CANADA			139		1378	111														38	1666
CAP VERT																			909		909
CHLTAIP																				1414	1414
COTE D'IVOIRE						12												69		18	99
GABON																				22	22
BARBADOS																				24	24
GRENADA																				7	7
MEXICO	3		**	25	**	10	4					7			12		10			22	93
STA LUCIA							**		**	**					1		**				1
ST. VINCENT																				9	9
URUGUAY	1		64		3	21													53	349	491
UK			17																	6	23
UK-BERMUDA			3			**									2				10		15
USA			3	23	36	282	4	2		43			51	322	3				99	291	1159
USA DISCARDS	4	40	618	62	0	28	6	14			1		29	3	1	82	1	1		1	891
TOTAL	8	40	844	110	1417	464	14	16	0	43	1	7	80	325	19	82	11	70	1071	4490	9112

** = less than 1 metric tonne

Cote d'Ivoire unel = mainly FAL

Gabon includes SMA, SPZ, and others

St Vincent includes Carcharhinus spp

Figures show shark landings except in the following cases:

Bermuda BSH = dead discards

Mexico catches include dead discards 2% of total but does not include live sharks liberated (7 MT). CCL includes FAL and CCB

SHARK BY-CATCH REPORTED FOR 1996 (MT)

	ALV	BTH	BSH	FAL	POR	SMA	OCS	LMA	CCT	CCL	CCS	CCE	DUS	CCP	TIG	SPL	SPK	SPZ	OTH	UNSP	TOTAL
BRAZIL		14	743	503		83										25				580	1948
CANADA			12		1015	67														13	1107
CAP VERT																					0
CHLTAIP																				1473	1473
COTE D'IVOIRE																					0
GABON																				454	454
URUGUAY																				301	301
UK																				18	18
UK-BERMUDA						1	1								1					5	8
USA			7	16	76	234	9	3		46		1	40	468	3				78	150	1131
USA DISCARDS			601	12									12						75	191	891
BARBADOS																					0
GRENADA																				4	4
GUYANA																				765	765
STA LUCIA																				0	0
ST. VINCENT																				3	3
TOTAL	0	14	1363	531	1091	385	10	3		46	0	1	52	468	4	25	0	0	153	3957	8103

** = less than 1 metric tonne

SHARK BY-CATCH REPORTED FOR 1997 (MT)

	ALV	BTH	BSH	FAL	POR	SMA	OCS	LMA	CCT	CCL	CCS	CCE	DUS	CCP	TIG	SPL	SPK	SPZ	OTH	UNSP	TOTAL
BARBADOS																				14	14
BRAZIL		37	1103	279		190										170				359	2138
CANADA			11		1339	110														42	1502
CAP VERT																					0
CHINA																				2	2
CHLTAIP																					0
COTE D'IVOIRE																					0
EQU. GUINEA*																				**	0
GABON																					0
GRENADA																				9	9
GUYANA																				1893	1893
HONDURAS*																				8	8
MEXICO																					0
STA LUCIA																					0
ST. VINCENT																					0
URUGUAY		1	189		6	18	14											4		159	391
UK																				5	5
UK-BERMUDA			1			1									1				4		7
USA			1	17	56	244	8	2		36			22	342	1					118	847
USA DISCARDS			185	46								22	25							151	429
TOTAL	0	38	1490	342	1401	563	22	2	0	36	0	22	47	342	2	170	0	4	4	2760	7245

* = reported by Sta Helena

** = less than 1 metric tonne

ALPHA CODE EXPLANATIONS FOR SHARK TABLE

ALV	Thresher	*Alopias vulpinus*
BTH	Bigeye thresher	*Alopias superciliuosus*
FAL	Silky shark	*Carcharhinus falciformis*
OCS	Oceanic whitetip shark	*Carcharhinus longimanus*
SMA	Shortfin mako	*Isurus oxyrinchus*
LMA	Longfin mako	*Isurus paucus*
POR	Porbeagle	*Lamna nasus*
BSH	Blue shark	*Prionace glauca*
CCT	Sand tiger shark	*Carchaias taurus*
CCA	Bignose shark	*Carcharhinus altimus*
CCB	Spinner shark	*Carcharhinus brevipinna*
CCL	Blacktip shark	*Carcharhinus limbatus*
CCE	Bull shark	*Carcharhinus leucas*
DUS	Dusky shark	*Carcharhinus obscurus*
CCP	Sandbar shark	*Carcharhinus plumbeus*
CCS	Night shark	*Carcharhinus signatus*
WSH	White shark	*Carcharodon carcharias*
BSK	Basking shark	*Cetorhinus maximus*
TIG	Tiger shark	*Galeocerdo cuvieri*
GAG	Tope shark	*Galeorhinus galeus*
SPL	Scalloped hammerhead	*Sphyrna lewini*
SPK	Great hammerhead	*Sphyrna mokarran*
SPZ	Smooth hammerhead	*Sphyrna zygaena*

APPENDIX 11

REPORT OF THE *AD HOC* WORKING GROUP ON SCRS ORGANIZATION

Background

At the 1997 meeting of SCRS, discussions were held and recommendations made about the need to review and develop alternative options for organization of the SCRS and annual meetings. During the intervening time, an *Ad hoc* Working Group on Organization was drafted and tasked with continuing discussions on options for alternative organization. The terms of reference for these discussions were specified as: "to consider procedures for more effective analysis and reporting, aimed at enhancing the credibility of the Commission's scientific work. The Group should consider an effective system of peer reviewing of reports and develop a plausible format for drafting reports (particularly for the reporting of full assessment results and for updating previous years' work)." The terms of reference are somewhat broad, which gives flexibility to deal with a full range of options. The *Ad Hoc* Working Group* met during the year through correspondence and during the Species Working Group Sessions at ICCAT headquarters, October 12 to 17, 1998. The following is a summary report of discussions and recommendations for consideration by the Committee and Commission. Recommendations for enhancing the efficiency and credibility of SCRS which would require Commission action prior to implementation or are of major impact on the current organizational structure are presented below. Recommendations which do not require Commission action or are of lesser operational impact are provided in Annex 1 of this report.

Recommendations to enhance the credibility of the Commission's scientific work

The current SCRS organization sometimes results in inconsistencies between reports of the different species groups, which are then submitted to the SCRS Plenary without having undergone a screening process to ensure consistency. SCRS has already implemented steps to provide succinct scientific advice to the Commission through Executive Summary Reports which are structured to provide the pertinent information and advice to the Commission. However, under the current SCRS organizational structure, there tends to be limited exchange of views among experts working on the different species because, in part, of overlap in species group meetings. Furthermore, the structure of SCRS Plenary meetings is such that it is difficult to engage in meaningful discussion of contentious issues raised in species group reports. To improve this situation, it is recommended that review mechanisms be established to benefit both the individual scientists working within the different species groups and to foster more consistency in approach and assumptions made for various assessments as well as in the scientific advice provided to the Commission in Executive Summary Reports.

To achieve this goal, it is recommended that an Advisory Committee*, consisting of individuals from the pool of the working group Conveners and Rapporteurs, the SCRS Chair (i.e., the SCRS Officers), and a professional fisheries population dynamics expert permanently attached to the Secretariat be established.

The terms of reference for this Advisory Committee, which is similar in many ways to the ICES Advisory Committee for Fisheries Management, will be to review the species group detailed reports of the stock assessments and the species group Executive Summary Reports for consistency in approach and assumption and for consistency in formulation of the scientific advice provided to the Commission. It will thus be the function of the Advisory Committee to recommend modifications as appropriate, to the scientific advice provided to the Commission and to recommend future assessment approaches to the species groups. To make this Committee effective and to assure continuity in the Committee structure, it is critical that a professional fisheries population dynamics expert be funded by the Commission and hired by the Secretariat in support of this activity. This position is anticipated to be filled at a P4-P5 level which would require appropriate funding.

* Drs. G. Scott (United States), Convener; J. Mejuto (EC-Spain), A. Fonteneau (EC-France), J. Porter (Canada), J. H. Meneses de Lima (Brazil), and P. Miyake (ICCAT).

This change in organizational structure will also require the Secretariat to translate the species group detailed reports and executive summary reports into English, French, and Spanish to allow the Advisory Committee full access to the description of methods, approach, and assumptions applied in the assessments conducted. It will be the responsibility of the species group Rapporteurs to present the detailed assessment report to the Advisory Committee and to ensure that recommendations for future assessment approaches are carried out by the species groups.

External reviews of the assessments and management advice formulation might also be considered in the context of the work of the Advisory Committee. However, this form or review would likely be most beneficial if carried out at the species group assessment level and carried out through the Advisory Committee process. Contracting for such reviews would likely cost on the order of US$ 25-30,000, including expenses requiring about 30 days each instance. It is not recommended that external reviews take the place of a permanent fisheries population dynamics expert attached to the Secretariat.

It is expected that full translation of these detailed, technical reports produced at a species stock assessment session would require up to three months, which implies that the stock assessment on which management advice is being based must be completed three months prior to the Advisory Committee meeting. If the Advisory Committee meeting was scheduled attached to the SCRS Plenary in mid-October as the SCRS Plenary is now scheduled, then assessments would need to be completed no later than mid-July. Under this schedule it is likely that assessments would lag two years, rather than one (in terms of catch and effort considered) since most nations would not be able to provide catch at size and effort data early enough (if at all) to permit the Secretariate to complete its preparatory work required in advance of each assessment. Alternatively, shifting the Commission meeting to February would permit sufficient time to complete assessments with a one year lag in catch and effort, translate the documents, and formulate management advice through the Advisory Committee for the Commission.

It is also recognized that socioeconomic concerns relating to the effects or practicality of management measures recommended by ICCAT are of increasing interest of the Commission. Although many ICCAT recommendations have proven to be ineffective in achieving their stated objectives, the SCRS is ill equipped to conduct socioeconomic analysis of these or alternative management measures. Incorporation of this expertise into the SCRS structure would require incorporation of additional expertise in fishery economics and fisheries sociology into the Secretariat and the SCRS. This was discussed at the ICCAT Tuna Symposium in Azores, but at this time, no recommendation is made on this topic. The Commission should be aware that the investment necessary for supporting socioeconomic analysis within the Secretariat and SCRS would be substantial.

-- To further enhance the scientific credibility of SCRS assessments, it is further recommended that a Working Group on Assessment Methods be established, convened by a professional fisheries population dynamics expert permanently attached to the Secretariat (the same individual as indicated above).

The statistical and analytical methods used by the SCRS are at times quite different between the various species groups, and sometimes variable between years. The reasons for this are not always obvious and although it is quite useful to be able to employ a suite of assessment tools and encourage development of new tools for the various stocks under investigation, it would be appropriate to apply these methods in a more consistent way than is presently conducted. Thus, the task of the working group would be to conduct performance evaluations of the available assessment models, clarify the implicit assumptions, establish rules and guidelines on their appropriate use and normalize the methods and maintain at the Secretariat, the software accepted for use by the various species groups. This guidance would in turn, be available to all scientists interested in the assessment work carried out at species group meetings and would give more transparency to the results of assessment analyses. Thus, the charge of this group is similar in many ways to the methodological working group established by ICES. Presently, species group participants are asked to provide software and inputs used in assessment to the Secretariat, but this request is not always followed, sometimes making it difficult to replicate analyses or to evaluate sensitivity of results to variations in input streams. One of the tasks of the Methods Working Group will be to solidify this requirement of all species groups. It is critical to the functions of the working group that the Convener be established as a professional fisheries population dynamics expert attached to the Secretariat. This implies that the Commission provide funding for and the Secretariat hire a professional fisheries population dynamics expert (as in the first recommendation) in support of this activity. As noted above, this position is anticipated at the P4-P5 level.

-- To increase the efficiency of the Secretariat in meeting the needs of the SCRS species working groups, it is further recommended that the Commission fund and the Secretariat hire a biostatistician (in addition to the fisheries population dynamics expert).

In recent years, there has been a reduced level of staffing for the ICCAT Secretariat, while demands of the species working groups have been increasing. While it is the responsibility of national scientists to assure the quality of and meeting the required time lines for reporting data submitted to ICCAT, there is a need for a biostatistician to identify inconsistencies in the currently available data base and to initiate development of a relational data base which would enhance the working of the species groups and to increase the Secretariat's efficiency in dealing with an ever increasing flow of information (also see the Report of the Sub-Committee on Statistics). This position is anticipated at the P2 to P3 level.

Addendum 1 to Appendix 11

The recommendations of the Ad Hoc Working Committee on Organization which are designed to enhance the efficiency and credibility of species working groups, but which do not require Commission action or are of lesser operational impact are summarized below:

Organization within species groups. It was noted that, for example, the Tropical Species Working Group is complex and, because of the multiple species considered within the group, it is difficult for some to understand the objectives and activities of the species group meetings. It was recommended that concentrating effort on only one species during a year would help to focus the group. Conducting simultaneous multiple species group discussions in the same meeting room detracts from focusing on the species of main concern and should be avoided. This applies not only within the tropical groups, but among some of the species groups (e.g. small tunas and billfish). It was also recommended that outlining a work plan for all assessments in advance of the species group meeting could help in this regard, as both the working group participants and the Secretariat would be aware of the specific expectations of the species group meeting. This is not a standard practice across all species groups, but for complex assessment discussions, this approach is recommended. An example draft work plan for the 1999 swordfish assessment is attached as **Addendum 2 to Appendix 11**. Special consideration needs to be given to providing adequate opportunity for member nations to attend and participate in species group assessments. Having assessment meetings separate from other species group discussions helps in this regard since there is no overlap in topics of discussion and thus small delegations can give full attention to the topic if those delegations so choose. In addition, care should be taken in choosing venues for such meetings. These should be chosen to provide reasonable opportunity for wide participation in the assessments.

Improvements to the current reports. It is important that the work carried out by species groups be replicable by future groups or others interested in SCRS assessments. In this regard, it is necessary for the working groups to compose sufficiently detailed reports to allow this to occur. For example, the input data used in stock assessment analyses should be clearly identified in the detailed reports prepared by the species groups. This would include the catch rate information and catch at age information used in analyses. Furthermore, although it has been previously recommended that the analytical software (VPA, Production Models, or other forms of assessment), input streams, and outputs from that software be provided to the Secretariat so that interested scientists not involved in the assessment meeting of the species group can have access to the information and methods used in developing assessment results. Species groups should also strive to improve the graphical presentations of the available information, including observations of catch and effort distributions across the range of fleets harvesting the resource (fishing maps).

Addendum 2 to Appendix 11

MODEL DRAFT WORK PLAN

(As prepared for the 1999 Swordfish Stock Assessment Session)

In 1999, the Swordfish Species Group will conduct a sex-specific stock assessment in the north Atlantic and a south Atlantic stock assessment according to methods decided at the April Inter-sessional Meeting. The following is the sequence of preparation, and the specifications for the stock assessments.

Deadlines:

Nov. 12. 1998 1997 data sex-ratio at size data (north stock) for sex-ratio key provided by National Scientists to S. Turner and G. Scott (USA)

Jan. 1, 1999 Small working Group convened by S. Turner to have completed sex-ratio keys for north Atlantic by 5 cm intervals, years aggregated, by small area (see Figure 1, SCRS/98/18), by quarter. To be distributed to the Secretariat and National Scientists. Initial sex-ratio at size keys for review by SWO participants and Secretariat by January 1, 1999.

Jan. 1, 1999 National scientists with size samples for the south Atlantic ensure that the Secretariat has the number of fish sampled by year, fleet, area, and quarter in order for the Secretariat to compile a document summarizing the coverage of the size sampling.

Mar. 31, 1999 ICCAT Task I deadline.

Apr. 1999 Test data set available: catch-at-age by sex 1978-1997 using sex ratio at size key from Turner Working Group, if possible, and USA and Spanish sex-specific CPUE indices out to age 9+ from National Scientists (if new methods cannot be incorporated by April, then default to sex-specific catch-at-age and CPUE already prepared using previous methods).

Apr. 1999 6-day Inter-sessional meeting for South Atlantic stock assessment preparation to do the following:

- Examine the coverage of sampling for size by year, fleet, gear, and quarter to determine if the data warrant size- or age-specific analyses in the assessment.
- Determine which CPUE data series to be used in the 1999 assessment. This may involve producing a combined biomass index for the south, and possibly age-specific indices. National scientists should bring edited and screened CPUE data to the meeting in a standardized format.
- Based on the quality of data available, determine the type of analyses to be used in 1999 to determine the status of the stock of the south Atlantic swordfish stock (e.g., production model, VPA).

July 31, 1999 ICCAT Task II deadline.

Aug. 1999 Components needed to update the north Atlantic biomass index be provided by National Scientists to the Swordfish Species Group Convener.

Sept. 1, 1999 Absolute last deadline to have catch-at-size (by sex) data to the Secretariat for preparation of the overall north catch-at-size by sex and south catch-at-size. Catch-at-age (by sex) should be available to scientists at the beginning of the stock assessment session. No revisions to the Task I or II data after this date.

Late Sept, 1999 Swordfish Species Group meets to conduct stock assessment for the north and south Atlantic stocks. Both stocks will be assessed as follows:

North: Sex-specific VPA

- Catch-at-age by sex from 1978 to 1998 (using the sex-ratio key provided by the Turner working group), and unisex catch-at-size updated from 1996 assessment (to be prepared by the Secretariat and available at the start of the meeting)

- Sex-specific (separate male and female indices) CPUEs by age out to age 9+, unisex CPUEs by age out to age 5+ (update of 1996 VPA analyses) (to be prepared by National Scientists and brought to the meeting), and updated biomass index (to be prepared as directed by the Species Group Convener, reviewed by National Scientists providing data in advance of the meeting, and provided in its final form at the beginning of the stock assessment session)
- Examine diagnostics from test data set analyses to make decisions about the form of sex-specific VPA to be used
- Conduct sex-specific VPA using years 1978 to 1998
- Conduct unisex VPA using updated 1978 to 1996 catch-at-age and unisex CPUE indices (update of 1996 VPA)
- conduct ASPIC production model and/or ASPM
- Provide projections on sex-specific VPA, and production model
- Fully evaluate effects of regulations (Secretariat to prepare catch limit and small fish tables in advance of or at beginning of the meeting)

South: Production Model or VPA (depending on the decisions of the April Inter-sessional Meeting)

- Catch-at-size (and possibly catch-at-age) to be prepared by the Secretariat and available at the start of the meeting
- points updated on the April Inter-sessional CPUE choices (1998 data to be provided by National Scientists and indices updated as assigned at the April Inter-sessional Meeting)
- Conduct stock assessment analyses using inputs, time spans and models determined during the April Inter-sessional Meeting
- Provide projections for south Atlantic assessment
- Fully evaluate effects of regulations (Secretariat to prepare catch limit and small fish tables in advance of or at beginning of the meeting)

APPENDIX 12

RESPONSES TO SPECIFIC REQUEST POSED TO THE SCRS BY THE COMMISSION WITH REGARDS TO THE EFFECT OF THE VOLUNTARY PROTECTION PROGRAM BY THE EUROPEAN PURSE-SEINE FLEET

This is a response to the Commissioner's request made at the 1997 annual meeting for an examination in 1998 of the results of the observer program adopted in 1996 for all tropical tuna fleets and the results of voluntary measure of closed area and period for fishing on floating objects. This voluntary measure taken by the French and Spanish purse seine boat owners was called ' The Protection Program of Atlantic Tunas by the Spanish and French Tuna Boat Owners', and is hereafter referred to as 'Protection Program'.

Results of the observer program adopted in 1996 for all tropical tuna fleets

Three programs have been developed which include observers on board commercial tuna vessels in the Atlantic Ocean. Each program is run on a different fleet (Japanese longline, European purse seine and FIS-Spanish baitboat). The major objectives of these programs are not only to obtain data on bigeye but also to get other information (such as biological information on species composition, size, maturity and taking samples for growth and genetic studies including by-catch species as well as information on fishing operations). Since not all data were processed in the data base and the time for analysis was limited, what is reported here is in the nature of a progress report. Therefore, it will take more than a year before any conclusive results can be presented.

The activities that are on-going or that have taken place so far are summarized as follows:

Longline fleet

The coverage by observers on the longline fleet was established at 5% by a Commission recommendation. So far only the Japanese fleet conducted an observer program, for Japan's tropical longline fleet. However, several countries have implemented longline observer programs. These are in the report of the Sub-Committee on By-Catch. Five observer trips were made in 1997 and two in 1998. A total of 428 days of fishing and 32,647 individuals in the catch were monitored. Three more trips are scheduled for the end of this year or early next year. The results of the trips were reported in documents SCRS/97/56 and SCRS/98/161, in which details of the trips as well as various information on catches, i.e., amount, size, maturity, length-weight relationships by species, number and kind of samples taken, were presented. Of the results obtained, it should be noted that fish caught in the tropical waters, except small fish, were sexually very active, while those caught in the temperate waters were not.

Purse seine fleet

From June 1997 to September 1998, 57 trips with observers on board purse seiners have been made in the framework of the EU research project on bigeye tuna (SCRS/98/99). The coverage rate of these trips for the period between June 1997 and December 1997, in terms of the total catch made by the EU purse seine fishery, was close to 13.6 %. With 43 trips data which has been processed so far (corresponding to 1355 sets), the catch of bigeye tuna represented 8% (1,895 MT) of the total tuna catches (24,054 MT). The major part of the bigeye catch was made on sets with floating object (87 % of the total catch of bigeye), comprising fish under 10 kg (76 % of the catch). As regards discards, bigeye represented 4.4 % of the 744 MT of the total amount of tuna discarded.

During the trips, observers on board collected length data of bigeye from 1,379 fishes caught in free school sets and from 9,140 fishes caught in FADs set. Some stomachs of bigeye have also been collected.

Tables and Figures to Appendix 12 (Responses to Commission on the Effect of the Voluntary Protection Program by the European Purse Seine Fleet)

Table M-I. Purse-seine catch at size class for skipjack tuna during the 4th quarter for the period 1991-1997.

	Taille			
year	30-38	39-47	48-56	57-65
1991	734	2 524	5 565	8 446
1992	402	1 489	3 245	4 617
1993	361	1 454	4 011	6 705
1994	1 318	3 482	6 172	8 577
1995	1 181	3 856	8 095	11 960
1996	3 303	6 415	9 429	9 889
1997	1 111	2 067	2 706	2 723

Table M-II. Purse-seine catch at age for bigeye tuna during the 4th quarter for the period 1991-1997.

	age		
year	0	1	2
1991	2 382 522	168 579	75 519
1992	1 409 425	158 187	47 178
1993	2 866 584	237 719	86 560
1994	2 711 949	304 877	105 692
1995	3 370 572	325 871	74 214
1996	4 459 880	212 773	72 263
1997	1 138 729	71 236	31 219

Table M-III. Purse-seine catch at age for yellowfin tuna during the 4th quarter for the period 1991-1997.

	age		
year	0	1	2
1991	684 106	306 277	132 462
1992	588 549	100 307	76 120
1993	433 870	149 067	66 883
1994	629 228	303 132	164 274
1995	1 440 184	340 772	155 529
1996	1 261 531	360 745	161 773
1997	878 028	375 085	34 040

Table M-IV. Values of *mrf* estimated to assess the impact of the moratorium on bigeye and skipjack populations.

species	age	*mrf*
bigeye	0	.4
	1	.4
	2 and more	1
skipjack	all	.3

Annex M-A: equations used to estimate the impact of the moratorium.

$$Expected\ C_{a,97,4} = \frac{1}{mrf} \times Observed\ C_{a,97,4}$$

$$mrf = \frac{1}{yrf} \times \frac{C_{a,97,4}}{C_{a,96,4}}$$

$$with \quad yrf = \frac{\sum_{q=1}^{3} C_{a,97,q}}{\sum_{q=1}^{3} C_{a,96,q}}$$

where $C_{a,y,q}$ is the catch at age a for quarter q of year y
mrf is the moratorium raising factor
yrf is the year raising factor calculated as the average over the 3 previous quarter

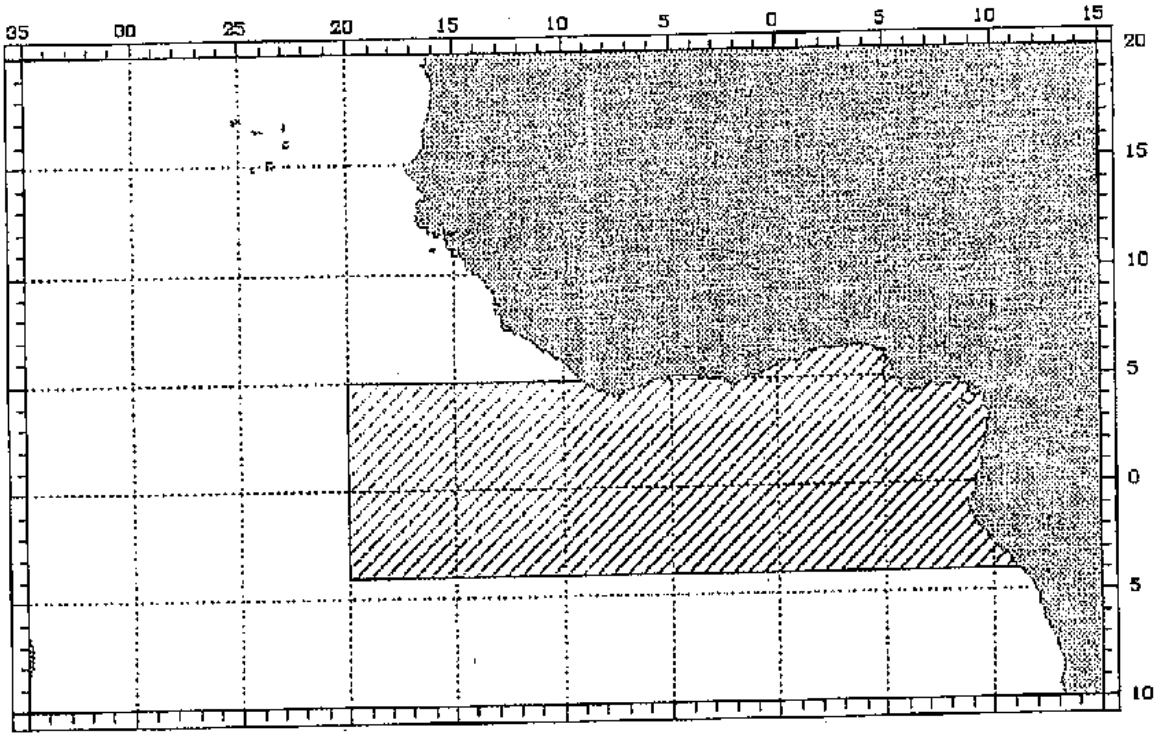

Figure M-1. Area of application of the protection plan of Atlantic tuna.

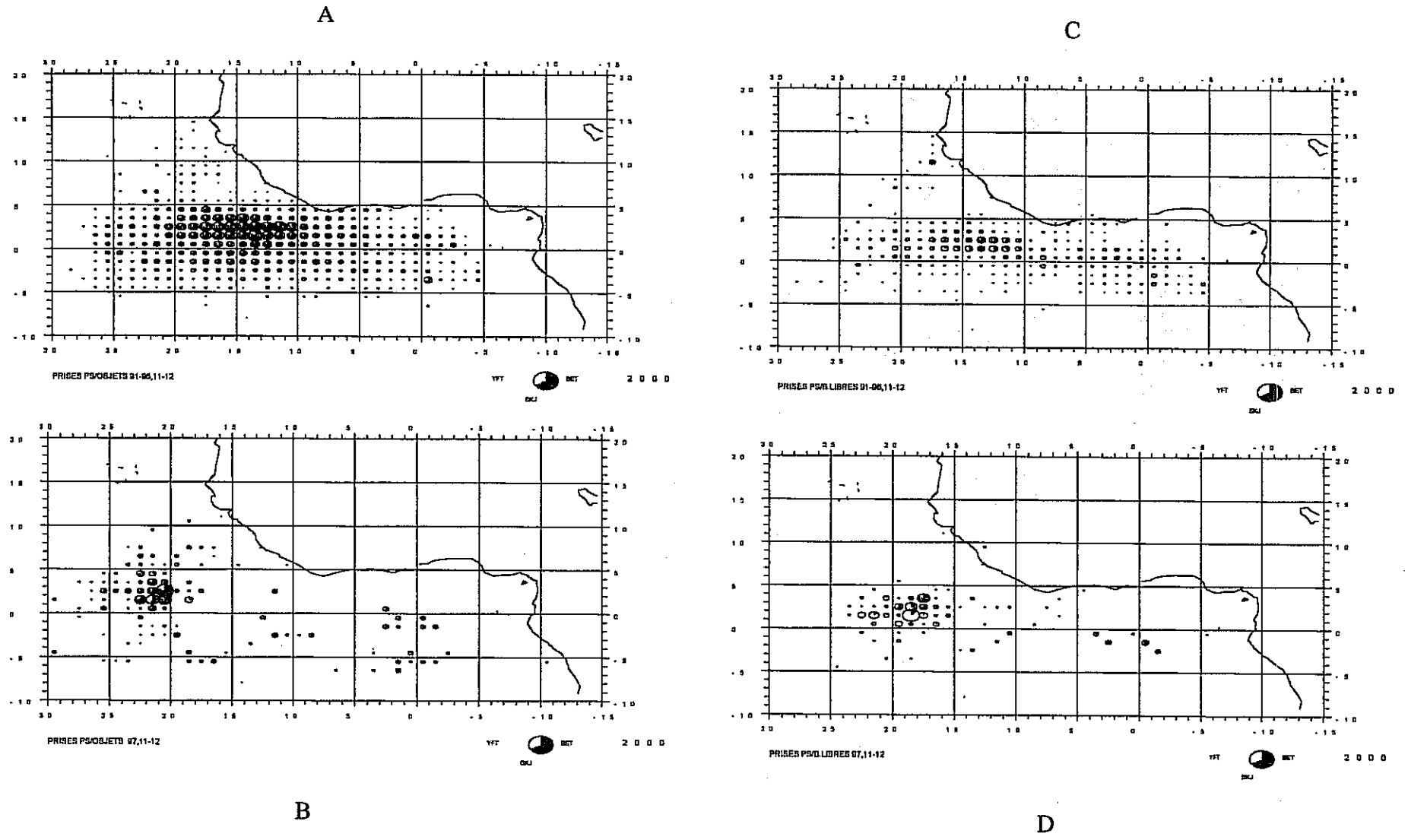

Figure M-2 : Distribution of the catch under floating objects and free schools during the months of November and December for two different periods : on floating objects, (A) average 1991-96 and (B) Nov-Dec 1997; on free schools, (C) average 1991-96 and (D) Nov-Dec 1997

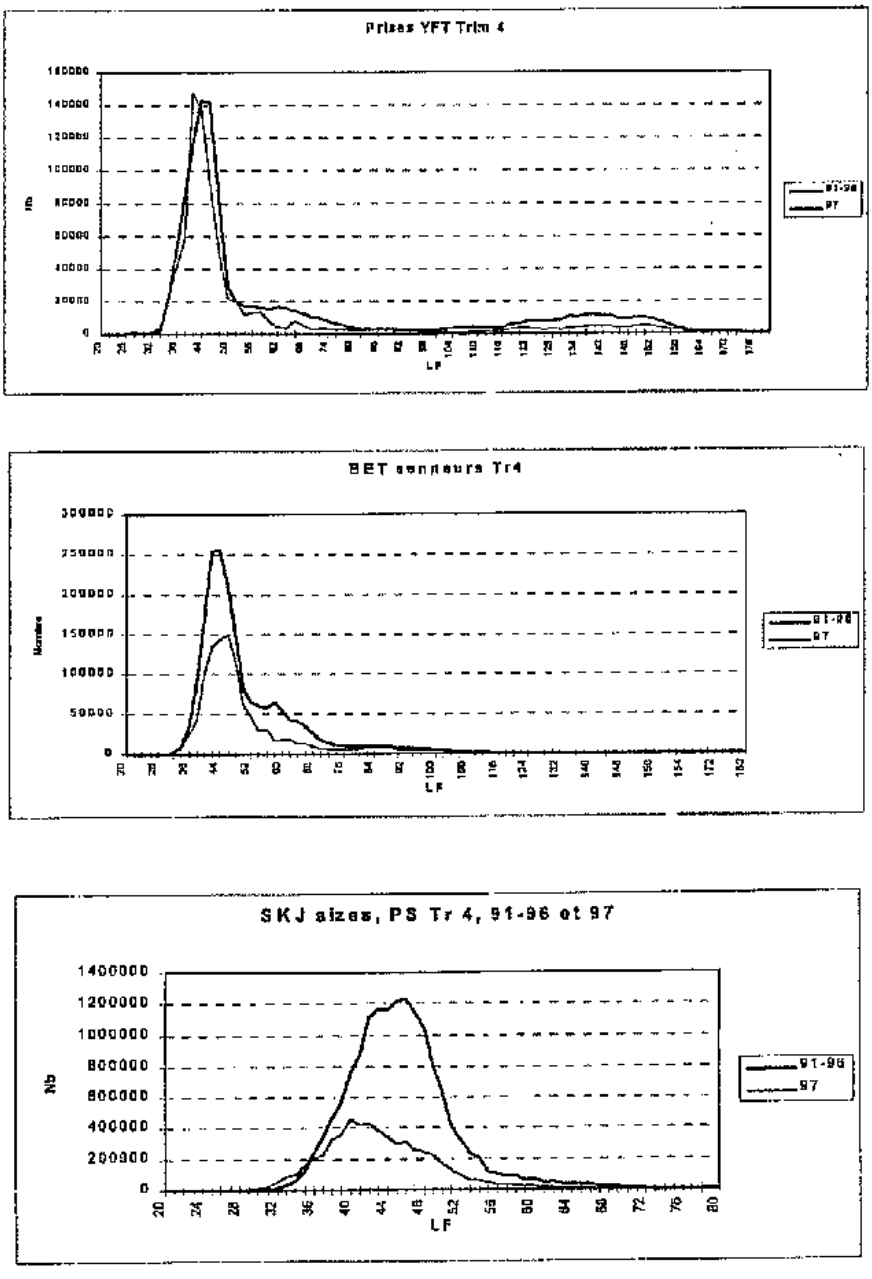

Figure M-3. Length frequencies of skipjack, bigeye and yellowfin caught by eastern tropical Atlantic purse seiners during the fourth quarter of the year, 1991-96 and 1997.

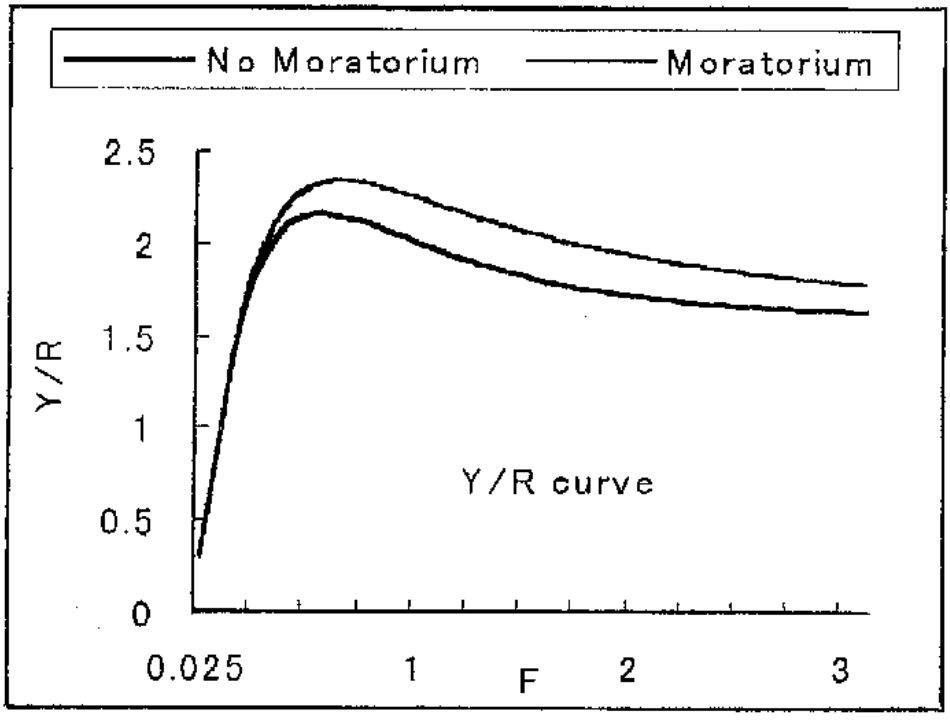

Figure M-4. Yield per recruit curves

NATIONAL REPORTS

NATIONAL REPORT OF BRAZIL*

by

J. H. Meneses de Lima and J. Dias-Neto**

1. Fisheries information

1.1 Fleet development

In 1997, the Brazilian longline fleet was comprised of 48 vessels. Of this total, 31are national vessels and 17 are foreign vessels chartered by Brazilian companies. The distribution of longline vessels by fishing port was as follows: Santos – 17; Itajai – 6 ; Natal – 13; Cabedelo – 11 and Recife –1. In comparison with 1996, the total number of longliners in 1997 showed a slight decrease (4%), however there was a marked increase of 34.8% in the number of national vessels. A similar increase was also observed in 1996, in relation to 1995. This increasing trend in the number of longliners is explained by changes in domestic policy, which resulted in economic stability, and by the introduction of new fishing technology (by the longline fishery directed at swordfish). These two factors created favorable conditions for Brazilian fishermen to make new investment in tuna fisheries, through the adaptation of fishing vessels and the acquisition of fishing gear and equipment to operate in the directed swordfish longline fishery.

The Brazilian baitboat fleet consisted of 45 vessels, of which only two were foreign vessels chartered by Brazilian companies. In relation to 1996, this fleet showed a decrease of 11.8% in the number of vessels. Itajai, in the state of Santa Catarina, is the main fishing port for the Brazilian baitboat fleet, followed by Rio de Janeiro and Rio Grande. The annual number of Brazilian tuna vessels (longliners and baitboats) which operated during the period 1992-1997 is shown in **Table 1**.

1.2 Catches

Table 2 shows catches of tuna and tuna-like fishes, by species and fishing gear, in 1997. The total Brazilian catch of tuna and tuna-like species (including sharks) in 1997 was 44,551 MT, showing a slight increase of 8.8% in relation to 1996. The major part of the catches is taken by baitboat (62.2% in weight) and skipjack is the main species caught by this fishery (92.3%).

Table 3 shows that until 1995 sharks were the dominant species in the catches of the longline fishery. However, since 1993, the percentage of shark catches has shown a decreasing trend. As for swordfish, which was the second most important species caught, there was a gradual and continuous increase in catches during the period 1994 to 1996. In 1997, swordfish catches showed a marked increase accounting for 43.7% of the total catch of the longline fishery and this species became dominant in the longline fishery with sharks as the second most important species (22.8%), followed by bigeye (13.2%). The dominance of swordfish over other species in the longline fishery is the result of the increased interest in swordfish. As for the other tuna species, yellowfin catches increased by 16.1% and bigeye and albacore showed a decrease of 27.5% and 27.1, respectively.

Table 3 also shows that bigeye is the second most important species in the fishery of leased longliners, while sharks appear as the second most important species in catches of genuinely Brazilian longliners. This difference in catch composition for the secondary species probably results from the fact that some longliners from the latter group continue targeting sharks, while the leased longliners target tuna or swordfish and discard the majority of the sharks caught.

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Table 4 shows catches by the baitboat fishery for the period 1992-1997. The total catch in 1997 was 27,475 MT, which represents an increase of 8.7% over the 1996 catch. While skipjack, the main species caught, showed an increase of 13.6% in relation to 1996, yellowfin catches showed a decrease of 16.1%. The 1997 catch of skipjack was the highest recorded in this fishery being, and slightly higher than the previous record of 25,051 MT observed in 1985, during the expansion phase of the fishery. As for yellowfin, the 1996 catch was almost half of the peak catch recorded in 1993 (3,088 MT).

Table 5 shows shark catches by species for each group of longline vessels, in 1996 and 1997. The total catch of sharks showed an increase of 9.8% in 1997 with blue shark as the most important species caught (38.2% in 1996 and 51.6% in 1997) followed by silky shark (25.8% and 13.1%, respectively in 1996 and 1997). The catch of sharks is supposedly higher than is currently reported because there are vessels which discard part of the sharks caught. This problem of shark discard has been addressed in a regulatory measure issued this year for the longline fishery, which prohibits finning of any shark species.

Landing estimates of the main tuna species taken by the artisanal fishery in the northeast region of Brazil are shown in Table 6, for the period 1992 through 1997. The total landing for 1997 was 5353 MT, representing a decrease of 29.7% over the estimated landing for 1996.This decrease is explained by the fact that landing data estimates available for 1997 do not cover all the states of the northeast region of Brazil.

1.3 New developments in the fishery

In 1997, as a result of good catch rates of swordfish shown by leased longliners using monofilament longline in fisheries targeting swordfish, some experimental directed swordfish fishing was conducted by small vessels from the artisanal fishery in the northeast region of Brasil, during the August to December period. As the resultant catch rates were higher than those shown by the longline fleet operating in the region with regular longline, this experiment was regarded as a technically and economically viable alternative to develop the artisanal and small-scale fishery from this region and a number of small vessels, ranging from 9 to 13 m in length and with less than 20 gross registered tonnage (GRT), entered into the swordfish fishery based at Natal (Rio Grande do Norte state).

A pelagic driftnet fishery, which was first developed in the southeast and south regions of Brazil and showed a rapid increase in the early 1990's, was in a process of expansion to the northeast region in 1995. The main species targeted by this fishery are sharks (mainly scalloped hammerhead shark which comprises more than 70% of the catches) with a small proportion of tuna and tuna like species, consisting mainly of yellowfin, frigate tuna and billfishes that are caught incidentally. The expansion of this fishery was cause of concern due to the reports of accidental catch of marine mammals and other non-fish species. However, in 1997, as a result of low productivity of the fishery during 1995 and 1996, this fishing activity was discontinued. Some driftnet vessels are still active in the south and southeast region of Brazil, but there are indications that the number of vessels engaged in this fishery has decreased.

2. Research and statistics activities

Since 1996, sampling activities for size frequency of swordfish have been initiated in Santa Catarina state, where a directed swordfish fishery has been developed by fishing vessels from other fisheries that were converted to operate as longliners. All swordfish are landed as dressed fish, and the size measurement taken is from the cleithrum edge to the front rise of the caudal keel (CK),which is converted to lower jaw-fork length through a conversion equation. In the state of Rio Grande do Norte where a directed swordfish fishery has also been initiated, data on individual weight of landed swordfish are being collected to estimate the fish length by means of a length-weight relationship. All the sampling data on cleithrum to keel length measurements have been processed and submitted to the ICCAT Secretariat, while part of the data on individual fish weight are still being processed. As for skipjack taken by the baitboat fishery, sampling activities for size frequency have been discontinued in Rio de Janeiro but are still active in Santa Catarina state, the main fishing port for the baitboats. In 1997, the number of skipjack sampled for size amounted to 7,642 individuals.

During the period from April to July, 1998, sampling activities for shark fin identification through the examination of morphological characters of shark fin and dermal denticles were conducted by the Fishery Department of Federal Rural University of Pernambuco, from landings of the longline fleet based at the port of Natal, Rio Grande do Norte state, aimed at estimating weight and species composition of sharks caught and discarded at sea. The results of shark fin identification have shown that silky shark (*Carcharhinus falciformis*) represented about 50% of the samples and blue shark (*Prionace glauca*) represented 33%.

From April, 1997, to April, 1998, three observers were placed on board longliners targeting swordfish, in the area between 20°S and 34°S. Data collected included size measurements, estimation of discards, and identification and

quantification of fish and non-fish species caught accidentally in the longline fishery. A summary of the main results is presented as follows: there was no rejection of shark species on board national longliners contrary to foreign leased longliners; sharks appeared as the dominant species caught during one observer trip on a national longliner representing 80% of the total catch in weight, and blue shark was the main species caught within the group of sharks; the majority of shark species were caught alive; as the proportion of sharks in catches of leased longliners is small compared with national longliners and this seems to indicate that the highest percentage of shark species in the catches of national longliners could in part be related to the fact that these vessels use steel leaders (on hook gangions) while the majority of the leased longliners use monofilament nylon leaders; one on board observer reported a great incidence of turtles caught accidentally and the estimated catch rate, expressed in number by 1,000 hooks, reached 11.6 individuals, a value that was considered very high compared with other indices obtained for the same area of the South Atlantic. About 75% of the turtles caught were brought on board live and were released with some of them being tagged.

2.1 Statistical collection systems

Statistics on catch and effort are collected through logbooks, whose submission is mandatory by all masters of fishing vessels over 20 GRT licensed to fish in Brazilian waters. Submitted logbooks must be completed in full on a daily basis, at the end of each trip. This requirement also applies to vessels chartered by Brazilian companies.

In 1997,the collection of tuna statistics continued and was extended to cover vessel operations of the small scale directed swordfish fishery. The compilation of Task I and Task II data on catch and catch/effort for 1997 for the main tuna fisheries has been finalized and data have been submitted to ICCAT. The compilation of some data on Task I for the artisanal fishery and for the small-scale fishery are still in progress and will be made available soon.

There is an active recreational fleet in Brazil, especially in the southeast region where the main billfish tournaments have been carried out. Minor competitions have also been initiated in the states of the northeast region of Brazil, during the last years. In relation with these fisheries, there is no requirement for recreational fishers to submit statistics. Some monitoring activities have been conducted by the "Instituto de Pesca", from São Paulo state, which include some tagging and release. It has been reported that for recent years in the majority of the tournaments carried out there is no retention of billfishes. The minimum sizes for retention of each species varies among the different tournaments, but in general the most common minimum sizes for sailfish, white marlin and blue marlin are, 35 kg, 50 kg and 150 kg, respectively. Taking into account the need to obtain information and statistics on recreational fishing activities for billfishes, a proposal for amendment of the legislation on recreational fishing has been made requiring the organizers of billfish tournaments to submit complete and accurate statistics for each competition and making the submission of these data a condition for the renewal of new licences.

3. Implementation of ICCAT conservation and management measures

In response to ICCAT regulatory recommendations, Brazil has been promoting adaptations in domestic fishery legislation and issuing new fishery regulations in order to fulfil its obligations as a Contracting Party of ICCAT.

In relation to the ICCAT recommendation on minimum size and weight for swordfish, this recommendation was incorporated into domestic legislation in 1995. However, some operational difficulties arose when this measure was implemented, and it was revised, amended, and reissued in August, 1998. Changes were introduced to address the situation whereby swordfish catches are landed in the condition of dressed fish, through the inclusion of a second length measurement to be taken (from the cleithrum edge to the front rise of the caudal keel), which is equivalent to the minimum size expressed as lower jaw-fork length measurement. In this way, it will be possible to conduct inspections independently of the condition of the landed fish.

In September, 1998, a regulatory measure was issued for shark fisheries including provisions for prohibition of finning sharks and establishing a maximum size length for pelagic drifnets This regulation also establishes that the weight of shark fins landed should be in proper proportion to the weight of carcasses landed (that is, a maximum of 5% of fins per dressed carcass weight) and makes mandatory the submission of data on the weight of fins landed.

Notwithstanding, it is important to mention the objection presented by the Government of Brazil to the 1997 Recommendation by ICCAT Concerning Compliance in the South Atlantic Swordfish Fishery, which was based on the understanding that the proposal for this recommendation was not presented in a clear way and it was not deeply discussed before its approval, and also because of its discriminatory nature, which in practice creates a situation of non-uniform application among the Contracting Parties, depending on the destination of each Party's catches: to supply its domestic market or to be exported to other Parties.

Since 1995, the Government of Brazil has been implementing in a more effective way a policy for the utilization of marine living resources from the Economic Exclusive Zone, with emphasis on the development of tuna fisheries. This resulted, first, in the assimilation of new fishing technology for the exploitation of swordfish and, secondly, in the incorporation of new, genuinely national longline vessels targeting swordfish. As a result, swordfish catches have shown an increasing trend and reached a maximum of 4,099 MT in 1997.

Taking into account that a total quota of 14,600 MT has been established for the South Atlantic swordfish fishery and that the Brazilian swordfish catch for 1997 has surpassed the Brazilian quota for 1998 (2,430 MT), the Brazilian Government has started consultations/discussions to seek alternatives, at the domestic level as well as in the framework of ICCAT, for proper consideration of the special situation of coastal states with developing fisheries when developing schemes for the adoption of catch quota allocation among countries participating in the fishery. In this context, proposals have been made requesting the establishment of a working group to propose the utilization of new criteria for the allocation of catch quotas in the framework of ICCAT.

4. Other activities

In April, 1998, Brazil participated in the Informal Multi-lateral Consultation to divide the 1998 southern albacore quota allocated among nations actively fishing in the south Atlantic and presented a proposal for the adoption of new criteria for the allocation of catch quotas. These new criteria are based on concepts and technical fundamentals embodied in legal documents and technical papers related with the conservation and use of marine living resources, in special the United Nations Law of the Sea and its recent developments.

NOTE: More detailed information on the Brazilian regulations concerning swordfish and sharks can be requested from the Brazilian authorities, as well as on the proposal concerning the adoption of new criteria for the allocation of catch quotas.

Table 1. Distribution of the number of vessels from the Brazilian tuna fleet, by type of fishery, for the period 1992-1997 [1/]

Flag	*1992*		*1993*		*1994*		*1995*		*1996*		*1997*	
	BB	*LL*	*BB*	*LL*	*BB*	*LL*	*BB*	*LL*	*BB*	*LL*	*BB*	*LL*
Brazilian	57	17	57	19	54	16	53	16	48	23	43	31
Leased [2]	-	30	-	36	-	26	3	21	3	27	2	17
Total	57	47	57	55	54	42	56	37	51	50	45	48

(1) Not including vessels from the artisanal and small scale fisheries

(2) Foreign vessels leased by Brazilian companies and licensed to fish in Brazilian waters. In accordance with Brazilian law these vessels have the same status as Brazilian vessels.

Table 2. Preliminary estimates of Brazilian catches (MT round weight) of tuna and tuna-like fishes, by fishing gear, in 1997

Fishing gear	*Total Catch*	*Yellowfin (YFT)*	*Albacore (ALB)*	*Bigeye (BET)*	*Skipjack (SKJ)*	*Swordfish (SWO)*	*Sail-fish* [1] *(SAI)*	*White marlin (WHM)*	*Blue marlin (BUM)*	*Blackfin tuna (BLF)*	*Frigate tuna (FRI)*	*Little tuna (LTA)*	*Spanish mackerel (BRS)*	*King mackerel (KGM)*	*Unspecified sharks (SHARK)*	*Other Fishes*
Longline	9,389	851	587	1,237	0	4,099	68	105	164	28	0	0	0	0	2,138	112
Baitboat	27,692	1,643	63	0	25,573	0	-	-	0	93	102	3	0	0	33	184
Purse seine	914	57	0	0	743	0	0	0	0	0	111	0	0	0	0	3
Hand line	233	156	0	0	0	0	0	0	0	0	0	0	0	0	20	57
Surface	6,294	145	0	0	248	0	64	26	0	263	2	507	2,125	2,398	413	105
Sport	29	0	0	0	0	0	1	0	28	0	0	0	0	0	0	0
Total	44,551	2,852	650	1,237	26,564	4,099	133	130	192	384	214	509	2,125	2,398	2,604	461

(1) May include other species of billfish.

Table 3. Catches (in MT) of tuna and tuna-like fishes taken by Brazilian and foreign leased [1] longliners, 1992-1997

	1992		*1993*		*1994*		*1995*		*1996*		*1997 [2]*	
Species	*Brazilian*	*Leased*	*Brazilian*	*Leased*	*Brasilian*	*Leased*	*Brazilian*	*Leased*	*Brazilian*	*Leased*	*Brazilian*	*Leased*
Yellowfin	227	970	418	1,100	165	919	98	1,214	106	627	190	661
Albacore	95	2,615	55	3,545	68	767	91	633	78	729	114	474
Bigeye	29	760	54	1,202	39	557	94	1,841	61	1,646	133	1,104
Swordfish	608	1,979	674	1,339	969	602	1,168	572	750	1,141	1,758	2,341
Sailfish	30	252	51	150	34	26	32	65	28	46	38	30
White marlin	117	92	79	224	73	17	60	43	46	24	70	34
Blue marlin	14	109	19	127	21	49	43	126	58	74	58	106
Other [3]	40	227	4	204	5	32	4	69	4	36	3	36
Sharks	2,000	575	2,137	1,439	1,892	720	1,461	692	1,109	752	1,333	805
Total	3,160	7,579	3,491	9,330	3,266	3,689	3,051	5,255	2,240	5,075	3,697	5,591

(1) In accordance with Brazilian law, these vessels have the same status as Brazilian vessels.

(2) Preliminary estimates.

(3) Includes *Acanthocybium solanderi*, but not dolphin fish and others.

Table 4. Catches (in MT) of tuna and tuna-like fishes taken by Brazilian baitboats, during the period 1992-1997

	Species			
Years	*Skipjack*	*Yellowfin*	*Others*	*Total*
1992	18,273	2,661	287	21,221
1993	17,611	3,088	414	21,113
1994	20,555	2,744	258	23,557
1995	15,675	2,613	659	18,947
1996	22,518	1,956	802	25,276
1997	25,573	1,642	260	27,475

Table 5. Catches of shark species (in MT round weight) taken by Brazilian and foreign flagged leased [1] longliners in 1996 and 1997

	1996			1997		
Species	*Brazilian*	*Leased*	*Total*	*Brazilian*	*Leased*	*Total*
Blue shark	552	192	743	693	410	1,103
Scalloped hammerhead	13	13	25	86	84	170
Bigeye thresher	13	2	14	26	11	37
Shortfin mako	35	48	83	96	94	190
Silky shark	467	36	503	249	30	279
Unspecified sharks	128	452	580	182	177	359
Total	1,207	741	1,948	1,333	805	2,138

(1) In accordance with Brazilian law, these vessels have the same status as the Brazilian vessels.

Table 6. Landing estimates (in MT) of the main tuna species caught by the artisanal fishery in the northeastern region of Brazil, 1992-1997

Year	*King mackerel*	*Spanish mackerel*	*Blackfin tuna*	*Others*	*Total*
1992	933	1,114	139	795	2,981
1993	1,136	629	–	607	2,372
1994	1,327	1,124	347	716	3,514
1995	1,249	1,311	280	454	3,294
1996	2,871	3,047	382	1,492	7,613
1997	2,387	2,125	297	580	5,353

NATIONAL REPORT OF CANADA, 1997*

by

J. M. Porter* and C. J. Allen**

1. National fisheries information'

The Canadian Atlantic statistical systems provide real time monitoring of catch and effort for all fishing trips (see section 2).

1.1. Bluefin tuna

Bluefin occur in Canadian waters from July to December over the Scotian Shelf, in the Gulf of St. Lawrence, in the Bay of Fundy, and off Newfoundland. In adherence to the ICCAT agreement, the Canadian quota for the 1997 calendar year was 552.6 MT. The Canadian nominal landings of Atlantic bluefin tuna in 1997 were 504.5 MT (**Table 1**), leaving 48.1 MT uncaught which will be carried over to the 1998 quota. In addition, at-sea observers estimated approximately 6 MT of dead bluefin discards from the swordfish longline test fishery (see section 3.2).

The major fishery since 1988 has been the tended line fishery in the Hell Hole between Browns and Georges banks (180 km southwest of Nova Scotia), though in recent years its importance had decreased substantially to about 22% of the Canadian landings (from 70% in the early 1990s). Further, the fishery in the Hell Hole is much more spatially dispersed than in past years. Fish captured in this fishery weigh about 200 kg (round), on average. The CPUE has been declining in recent years, and is at a much lower level than at the inception of this fishery in 1988 (SCRS/98/42). In 1997, 20% of the Canadian catch came from the Gulf of St. Lawrence. This represents the level of harvest generally seen during the 1990s. The nominal CPUE levels presently observed are much lower than the CPUE observed in the early 1980s (SCRS/98/42). The Gulf of St. Lawrence fish weigh about 400 kg (round), on average. Additional catches were also taken from the St. Margaret's Bay traps (59 MT), from the rod and reel fishery off northeastern Nova Scotia (69 MT), and from a new fishing area off Halifax (84 MT). In the Bay of Fundy, 55 MT were taken by electric harpoon. In 1997, 21 MT were taken in the tended line fishery on the Tail of the Grand Banks of Newfoundland; this fishery has shown marked fluctuations in recent years due primarily to decreased effort in the groundfish fishery and irregular presence in the offshore fishing grounds. The offshore longline vessel, which directs for tuna other than bluefin in the northwest Atlantic caught 6.5 MT of their 20 MT bycatch limit in 1997.

In 1997, 554 licensed fishermen actually participated in the directed bluefin fishery, one offshore longline license was authorized to direct for other tuna with a small bluefin bycatch provision, and four fish-trap license holders in St. Margaret's Bay used 24 bluefin tuna trapnet licenses (**Table 2**).

1.2. Swordfish

Swordfish occur in Canadian waters from May to November, primarily on the edge of Georges Bank, the Scotian Shelf and the Grand Banks of Newfoundland. The ICCAT recommendation for the Canadian swordfish quota for 1997 was 1,130 MT. The Canadian nominal landings of swordfish in 1997 were 1089.5 MT (**Table 1**), leaving 40.5 MT uncaught which will be carried over to the 1998 quota. In addition, at-sea observers estimated approximately 5 t of dead swordfish discards from the swordfish longline test fishery (see section 3.2) and the directed fishery for other tunas.

In 1997, 1,000 MT were taken by longline (or 92% of the catch), while the tonnage taken by harpoon was 89 MT

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(**Table 3**). The mean weight (round) of longlined and harpooned swordfish was 70 kg and 131 kg, respectively (**Table 3**). Post-season analyses of the catch-at-size (calculated by converting dressed weight to lower jaw fork length) indicated that 263 undersized (< 119 cm LJFL) swordfish (1.7% of the catch by number) may have been landed, contrary to the ICCAT swordfish recommendations for regulatory measures and Canadian Conditions of License (see section 3.2). Although the Canadian longline CPUE for mature fish increased slightly in 1997, the CPUE values for 1996 and 1997 are the lowest in the 10-year time series (SCRS/98/44).

Only 60 of the 77 licensed swordfish longline fishermen landed fish in the 1997 fishery (**Table 3**). This is in marked contrast to 1993-96 when all, or nearly all, of the swordfish longline licenses were active due to the decline of groundfish stocks (**Table 3**). The reduced effort in the 1997 fishery was a result of a combination of factors including the reduced quota which closed the fishery in September (over one month in advance of the traditional completion of the fishery), the lack of development of a distinct thermocline, and marked reduction in the price of swordfish during the season. Although a total of 1,400 fishermen are eligible for harpoon licenses, only about 105 actually landed fish in 1997. For many, harpooning swordfish is an opportunistic activity conducted during other fisheries, though in recent years several fisherman fish early in the season solely by swordfish harpoon. In addition, one offshore longline license was issued for tunas other than bluefin with a swordfish bycatch provision.

1.3. Other tunas

The other tunas (albacore, bigeye and yellowfin) are at the northern edge of their range in Canada, hence catches are small. They are found along the edge of the Gulf Stream and Georges Bank, the Scotian Shelf and the Grand Banks during summer months. One Canadian offshore longline vessel has been designated to direct for other tuna species and the 77-vessel swordfish longline fleet has a dual license capability enabling them to direct for other tunas during the swordfish fishery. In addition, bluefin tuna vessels are authorized to catch and retain an incidental bycatch of other tuna while fishing for bluefin. The fishing activity (catch and nominal CPUE, SCRS/98/44) for other tunas in 1997 was about the same as in 1996, with swordfish longline vessels directing for yellowfin (101.1 MT) and bigeye (165.7 MT) early in the season.

1.4. Sharks

Historically, blue shark, porbeagle and shortfin mako have been a bycatch of the Canadian swordfish and groundfish longline fisheries although small amounts are also landed from other fisheries. It is believed that the bycatch is larger than reported because of discarding, though regulatory amendments are addressing this problem. A directed longline fishery has been developing in recent years and a Management Plan for these species was implemented in 1995-96. This plan was further developed in 1996 (and approved for 1997-99). The intent of this plan is to provide the basis for a Scientific Monitoring fishery by enabling a minimum number of Canadian exploratory shark fishing licenses to direct for shark while providing detailed scientific data on stock abundance and distribution. This information will be used to determine whether or not a commercial shark fishery is sustainable after 1999, and, if so, under what conditions.

In 1997, 46 exploratory shark fishing licenses were authorized to land porbeagle and/or blue shark, with all other sharks, including shortfin mako regulated to a bycatch. The management plan has put a freeze on any new exploratory shark fishing license authorizations. In, fact, this is nine less exploratory shark fishing licenses than in 1996 as the Atlantic Large Pelagics Advisory Committee agreed that licenses not fishing would lapse. Total reported landings in 1997 were 1339 MT of porbeagle, 11 MT of blue shark and 110 MT of shortfin mako (**Table 1**). In addition, there were 609 recreational shark licenses restricted to hook and release only.

2. Research and statistics

In 1994, an industry-funded Dockside Monitoring Program (DMP) was established in Atlantic Canada, according to Department of Fisheries and Oceans standards, for the swordfish longline fleet and the majority of bluefin landings. Since 1996, this system has applied to all fleets (including sharks), and included monitoring of all trips even when no fish were caught. This statistical system allows a real time monitoring of catch and effort. At the completion of each fishing trip, log record data must be submitted by each fisherman to a monitoring company which inputs the data into a central computer system. Log records contain information on catch, effort, environmental conditions and bycatch. Log records from trips with catch must be received from fishermen before they can proceed with their next fishing trip (log records from zero catch trips can be mailed in at a later time). Ideally, this ensures 100% coverage of properly completed log records and individual fish weights. Prior to the implementation of the Dockside Monitoring Program, even though the submission of logbooks was compulsory, less than 50% of trips were represented by useable log records and information on individual sizes of fish (see **Table 3** for swordfish). The effectiveness of this system was thoroughly reviewed in 1998, and appropriate changes recommended, as necessary. Problems such as bycatch and highgrading are assessed through

Observer Programs and at-sea surveillance on the domestic fleet. License holders that fail to comply with the domestic regulations and conditions of license are liable to prosecution which may include fines, loss of fishing licenses and possible administrative sanctions.

2.1. Bluefin tuna research

The 1997 scientific research program at the Biological Station St. Andrews was as follows:

1) Revised standardized CPUE analyses for the Gulf of St. Lawrence fisheries (1981-96). This included a correction of historical bluefin catch rates (1981-83). Updated standardized CPUE for Hell Hole fishery (1988-96).

2) Participated in three commercial trips (rod and reel, and harpoon) in order to become more familiar with fishing strategies and operations.

3) Dockside Monitoring for all bluefin tuna landed in Canada, and data entry by Regional Statistics offices. Since 1996 there has been monitoring and data entry for all trips even when no fish were landed. In 1997, biologists provided training to the monitors.

4) Collected bluefin blood and tissue samples for a NMFS (USA) research project on bluefin sexual maturity and genetics.

5) Initiated a collaborative (Canada/USA/Science/Industry) high-tech satellite tagging project to be conducted on bluefin in 1998.

2.2. Swordfish Research

The 1997 scientific research program at the Biological Station St. Andrews was as follows:

1) Consultation with Industry on the swordfish CPUE methods and calculations. Updated and revised age-specific CPUE to include the effect of targeting other tunas on swordfish catch rates (SCRS/97/112).

2) Preparation of Canadian swordfish sex-ratio at size data for ICCAT Intercessional in January 1998.

3) Dockside monitoring in place for all longline swordfish landed in Canada and data entry conducted by regional Statistical offices. In 1997, there was dockside monitoring for all swordfish landings including harpoon, and the system improved the monitoring of late season catches while vessels were still at sea in order to closely monitor the quota.

4) Completion of the juvenile swordfish cooperative tagging study with the Nova Scotia Swordfishermen's Association. Since 1993, 357 swordfish were tagged with six recaptures to date.

2.3. Other tunas

Biological sampling of other tunas (albacore, bigeye, yellowfin) has been conducted on the Canadian offshore and Japanese fisheries within the 200-mile fisheries zone. There was limited sampling of the domestic fleet (submission of tally sheets, logs, and some observer coverage).

2.4. Sharks

Prior to 1994, there was no active research program on sharks. Increasing interest by industry to exploit sharks (particularly porbeagle, blue and mako) stimulated a modest research and assessment effort on sharks. The focus of the research program has been to establish the collection of basic fisheries information from this fishery. This will include detailed catch and effort data on a set-by-set basis, and species, size and sex composition of all catches. The needs for the program can be outlined in four, broad areas and specific projects within each area have been defined and are being undertaken within available resources:

1) The collection and processing of information from the historical and current fishery.

2) The analyses of existing data to elucidate the trends in abundance.

3) Studies on shark life history, including a tagging program, operating on a co-operative basis with commercial and sport fishermen, to help delimit the stock areas.

4) Clarification of the official landings statistics.

3. Implementation of ICCAT conservation and management measures

For bluefin, swordfish, and sharks, Canada has issued multi-year management plans prior to the opening of the respective fishing seasons. Details of management measures and their enforcement are provided in Appendix A. These plans are compiled in consultation with the fishing industry and incorporate all relevant ICCAT regulatory recommendations. They are implemented under the *Fisheries Act of Canada*. The necessary ICCAT regulatory recommendations are either specified in the *Atlantic Fishery Regulations* (1985) (made under the *Fisheries Act*) or are handled as written Conditions of License, both of which are legally binding on fishermen.

3.1. Bluefin tuna

Canada has implemented the ICCAT regulatory recommendations that apply to bluefin tuna in the Canadian Atlantic Bluefin Management Plan (Appendix A). The 1997 quota was set at 552.6 MT, (see 1.1 above), and no person shall have in their possession any bluefin weighing less than 30 kg. In addition, Canada has limited entry into the fishery; and restrictions on the amount and type of gear used, vessel replacement, management fishing areas, and license transfer requirements.

Since 1995, Canada has had a computerized system to record the implementation of the ICCAT Bluefin Tuna Statistical Document Program. Prior to the ICCAT program, Canada already had a system of uniquely numbered tags to be attached to all bluefin tuna landed in Canada.

3.2. Swordfish

Canada has implemented the ICCAT regulatory recommendations that apply to swordfish in the Canadian Atlantic Swordfish Management Plan (Appendix A). The 1997 quota was set to 1,130 MT, and there is a prohibition on the taking and landing of swordfish less than 119 cm LJFL (no tolerance). Post-season analyses of the catch-at-size (calculated by converting dressed weight to lower jaw fork length) indicated that 263 undersized swordfish (1.7% of the catch by number) may have been landed, contrary to the ICCAT swordfish recommendations for regulatory measures and Canadian Conditions of License. As a consequence, in 1998, increased enforcement surveillance will be applied throughout the fishery. In addition to the ICCAT regulatory recommendations, Canada has limited entry into the fishery, strict bycatch provisions, time-area closures to protect small fish and minimize bycatch, and gear restrictions. In an effort to enhance large (spawning stock) swordfish, a substantial portion of the Scotian Shelf has been closed for the past three years from early autumn to the end of the season. Since 1995, a relatively large portion of the southwestern part of the Scotian Shelf has been closed to swordfish longline gear for a period of up to two months to protect small swordfish and minimize bycatch of bluefin tuna. During that period, test fisheries were conducted in adherence to stringent test fishery protocols, including use of industry-funded observers, to determine whether or not the area should be opened and if so, under what conditions. During the 1997 test fishery (19 trips), a total of 109 bluefin (28% estimated alive), and 406 swordfish (40% estimated alive) were discarded.

3.3. Other tunas

In 1997, these other tunas were managed under the *Fisheries Act of Canada*. The effort is restricted by limiting entry into the directed fishery to vessels having a swordfish longline license and to one offshore longline license specifically allowed to direct for these other tunas. There was 10% observer coverage (trips) on the large pelagic longline fleet, including the other tunas. No person shall have in their possession any bigeye weighing less than 3.2 kg. Beginning in 1998, a domestic management plan will be issued for bigeye, yellowfin and albacore.

3.4. Sharks

ICCAT has no regulatory recommendations for sharks. However, Canada has a three-year domestic management plan which includes provisions for a small number of limited entry exploratory longline licenses, regulated total allowable catch, bycatch restrictions, full dockside monitoring of all landings, restrictions on processing of the landed/caught fish (including a prohibition on finning), gear restrictions, time-area closures, industry-funded observers, and requirements to provide detailed at-sea fishing and biological data (Appendix A).

4. Inspection schemes and activities

Canada is not a signatory to the ICCAT Scheme of Port Inspection, and uses a more comprehensive enforcement protocol which involves a combination of the Dockside Monitoring Program (see section 2), and shore and sea-based patrols of Department of Fisheries and Oceans Fisheries Officers to ensure compliance with domestic regulations (which include ICCAT regulatory recommendations; see section 3). No foreign vessels land tuna in Canadian ports and efforts are concentrated on the Canadian fleet. The Japanese vessels fishing in the Canadian 200-mile fishing zone are required to have 100% observer coverage while in Canadian waters. As well, their activities are also monitored by aerial surveillance and at-sea inspections.

In addition to the Dockside Monitoring Program to ensure complete coverage of the catch and effort of the Canadian fleet (see 2 above), aerial and vessel surveillance is used to monitor the fleets at-sea. Shore-based patrols monitor routine landings, watch for illegal landings and conduct airport and border surveillance. Observer coverage is used periodically to monitor the commercial fishery. Test fisheries are established to define areas and times to minimize the catch/bycatch of restricted species or undersized targeted species (see section 3.2).

NOTE: Appendix A is available at the Secretariat for consultation.

Table 1. Summary of 1991-97 Canadian landings (tonnes round weight) of large pelagic fish species

	Landings						
Species	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*
Swordfish	1026.5	1546.5	2233.7	1675.7	1609.2	739.1	1089.5
Bluefin tuna	481.7	443.5	458.6	391.6	576.1	598.0	504.5
Albacore tuna	5.7	1.0	8.7	32.2	11.5	23.9	30.8
Bigeye tuna	27.1	67.5	124.1	110.5	148.6	144.0	165.7
Yellowfin tuna	28.0	25.5	71.5	52.3	174.4	154.5	100.1
Unspecified tuna	2.0	3.2	9.1	0.2	0.0	0.0	0.0
Blue shark	32.0	101.1	20.8	133.0	123.0	11.8	10.9
Shortfin mako	346.0*	119.0	152.2	157.2	107.0	67.4	110.1
Porbeagle		741.0	919.0	1549.0	1305.0	1015.4	1339.4
Unspecified sharks	61.4	49.0	22.7	107.1	38.4	12.7	42.5

*Mackerel sharks

Table 2. Distribution of bluefin tuna and swordfish fishing licenses by region and species* in 1997

	Number of licenses					
	Bluefin		*Swordfish longline*		*Other tunas****	
Region	*Total*	*Active*	*Total*	*Active*	*Total*	*Active*
Gulf	606	465	0	0	0	0
Newfoundland	54***	13	8	0	8	0
Scotia-Fundy	42	42	69	60	69	54
St. Margaret's Bay**	4	4	-	-		
Quebec	54	30	0	0	0	0
	760	554	77	60	77	54

* Bluefin tuna, swordfish and other tunas are regulated by limited entry.

** Four fish trap license holders with 6 bluefin trapnet licenses each.

*** 38 of these licenses are subject to a reduced level of fishing activity and restricted to NAFO Divisions 3LNO.

**** Restricted to tunas other than bluefin (albacore, bigeye, yellowfin).

Note: Active fishermen are those that picked up their licenses, license conditions and tags, and submitted log records.

Table 3. Summary of 1988-97 swordfish vessels landing fish, landings (tonnes round weight) and average weight of fish (kg round) by gear, and percentage of small fish*

	1988	*1989*	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*
Number of vessels landing fish										
Longline	39	52	50	53	46	75	74	77	77	60
Harpoon	+	+	+	61	72	72	32	97	112	105
Landings (t)										
Longline	887	1097	819	953	1486	2206	1654	1421	646	1000 89
Harpoon	24	146	92	73	60	28	22	188	93	
Total	911	1243	911	1026	1546	2234	1676	1609	739	1089
Average weight (kg)										
Longline	50	52	61	61	57	56	63	68	69	70
(# sampled)	(1315)	(3902)	(10280)	(8111)	(5904)	(19469)	(26279)	(20247)	(9077)	(14438)
Harpoon	--	129	138	78	67	129	120	122	161	131
(# sampled)	(0)	(637)	(164)	(146)	(136)	(151)	(83)	(1131)	(561)	(652)
% of catch small fish* (by number)	16	16	11	11	16	15	11	9	0	2
% of catch sampled	7	23	71	49	23	50	99	94	97	100

* <25 kg round weight until 1995, and <119 cm LJFL in 1996 and 1997.

\+ undetermined number, but <100.

NATIONAL REPORT OF CHINA*

1. Introduction

The People's Republic of China became a Contracting Party to ICCAT on October 24, 1996. This is the first time that the Chinese delegation has attended a meeting of the SCRS.

2. The fisheries

China initiated its tuna fishery in the Atlantic Ocean in the early 1990s. In 1997, there were four longline fishing vessels with Chinese flag exploiting tuna and tuna-like species in the region. The total catch in 1997 amounted to 617 MT, representing a 27% decrease in comparison with 870 MT caught in 1996. Bigeye tuna was the main species caught by the Chinese longliners (with a total catch of 378 MT), which showed an 18% decrease in relation to 1996 catches. Catches of yellowfin tuna (74 MT) and bluefin tuna (42 MT) decreased by 33% and 47%, respectively, as compared to 1996. Swordfish catches also showed a major decline (70%). However, the catches of other species showed a minor increase of 16%. Catches by the Chinese fishery are summarized in **Table 1**.

3. Research, statistics and management

As the tuna fishery in the Atlantic Ocean is a relatively new industry to China, research on tuna fisheries biology and stock assessment started very recently. The fisheries authorities in China require that accurate and timely catch statistics be reported to the ICCAT Secretariat, in accordance with the ICCAT statistical scheme. As a Contracting Party to ICCAT, China will continue to cooperate with the Commission and to observe the management regulations that ICCAT adopts.

Table 1. Summary of the Chinese tuna fishery catches (in MT), 1993 to 1997

Species	*1993*	*1994*	*1995*	*1996*	*1997*
Bigeye	62	379	421	460	378
Bluefin	--	84	118	80	42
Yellowfin	123	138	177	110	74
Albacore	--	14	8	20	--
Swordfish	55	65	79	100	30
Sharks	--	--	--	--	2
Others	41	68	76	80	90
Total	281	748	879	850	617

* Original report in English.

NATIONAL REPORT OF CÔTE D'IVOIRE *

by

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1. Introduction

Because of their economic importance and in order to conserve the stocks, tunas are given special attention, through the framework of the International Commission for the Conservation of Atlantic Tunas (ICCAT). This international organization includes several countries, among them Côte d'Ivoire, which hold annual meetings to review the research work carried out on Atlantic tunas and billfishes. At these sessions, a review is carried out of all the available knowledge that can contribute to the better understanding of the stocks of these Atlantic fish, with a view towards proposing appropriate management measures. The central eastern Atlantic zone (25°N-15°S and 40°W-15°E) comprises the major fishing area for tropical tunas. Almost all the surface (purse seiners, baitboats) and pelagic fisheries (longliners) take place in this area. Due to its geographic position and the importance of the economic activities relative to tuna fishing, Côte d'Ivoire, specifically its port of Abidjan, plays a major role in the exploitation of the tuna resources. On average, 170,000 MT of tunas are landed or transshipped annually at the port of Abidjan. Besides the landings of tunas by the commercial fleets, other activities take place relative to the artisanal fishery. This fishery catches tunas as well as other large fish species, such as billfishes and sharks. One of the main activities of the *"Centre de Recherches Océanologiques"* (CRO) of Abidjan is to carry out, jointly with the ORSTOM, regular monitoring of all these fisheries in to collect the most precise data , aimed at improving knowledge on the different species caught.

This report summaries the research work on tunas and billfishes, particularly the statistical monitoring of the landings at Abidjan, carried out by the CRO in 1997. This daily monitoring is part of the CRO-ORSTOM collaboration, supported by a team of technicians and scientists of both organizations, based at Abidjan. This summary only deals with the French, Ivorian and Senegalese (FIS) and NEI fleets. It should be noted that since 1984, Côte d'Ivoire does not have any tuna vessels.

2. Landings by the commercial fleet in 1997

Tunas are landed daily at the port of Abidjan by three international commercial fleets comprised of French, Spanish and NEI purse seiners. The NEI fleets are those which are neither Spanish nor French and which do not officially report their catches to ICCAT. During 1997, CRO technicians conducted 134 landings surveys and 4,781 surveys of the activities of 24 FIS and NEI vessels that landed tunas regularly at Abidjan. In total, 50,334 MT of tuna were landed (**Table 1**), mainly during the first four months of the year. In general, the majority of the catches by purse seiners in the central east Atlantic are obtained in the first and last quarters of the year. In 1997, in particular, the decrease observed in the last quarter (**Figure 1**) could be a consequence of the moratorium established from November, 1997, to January, 1998, which prohibited fishing under floating objects during this period.

There was a decline of 36.23% in the amount of tunas landed, as compared to 1996 (from 78,929 MT in 1996 to 50,334 MT in 1997).

The tuna landings at Abidjan by the commercial fleets are classified in three categories:

- Large-sized fish, undamaged, which do directly to the local canning factories (i.e. PECHE-FROID and SCODI).
- Very small or damaged fish, or those that are too salty, that are rejected by the factories and which are commonly known as "junk fish". These are consumed locally and are very inexpensive.

* Original report in French.

– The frigate tunas or "melvas", which are generally small tunas (frigate tuna and Atlantic black skipjack), which comprise a major component of the "junk fish".

This "junk fish" is mostly from the objects and coastal fisheries. The landings of these fish take place generally after 6 p.m. and are transported in containers (the unit of measure is the container). Since 1981, the CRO has been monitoring these "junkfish" and some boat owners and shipping agents have their own survey and monitoring systems for such fish.

In 1997, the total amount of "junk fish" landed was 9,389 MT, by the French, Spanish and Ghanaian fleets. The landings are comprised as follows: 51% frigate tunas, 21% Atlantic black skipjack, 14% skipjack, 10% yellowfin and 4% bigeye (**Figure 2**). As in the case of the total landings of tunas, it can be noted that the amount of "junk fish decreased at the end of the year due to the moratorium (**Figure 3**). The average size of each one of the main species which comprise this "junk fish" is about 40 cm for yellowfin, skipjack , bigeye and frigate tuna, and 48 cm for Atlantic black skipjack (**Figure 4**). These results are somewhat disturbing in relation to the stocks of bigeye and yellowfin tuna, since the fish landed in this category are all juveniles.

The proportion of "junk fish" in the total landings varies between 5 and 10%, according to the years. For 1997, it is estimated at 7%. As was the case for the total landings, those of "junk fish" declined in 1997, from 10,889 MT in 1996 to 9,389 MT in 1997.

3. Canoe fishing

Canoes land various groups of fish daily at Abidjan, among which are tuna species, billfishes and sharks. The 1997 landings included 2,262 sailfish *(Istiophorus nigricans)*, 669 swordfish *(Xiphias gladius)*, 936 blue marlin *(Makaira nigricans)*, 66 which marlin *(Tetrapturus albidus)*, and 2,097 sharks (**Table 2**).

In the category of large fish, billfishes are predominant in the catches (3,933), followed by sharks (2,097), and then large tunas, especially yellowfin *(Thunnus albacares)* (46 fish).

As regards the three billfish groups, sailfish are the most numerous, followed by marlins and swordfish (**Figure 5**). From now on, detailed monitoring of the fish caught by canoes will be conducted in order to evaluate the amount of fish landed annually.

4. Other research activities

The second aspect of the CRO research activities relative to tuna resources concerns studies on the biology of tunas and their environment. This research is carried out with a program entitled *"Propagation Induite en Zone de Convergence des Ondes Longues Océaniques (PICOLO)"* (Induced Propagation in the area of convergence of large oceanic waves). This multi-discipline program is comprised of various research subjects, whose objective is to acquire knowledge to help understand and explain the concentration of tunas in the central eastern Atlantic area, which is known to be unproductive, from a biological point of view, during the first and fourth quarters of the year. This PICOLO area is from 5°N-0°N and 20°W-10°W. The program was initiated with ORSTOM funds, but it is based at the CRO in Abidjan, with the participation of Ivorian scientists and technicians. The major operations are: physics, primary and secondary reproductions, the dynamics of the tuna fishery, tuna feeding, nutrition and reproduction of *Vinciguerria nimbarria*, which is a meso-pelagic fish recognized as being a potential prey of tunas. In 1997, three oceanographic trips were carried out, bringing to 12 the number of campaigns carried out since the preparatory phase of the program. In 1998, two other trips were made. In early October, a meeting was held in Paris to review the progress of the program. The provisional results presented by all the participants at that meeting are very promising to resolve problems that arose with the implementation of the program.

5. Conclusion

This report briefly describes the landings of tunas and billfishes at the port of Abidjan in 1997. With regard to the tunas, an overall decline is observed in the landings, as compared to the preceding year. This trend is observed in the total landings as well as in the "junk fish". This decrease in catches could be attributed, in part, to the moratorium established from November 1, 1997, to January 31, 1998. This measure prohibited purse seine fishing under objects in the area

between 5°N-4°S and 20°W-15°E. This zone, as well as the period, were selected taking into account the importance of the catches under objects that have been made there in the last seven years.

As concerns the surveys made on billfishes landed by the canoes at the port of Abidjan, these indicate important landings of sailfish, swordfish and marlins, as occurred last year. These surveys have to be improved in the future and increased or diversified in the number and the quality of the data obtained (measurements, weights). Later, the sampling should be extended to all the major landing points along the Ivorian coast. The ICCAT budget allocated to marlins should provide funds for this research.

The perspectives as regards the tuna program are the application, starting in 1998, of a new scheme of sampling and statistical data collection, to be carried out by ORSTOM and the IEO (Spanish Institute of Oceanography), both work in collaboration with the CRO. Bigeye biology studies will also be carried out within the framework of the BETYP.

Table 1. Summary of monitoring of FIS landings at Abidjan in 1997

Month	No of landings surveyed	Total landings (MT)	No. of surveys
January	16	7478	573
February	11	5352	397
March	14	7304	485
April	16	7222	505
May	8	2639	285
June	10	2356	293
July	9	3510	384
August	12	3802	496
September	13	4042	380
October	10	1928	304
November	10	3166	474
December	5	1535	2053
Total	**134**	**50334**	**4781**

Table 2. Nominal catches by canoes, landed at Abidjan in 1997

Period	*1st Quarter*	*2nd Quarter*	*TOTAL*
No. of samples	**2171**	**3702**	**5873**
Atlantic sailfish *(Istiophorus albicans)*	1816	446	2262
Atlantic blue marlin *(Makaira nigricans)*	540	396	936
Atlantic white marlin *(Tetrapturus albidus)*	5	61	66
Broadbill swordfish *(Xiphias gladius)*	312	357	669S
Silky shark *(Carcharhinus falciformis)*	13	0	13
Smooth hammerhead *(Sphyrna zygaena)*	239	678	917
Great hammerhead *(Sphyrna mokarran)*	126	175	301
Longfin mako *(Isurus paucus)*	180	410	590
Manta ray	193	794	987
Silky shark *(Carcharhinus falciformis)*	11	8	19
Green turtle *(Chelonia mydas)*	1	0	1
Yellowfin tuna *(Thunnus albacares)* (in boxes)	487	424	911
Oceanic skipjack *(Katsuwonus pelamis)*	238	288	526
Frigate tuna	473	782	1255
Spinner shark *(Carcharhinus brevipinna)*	59	156	215
Various shark species	18	43	61
Yellowfin tuna *(Thunnus albacares)* (large size)	46	0	46
Dolphins (unidentified)	1	1	2
TOTAL	**4758**	**5019**	**9777**

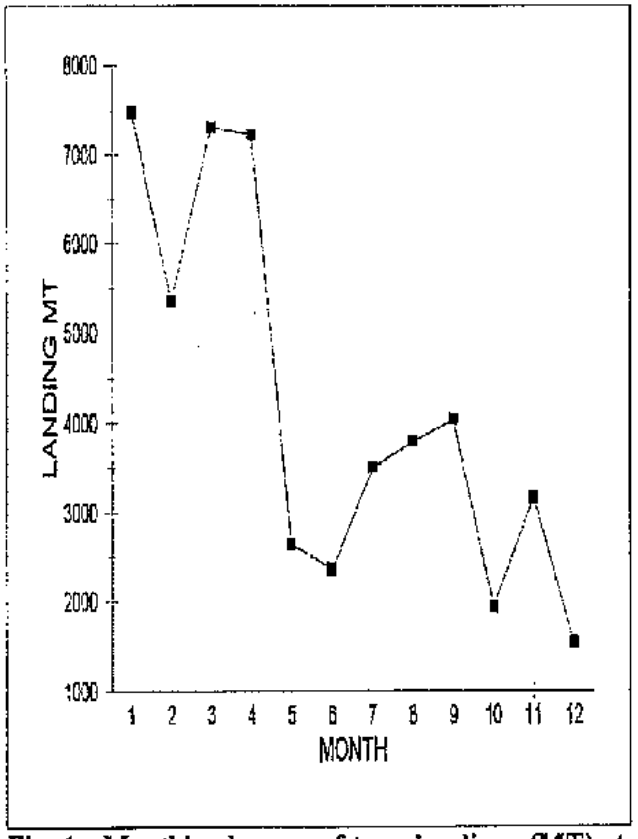

Fig. 1. Monthly changes of tuna landings (MT) at Abidjan fishing ports by FIS and NEI fleets in 1997.

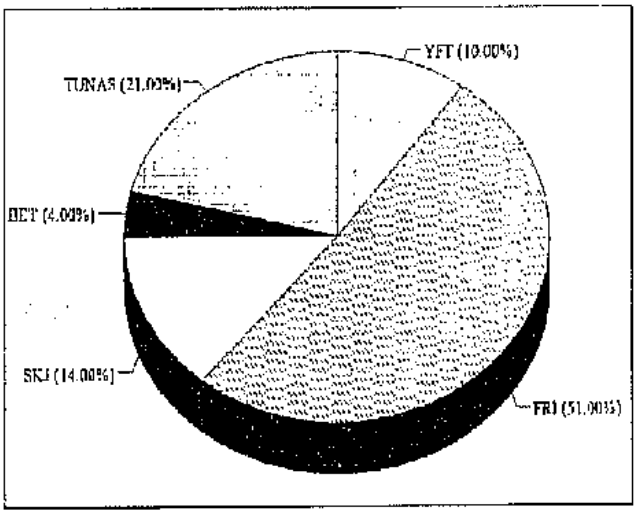

Fig. 2. Species composition of junk fish landed at Abidjan Port during the first quartetr of 1998.

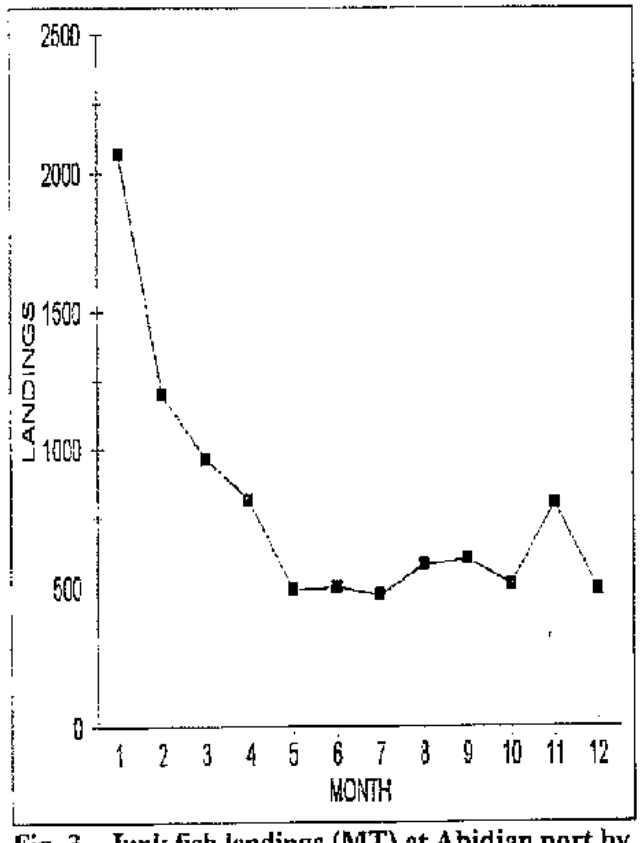

Fig. 3. Junk fish landings (MT) at Abidjan port by French, Spanish and Ghanaian fleets in 1997.

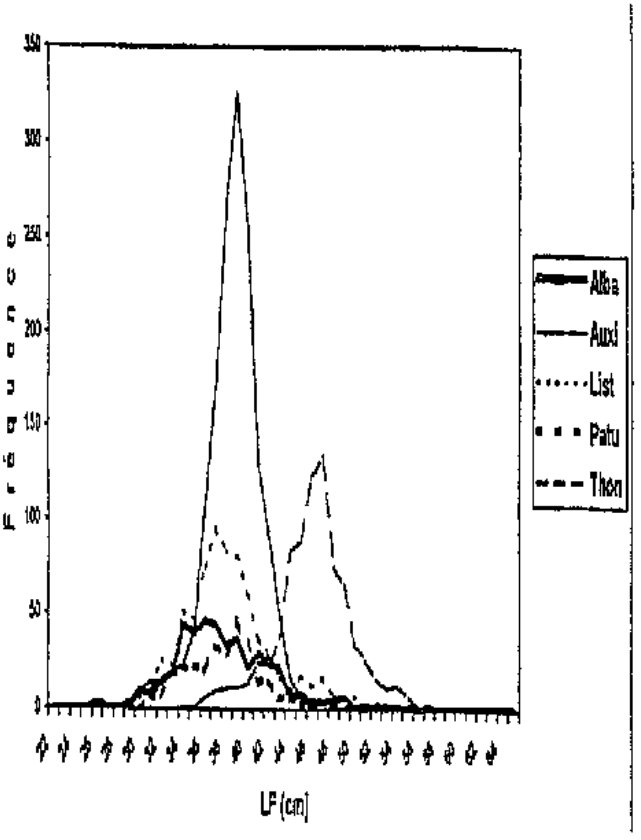

Fig. 4. Size frequency distribution of fish sampled from junk fish at Abidjan port in 1st quarter of 1998 (Alba=YFT, Auxi=FRI, List=SKJ, Patu=BET and Thon=Tuna unclassified).

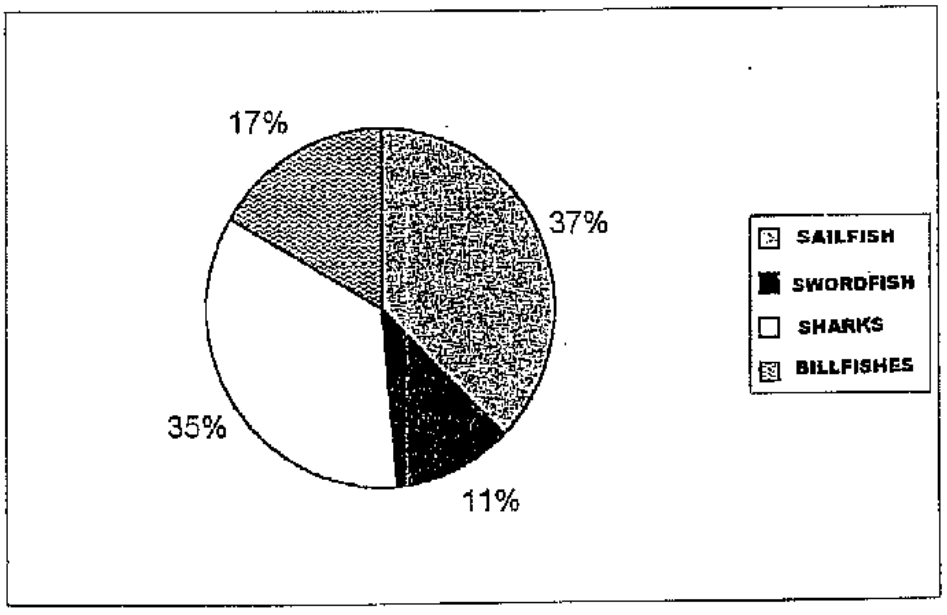

Fig. 5. Species composition of the canoe landings at Abidjan in 1997 (% of sharks and billfishes).

NATIONAL REPORT OF EC-FRANCE *

1. National fisheries

1,1 General overview

In 1997 French catches of tunas amounted to about 74,000 MT, a decline of close to 15% with respect to the level of recent years.

1.2 Temperate tunas

– Bluefin tuna

Since the 1970s, bluefin tuna have been caught mainly by purse seiners in the Mediterranean Sea. The catch statistics have been revised for 1992, 1993, 1995 and 1996. The 1997 fishing season, carried out by 33 purse seiners, caught 7,100 MT (preliminary estimate) as compared to 8,500 MT and 9,500 MT in 1996 and 1997, respectively, with a comparable nominal effort (in number of vessels), although old vessels have been replaced by more modern boats.

In 1997, a decline was observed in the average weight of the catches. The increase in exports of large fish to Japan prompted the French purse seiners to increase their fishing effort during the reroductory period (spawning in the Balearic Islands area). This new fishery also provoked the introduction of more and more improvements to them it more efficient and profitable (e.g. aerial detection, pools and cages for fattening fish to transship at sea, Spanish dealer infrastructures, etc.). Spawning fish measure between 190 and 230 cm (140-250 kg).This situation causes serious statistical problems. During the remainder of the fishing season, the fish caught generally weigh an average of 20 kg. It is noted that the new purse seiners are larger, and search for bluefin tuna farther and farther from their home ports, at times in the central Mediterranean and off North Africa, but fishing effort is concentrated in the western part of the western area of the Mediterranean basin.

There is also an active sport fishery in the Mediterranean that fishes bluefin tuna but, unfortunately, data on the catch and effort of these fishing activities are not available.

Bluefin tuna catches in the Atlantic are estimated at 269 MT, and these have been undergoing a constant decline since 1995. For this reason, the tuna vessels have been mainly targeting albacore.

-- Albacore

In the Atlantic, catches of albacore during the summer of 1997 were carried out by 32 vessels equipped with driftnets, and 70 (35 pairs) pelagic trawls as well as by some vessels with unspecified gears that landed an approximate total of 4,600 MT in 1997 (i.e. a level equal to that of 1996. Fishing effort in number of driftnet vessels seems to be decreasing, after a declining trend that started in 1994, following a period of stabilization between 1995 and 1996. The length of the nets uses by the French fleet has been strictly regulated at 2.5 km per vessel, since July 27, 1994. The number of vessels equipped with pelagic trawls fluctuates according to the years, with an increase of 18 vessels between 1995 and 1996, followed by stabilization in 1997.

In the Mediterranean, the sport fishermen actively fish albacore from mid-August until the end of October. The catch by the sport fishery is not statistically monitored, but it is estimated, according to the years, at about 3 to 5 MT. The annual fluctuations in the catches of albacore in the Mediterranean clearly show the aleatory nature of the abundance of this species along the French Mediterranean coasts.

* Original report in French.

Catches of albacore (south stock), obtained as by-catch of the French inter-tropical purse seiners, are monitored by detailed statistical coverage for the 1991 to 1997 period. All the data of this fishery, monthly catches by 1x1 degree squares and sampling by 5x5 degree squares have been presented to ICCAT. These catches are very variable according to the years, and represent an average of 210 MT (1991-1997).

1.3 Tropical tunas

-- Purse seine fleet

The catches of tropical tunas by French tuna vessels amounted to 53,100 MT, of which 30,000 MT were albacore, 16,800 MT were skipjack, and 5,900 MT were bigeye. These French purse seiners saw an important decline in 1997 in their catches, following the moratorium on fishing with floating objects, which was voluntarily accepted by the French and Spanish fishermen, from December, 1997 to January, 1998.

-- Baitboat fleet

As concerns the tropical baitboat fleet, there are seven French vessels based at Dakar, i.e. the same number as the previous year. The French baitboat vessels caught 5,100 MT (with similar proportions of the three species: yellowfin, skipjack and bigeye).

2. Research and statistics

French research on tunas is carried out on temperate species of the Atlantic and Mediterranean by IFREMER and on tropical species of the Atlantic by ORSTOM.

2.1 Temperate tunas

-- Bluefin tuna

Collection of statistics on bluefin tuna landings from purse seiners that operate in the Mediterranean continued, but unfortunately it is still impossible to obtain detailed statistics from this fleet, in accordance with ICCAT requirements.

Spain, France, Greece, and Italy initiated research activities to obtain improved knowledge on the biology of the reproduction of this species. This research is coordinated by France. A study is being developed on environmental conditions in relation to the catches of bluefin tuna, at different geographic scales, within the framework of the FIGIS program, which consists of an application of geographic information systems to data available on large pelagics. These programs contribute to the objectives of the ICCAT Bluefin Year Program (BYP). On the other hand, in 1998, four French scientists actively participated in the stock assessments of the bluefin tuna stock in the eastern Atlantic (ICCAT Bluefin Tuna Stock Assessment Session, Genoa, September, 1998).

-- Albacore

As regards the North Atlantic, in recent years research on albacore has concentrated on the development of models to determine the age of the large size fish, in order to improve the analytical stock assessments. There is no other research directed at Atlantic albacore, and the statistical monitoring of this fleet is still insufficient.

In the Mediterranean, data on the recovery of 3,000 albacore tagged between 1986 and 1991 continued to be collected at the rate of 2 to 3 per year, always in the Mediterranean, confirming that Mediterranean albacore do not seem to cross the Strait of Gibraltar. No genetic difference has been found in the overall Mediterranean.

2.2 Tropical tunas

The collection of fishery statistics and research programs on tropical tunas are carried out in close collaboration with the scientific institutes of Cote d'Ivoire and Senegal. These statistics cover 100% of the fishing logbooks of this fleet and are based on the annual sampling of almost 200,000 tunas (sampling is carried out through cooperative efforts of the Dakar and Abidjan research centers).

A new statistical scheme has been put into effect to correct, in a statistically optimal way, the species composition of the catch and its sizes, taking into account the type of schools, associated with fishing objects or free schools. This new files have been facilitated to ICCAT and cover the period from 1991 to 1997.

Research on tropical tunas, which is active and divers, has centered on the following subjects:

-- Participation of two ORSTOM scientists in the Miami Working Group on catches per unit of effort of the purse seiners.

-- Analysis of the ethology and dynamics of the association of schools-baitboat vessels, developed by the Dakar fleet (MAC Program, carried out in collaboration with the CRODT of Dakar). This program has conducted numerous tagging experiments (close to 4,000 tunas tagged), and the recovery rates are exceptionally high.

-- Analysis of the sampling scheme and correction of purse seine fishing logbooks. This project, financed by the European Union and carried out in cooperation with the Spanish Institute of Oceanography (IEO, finalized in late 1997. Its objective was to improve fishery data, which made it possible to provide detailed statistical data which took better into account the topology of fishing modes (free schools and floating objects) to ICCAT.

-- Comparative analysis of the world tuna fisheries for tropical tunas and of the environmental conditions at the world-wide level. The results of this work were published in late 1997 in the form of a world atlas on tuna fisheries and their oceanographic environment (ORSTOM editions).

-- Analysis of the causes of the increase in the catches of bigeye tuna by European purse seiners. The object of this research program, financed by the European Union, and developed in cooperation with the IEO, was to study the factors responsible for this increase in the historical development of the fishery (use of artificial floating objects, change in zones, changes in fishing gears, etc.). The program is supported mainly by observers on board purse seiners to obtain data at the finest scale.

-- Analysis of the effects of the Legeckis waves on the enrichment of the northern equatorial area (from 10 to 20°W). This international multi-disciplinary program, PICOLO, was carried out from 1994 to 1998 and included numerous multi-disciplinary cruises on board the ORSTOM research vessel *"Antea"*. The results have been very positive and will be presented to ICCAT in 1999.

-- Analysis of the project on the creation of a European laboratory to carry out research on tunas (ORDET).

-- Analysis of the effects of the environment on the tuna resources in the Atlantic, on the levels of recruitment and the catchability of the stocks, as well as on the behavior of tunas relative to their respective environment.

These research projects have been the subject of various papers presented to the SCRS in 1998 by French scientists.

Table 1. French catches of tunas (in 1,000 MT), 1987-1997

Species	*1987*	*1988*	*1989*	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*
Yellowfin	16.6	21.6	30.6	43.8	39.4	37.1	39.0	37.7	30.4	34.6	21.4
Skipjack	15.1	16.3	15.6	16.4	35.2	23.7	36.1	35.6	28.1	25.0	21.2
Bigeye	3.4	3.8	2.8	4.9	8.2	9.1	14.8	14.9	10.8	11.9	8.0
Albacore	2.0	2.8	3.7	3.4	4.2	6.1	7.0	6.0	5.3	4.6	4.5
Bluefin	4.9	6.5	4.9	5.2	5.2	8.3	8.1	12.2	1.03	9.7	8.5
Total	42.0	51.0	57.6	73.7	92.2	84.3	105.0	106.4	84.9	85.8	73.6

NATIONAL REPORT OF EC-GREECE*

by

Directorate General for Fisheries

1. General overview of bluefin tuna fisheries

Fishing activities concerning large pelagics in Greece are implemented on a regular basis since the beginning of last decade. Fishing for bluefin tuna at that time was restricted in the northern Aegean Sea and only a small number of boats were involved in the fishery, mainly using hand line and purse seine.

Since 1992, the bluefin fishery has undergone considerable change Several new vessels using a variety of fishing years (e.g. Japanese-style longlines) have entered the fishery, and the bluefin fishing areas have been expanded throughout the Greek seas, in the Aegean and Ionian Seas as well as in the Levantine Sea. The fishing seasons take place mainly during spring and winter, with greater fishing intensity in winter, according to the demand of the Japanese market.

The main reasons for the diversification of Greek fishermen in the bluefin fishery are the increasing market demand and the prohibitions in Greek legislation concerning the swordfish fishery.

The fishing fleet that caches bluefin tuna cannot be well identified since its characteristics are various and the fleet increases every year. However, the aforemented fishing fleet can be described as comprising about 500 vessels that are active in the coastal zone, have an overall length between 12 and 22 m, and use hand line as their fishing gear.

A small number of purse seiners (about 10) fish mainly in the northern Aegean Sea, using seine nets measuring between 1000–2000 m, with a height of 200 m and a mesh size of 35-50 mm. The bag, which is the central part of the net, is 60 m long and comprises meshes measuring 26 mm.

2. Statistics

The total catches of bluefin tuna reached 1,217 MT in 1997, which represents an increase as compared to 1996 catches.

For the period from 1997 to 2001, and in accordance with the decision EC 97/413 of the Council and with the approval of the new Multi-annual Guidance Programme (MGP IV) for the fishing fleet, fishing effort of the Greek fleet fishing large pelagics has to be reduced by of 3.6%. The latter obligation concerns those stocks defined as over-fished.

EC Council regulation No. 65/EC/98 establishes the TAC of bluefin tuna for each Member State of the EC for 1998. In application of that regulation, and in accordance with a Greek Ministerial decision (nb 249837/97), the licenses of vessels fishing bluefin tuna are controlled as are as the quantities landed or transhipped by vessels flying the Greek flag or registered to Greece.

The Greek Ministry of Agriculture, in collaboration with the University of Athens, recently developed a technical report for the revision of catch data for bluefin tuna for Greece in the Mediterranean for the period 1987-1997 (SCRS/98/90).

3. Research

Research activities on large pelagic fisheries in Greece have been carried out since 1986 by the Marine Institute of Crete and by the University of Athens.

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* Original report in English.

NATIONAL REPORT OF EC-PORTUGAL*

by

Joao Gil Pereira**

1. Status of the fisheries

The Portuguese catches of tunas and tuna like species amounted to 13,501 MT in 1997. The 1997 catch represents a decrease 25.8% as compared to the catch of 1996, and a 46.5% decrease from the 1995 catch. This decreasing trend is mainly due to the decline in the baitboat tuna catches in recent years.

The Portuguese tuna fishery takes place mainly in the Azores and Madeira Islands, where local baitboat fleets target different species of tuna (bigeye, skipjack, albacore and bluefin), depending on the season and the local abundance of each species. The baitboat fishery has an opportunistic character, targeting different species of tuna (bigeye, skipjack, albacore and bluefin), depending on the season and the local abundance of each species. Tuna catches in the Portuguese continental EEZ are taken by several surface gears, and are mostly incidental.

A longline fleet based at continental Portugal mainly targets swordfish, and operates in the North and South Atlantic. The longliners based in the Azores also target swordfish, mainly in the North Atlantic.

Since 1990, a fleet of three longliners based in Madeira has been operating in the eastern Atlantic and in the Mediterranean, catching an average of 300 MT per year. The Mediterranean Sea has been the main fishing area for this fleet but, in 1997, fishing took place mostly in the eastern Atlantic. A total of 282 MT of bluefin were caught in 1997, but only 37 MT were from the Mediterranean.

One trap has been operating in the South of Portugal since 1995, targeting bluefin tuna. In 1997, the bluefin catch taken by this trap was 19 MT. Bluefin catches taken by the baitboat fleets, which operate around the Madeira and Azores Islands, are quite variable from year-to-year and are related to the local abundance of bluefin in the proximity of the islands. The great increase in the abundance of large bluefin tuna around the islands, observed in recent years, is reflected in the baitboat catches. In 1997, baitboats caught 340 MT around Madeira and 107 MT in the Azores area in the first half of the year.

Albacore catches by the Azores baitboat fleet showed a sharp decrease in 1997 (180 MT), after a five-year period of high abundance around the Azores Islands, especially during the fourth quarter of the year.

As concerns the tropical species (bigeye and skipjack tunas), a decrease in the catches has also been observed in recent years in the Azores and Madeira baitboat fisheries.

Tables 1 and 2 summarize the catches of tunas and tuna-like species taken by the Azores and Madeira fleets, from 1995 to 1997. The catches taken by the fleet based in continental Portugal for the same period, by species, gear and area are given in **Table 3**.

The distribution of the Portuguese baitboat fleet, by gross registered tonnage (GRT), from 1995 to 1997, is given in **Table 4**.

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* Original report in English.

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2. Research and statistics

Research programs on tunas are mainly carried out by the Azores University (Departamento de Oceanografia e Pescas), the Fisheries Research Laboratory of Madeira and the Instituto de Investigaçao das Pescas e do Mar (IPIMAR).

The collection of tuna statistics and sampling for size frequencies of the main species has continued The statistical data have been routinely reported to the ICCAT Secretariat and the results of scientific research have also been presented at the regular meetings and inter-sessional workshops of the Standing Committee on Research and Statistics (SCRS).

In 1998, a scientific observer program of the Azores baitboat fishery was implemented (POPA Program), and the trips by 15 tuna vessels have been covered by the observers.

Table 1. Catches of tuna and tuna-like species (MT) taken by the Azorian fleet, 1995-1997

Gear	*Species*	*1995*	*1996*	*1997*
Baitboat (BB)	BET	4964.0	1771.2	2590.0
	SKJ	603.0	6250.4	3592.0
	ALB	6255.0	821.9	179.6
	BFT	22.0	20.0	107.4
	TOTAL BB	*11844.0*	*8863.5*	*6469.0*
Troll	BON	13.0	24.7	31.6
Longline (LL)	SWO	460.1	409.2	278.0
TOTAL		**12317.1**	**9297.4**	**6778.6**

Table 2. Catches of tunas and tuna-like species (MT) taken by the Madeira fleet, 1995-1997

Gear	*Area*	*Species*	*1995*	*1996*	*1997*
Baitboat (BB)	Madeira	BET	4412.1	3723.3	2766.5
		SKJ	4357.1	2000.0	796.7
		ALB	202.8	799.8	213.1
		BFT	11.9	59.9	340.2
		YFT	48.7	18.2	21.8
		OTH	5.8	0.7	44.1
		TOTAL	***9038.1***	***6601.9***	***4182.3***
Longline (LL)	Madeira	SWO	41.2	50.9	--
Longline (LL)	East Atl. + Med.	BFT	446.4	--	--
	East Atl. + Med.	BET	11.0	--	--
	East Atl. + Med.	SWO	2.7	--	--
	East Atlantic	BFT	--	97.2	246.0
	Mediterranean	BFT	--	274.3	37.0
		TOTAL	***460.1***	***371.5***	***283.0***
Baitboat (BB)	South Atlantic	YFT	155.2	259.2	149.1
		BET	253.5	316.3	80.4
		SKJ	26.1	25.6	5.9
		ALB	655.0	494.2	255.8
		TOTAL	***1098.8***	***1095.4***	***491.2***
TOTAL			**10629.5**	**8119.7**	**4956.3**

Table 3. Catches of tuna and tuna-like species (MT) taken by the continental Portuguese fleet, 1995-1997

Gear	*Area*	*Species*	*1995*	*1996*	*1997*
		YFT	5.0	2.8	2.2
		ALB	12.0	9.9	2.4
		LTA	72.0	183.6	98.4
Purse seine & Surf	NE Atlantic	SKJ	10.0	23.3	2.6
		OTH	229.0	184.4	105.1
		BON	57.0	51.4	13.3
		TUS	--	--	84.3
		SWO	1.0	0.8	0.6
		LTA	--	--	211.5
Trap	NE Atlantic	BFT	1.0	15.0	19.1
		BON	--	--	2.6
		SKJ	--	--	0.6
		YFT	14.0	7.5	3.2
		BFT	--	--	19.2
		BON	7.0	5.2	1.8
Longline	NE Atlantic	SWO	1,115.0	997.5	684.8
		ALB	--	1.5	--
		SKJ	--	1.9	0.3
		LTA	--	34.1	10.5
		OTH	188.0	45.5	91.5
Trawl	NW Atlantic	BFT	--	7.2	--
		SWO	379.6	389.4	440.6
		YFT	8.0	--	--
Longline	South Atlantic	BET	22.0	--	--
		OTH	72.0	17.8	81.8
TOTAL			**2,191.6**	**1,971.7**	**1,876.4**

Table 4. Distribution of the Portuguese baitboat fleet, by GRT, 1995-1997

	Azores			*Madeira*		
GRT	*1995*	*1996*	*1997*	*1995*	*1996*	*1997*
< 50	--	--	1	18	25	22
51-150	18	17	14	18	20	17
> 151	11	8	9	9	8	9
TOTAL	**29**	**25**	**24**	**45**	**53**	**48**

NATIONAL REPORT OF EC-SPAIN *

1. General information

Spanish catches of tuna and tuna-like species in 1997 amounted to 116,055 MT, comprised as follows: 24,155 MT yellowfin; 12,671 MT bigeye; 37,715 MT skipjack; 17,366 MT albacore; 14,862 MT swordfish; 8,047 MT bluefin tuna; and 1,239 MT of other species.

For all species combined, size sampling was carried out on more than 400,000 fish in 1997 (39,463 yellowfin; 63,042 skipjack; 19,080 bigeye; 48,720 albacore; 29,121 bluefin; 192,560 swordfish; and 10,294 various species).

2. The fisheries

2.1 Tropical tunas and Canary Islands tunas

-- The tropical purse seine fishery

Among the tuna fisheries in the eastern inter-tropical Atlantic, the most important is that carried out by large purse seiners of various nationalities, of which the Spanish fleet is one of the major fleets. This fishery is directed at yellowfin and skipjack, with by-catches of other species, such a bigeye and small tunas.

In 1997, there were 20 vessels in operation, four less than in 1996. The vessel carrying capacity (calculated taking into account the time each vessel has spent in the fishing grounds) declined to 9,870 MT (from 13,019 MT in 1996). Effort, expressed in standardized days fishing, was 6,666 days (as compared to 8,485 days in 1996).

The catches taken by this fleet amounted to 61,604 MT (75,189 MT in 1996), broken down by species as follows: 23,570 MT yellowfin (31,711 MT in 1996); 30,940 MT skipjack (33,461 MT in 1996); 6,411 MT bigeye (9,014 MT in 1996); and 683 MT of other species (1,003 MT in 1996).

CPUE (in MT/standardized days fishing) was: 3.54 MT for yellowfin (3.74 MT in 1996); 4.64 MT for skipjack (3.94 MT in 1996); and 9.24 MT for the combined species (8.86 MT in 1996).

The average weights of the fish caught were: 6.9 Kg for yellowfin caught with objects and 37.5 Kg for free school fish; 1.7 Kg for skipjack caught with objects and 2.2 Kg for free school fish; and 3.2 Kg for bigeye caught with objects and 4.6 Kg. for bigeye caught in free schools.

-- The tropical baitboat fishery

This fishery was carried out by six baitboats that operated from the port of Dakar (Republic of Senegal). The target species are yellowfin, bigeye and skipjack. In recent years, the majority of the catches are taken under tuna "spots" (or "manchas").

The number of vessels increased by two units as compared to 1996. Total catches amounted to 2,476 MT (as compared to 2,015 MT in 1996). The breakdown by species is as follows: 585 MT yellowfin (448 MT in 1996); 1,191 MT skipjack (572 MT in 1996); and 701 MT bigeye (995 MT in 1996).

Effort, in days fishing, was 622 days, which was higher than in 1996 (450 days). The average sizes caught were: 6 Kg for yellowfin; 8 Kg for bigeye, and 2.5 Kg for skipjack.

* Original report in Spanish.

– The Canary Islands fishery

This fishery takes place off the Canary Islands and the African coast close to the Islands, and is carried out by vessels using live bait. The number of baitboats that operated in 1997 was 378, and these vessels carried out a total of 5,799 trips, with a estimated duration of 9,519 days at sea.

Catches by this fishery reached 13,298 MT in 1997 (as compared to 13,278 MT in 1996). The breakdown, by species, is as follows (with the corresponding catch in 1996 in parentheses): bluefin tuna: 360 MT (157 MT); yellowfin tuna 411 MT (2,621 MT); albacore: 1,045 MT (743 MT); bigeye: 5,559 MT (5,253 MT); skipjack: 5,884 MT (4,472 MT); and others: 39 MT (32 MT). The average weight of fish caught was 7 Kg for yellowfin, 18 Kg for albacore, 13 Kg for skipjack and 177 Kg for bluefin.

2.2 Temperate tunas

– Bluefin tuna (east Atlantic)

Catches of bluefin tuna by the baitboat fishery in the Bay of Biscay in 1997 amounted to 2,742 MT. The catch per unit of nominal effort of the age class (fish between 8-14 Kgs.) which is used as an index of abundance in the stock assessments was 39 fish per day (SCRS/98/47), which represents a decline as compared to the nominal index estimated in 1996. During the autumn months, part of the Cantabrian baitboat fleet moves to the Golf of Cadiz (ICCAT Statistical Area 58). Catches in 1997 in this area were 215 MT, which is similar to that of 1996. Part of the troll fleet that shifted to the Mediterranean in the autumn caught 5 MT of this species. In the eastern Atlantic (South Atlantic area of Spain), bluefin tuna are also caught by trap (4 operative units), whose catches reached 2,723 MT, which was a 56% increase with respect to the previous year and an increase of 47% as compared to the annual average of the last five years. In addition, bluefin tuna catches are taken in the Canary Islands area (see section 2.1 on the Canary Islands fishery).

– Bluefin tuna (Mediterranean)

Spanish catches of bluefin tuna in the Mediterranean Sea were 2,205 MT in 1997, which represents a 17% decline compared to those of the previous year (2,588 MT), and a 22% decline with respect to the average annual catch of the last five years. Fishing effort also decreased, due to the entry into force of regulatory measures relative to the purse seine moratorium and minimum size.

Bluefin tuna are caught by purse seine, surface longline, hand line, trap, baitboat, and by other surface gears. This is a seasonal fishery that takes place from April to October.

The purse seine fishery remained stable in terms of the number of vessels (6) and declined as concerns fishing effort in number of days at sea and days fishing. Catches also decreased by 30%, and amounted to 1,172 MT, as compared to 1,675 MT in the previous year. Hand line catches amounted to 69 MT, compared to 206 MT in 1996. Surface longline catches were 296 MT in 1997, whereas bluefin catches taken by Japanese type longline rose to 576 MT. Lastly, the decline is confirmed in the surface fishery taking juveniles, whose catch dropped to 29 MT, and which was comprised of fish weighing very close to the minimum size of 6.4 Kg. The trap fishery maintains two operative units in the Mediterranean and none of those caught bluefin tuna.

– Albacore (North Atlantic)

The total catch taken by the Spanish surface fleets in the fisheries of the Cantabrian Sea and adjacent waters of the eastern Atlantic, North of 35°N in 1997 were 16,199 MT. The baitboat fleet in the Bay of Biscay caught 8,348 MT, the same level as in 1996, with a nominal effort of 6,414 fishing days. The troll fleet landed 7,864 MT in 1997, 18% more than in 1996, with 11,464 days of effort, 13% less than the previous year (12,287).

The baitboat fleet and troll fleets carried out their activities during the summer months and in early autumn, when environmental conditions permit (June-October). The major part of the catch is comprised of juvenile fish and sub-adults (55-90 cm) from the stock in the North Atlantic. The number of vessels remained stable since 1994: 220 baitboats and 440 troll vessels. In the autumn months, part of this fleet shifts to the southwest of the Iberian Peninsula, in the Atlantic.

Catches in 1997 were 7 MT, which represents an strong decline as compared to 1996, when 553 MT were caught by baitboat. These catches are comprised of sub-adult and adult fish (75-100 cm). This species is also caught in the Canary Islands area (see section 2.1).

– Albacore (Mediterranean)

In the autumn, some troll vessels and baitboats from the Cantabrian Sea shift to the western Mediterranean. The catches obtained in 1997 amounted to 202 MT by the troll fleet. The catches are comprised of juveniles and sub-adults (60-80 cm).

– Swordfish

Swordfish are caught mostly by the Spanish surface longline fleet in the North and South Atlantic and in the Mediterranean Sea. The basic data relative to the activity of this fleet in 1997 (catch, nominal effort, size sampling, are shown in **Table 1**.

The surface longline fleet caught 5,133 MT from the North stock, 8,461 MT from the South stock, and 1,179 MT in the Mediterranean. In addition, other gears caught 4 MT in the North Atlantic and 85 MT in the Mediterranean, as by-catch of other longline fisheries or by other gears. The fishing areas of the Spanish fleet in 1997 did not change significantly from 1996 (SCRS/98/109).

The traditional fleet of surface longliners that fish in the North stock continued with the fishing strategy initiated in recent years (based on economic maximization of the fishing activity without clearly defining the target species), varying their target species several times during the same trip, depending on availability. This change in strategy will have implications in the interpretation of the standardized CPUE indices.

In the Mediterranean in 1997, the number of operative longliners remained stable, with the majority of these vessels fishing with seasonal permits, although catch and effort increased slightly (+10%) due to better environmental conditions, but which resulted in a 7% decline in the average annual catch of the last 10 years. During the months of May , June and July, many vessels changed their fishing strategy and directed effort at bluefin tuna by making changes in the gear. August to December are the months with the most important fishing activity.

– Small tunas

In the Mediterranean, catches of Atlantic bonito *(Sarda sarda)* by trap and surface gears remained at the same level as the previous year (600 MT). However, catches of frigate tuna *(Auxis spp.)* decreased by 70% (from 2,296 MT in 1996 to 600 MT in 1997).

3. Research and statistics

3.1 Tropical tunas and Canary Islands tunas

A total of nine documents of various types were presented to the 1998 SCRS meeting relative to the different tuna fisheries.

– The tropical purse seine fishery

The principal source of information is the fishing logbooks that are completed by the vessel captains on a daily basis and/or when a set is made. The coverage rate attained in 1997 was 88% of the catches. Sampling of the catches was carried out at the major landing and/or transshipment ports: Abidjan (Côte d'Ivoire), Dakar (Republic of Senegal) and La Puebla del Caramiñal (Galicia, Spain).

As regards the size composition of the catches, 2,262 samples were made in 1997 in which 94,162 tuna were measured: 30,164 yellowfin, 46,576 skipjack, 9,146 bigeye, and 8,276 fish of other species.

Since 1990, this fishery has undergone a change in the exploitation pattern, which has consisted of the massive introduction of artificial floating devices. As a result of this change, research in recent years has centered on the monitoring and analysis of the development of this new fishing technique.

In 1996, a joint Spanish-French project was initiated, financed by the EU, to study the statistical data processing scheme in this fishery, and more precise statistics are now being obtained on the species composition of the catches and their size distribution, taking into account different time-area strata and different school types (free schools, objects, carcasses, etc.). This project finalized in December, 1997. The major conclusions were presented to the SCRS last year. As a result of this project, the species composition and size distribution of the catches has been corrected, for the 1991-1996 period.

Another Spanish-French joint project was started in 1997, partially financed by the EU, to study the causes for the increase in the bigeye catches by this fleet. Project activities include the introduction of observers on board tuna purse seiners. This observer program started in June, 1997, and in still on-going. There were 11 observer cruises carried out in 1997, and data were collected from four other vessels during the period of the moratoria on floating objects fishing (November and December, 1997, and January, 1998).

– The tropical baitboat fishery

The fishing logbooks that are completed by the vessel captains are the source of information on this fishery. The coverage rate is estimated to be close to 100%. Information on size distribution of the various species caught is collected by a reporter/sampler at the port of Dakar (Senegal). In this fishery, in the last few years, the most important catches are taken under objects ("spots").

A total of 61 samples were taken (52 in 1996) in which 2,950 fish were measured (5,075 in 1996). Of these, 866 were yellowfin (1,166 in 1996), 399 bigeye (2,053 in 1996) and 1,685 skipjack (1,856 in 1996).

The Canary Islands fishery

There is an information and sampling network in place at the major tuna landing points in the Canary Islands. This network is comprised of 10 reporter-samplers at the following ports: La Restinga (Hierro Island); Playa Santiago and Valle Gran Rey (La Gomera Island); Santa Cruz de La Palma and Tazacorte (La Palma Island); Playa de San Juan and Santa Cruse de Tenerife (Tenerife Island); Arguineguin and Mogán (Gran Canary Island); and Arrecife de Lanzarote (Lanzarote Island) For vessels that unload at the port of Algeciras (Peninsula), there is also a reporter-sampler. The coverage rate for catch data is 100%.

There were 172samples taken, with 14,541 fish measured (18,191 in 1996), by species, as follows: 1,373 yellowfin, 470 albacore, 7,700 bigeye, 4,800 skipjack and 188 bluefin tuna.

Monitoring of the fishery under objects ("spots") continued in 1997, by means of periodic sampling at the port of Arrecife de Lanzarote and implementation of fishing logbooks, aimed at obtaining precise data on this fishing activity, such as species composition of the catches, catches by time intervals, etc. The data collected are now being processed.

3.2 Temperate tunas

– Bluefin tuna

Data corresponding to ICCAT Tasks I and II have been collected on bluefin tuna from the eastern Atlantic and Mediterranean on the following fishing gears, by time-area strata: surface longline, trap, purse seine, Japanese longline, hand line, baitboat, troll and other surface gears.

The collection of effort data by time/area and size sampling of the Bay of Biscay baitboat fleet is carried out by reporter/samplers located at the major ports: Fuenterrabia, Guetaria and Algeciras. In addition, fishing logbooks were collected from the baitboat fleet in the summer and fall fisheries to estimate effort by time-area strata.

A sample of 400 fin ray spines were collected from the Cantabrian fishery, to read and to develop a size-age key in order to obtain information on the stock structure of the baitboat fishery in 1997.

In the Mediterrancan, the Research Program DG-XIV 95/10 on bluefin tuna continued. The main objective are related to compiling information on recruitment areas, growth, stock structure and the impact of fishing on the catch of juveniles below the minimum size recommended by ICCAT. Growth studies were carried out using modal progression and tag-recovery data, as well as by analysis of the daily growth rings on the otoliths. To study stock structure, a cruise was cruise was carried out in which 401 juvenile bluefin tuna were tagged and released. In addition, heart, liver and muscle samples were taken from 200 fish for genetic analysis.

In accordance with an ICCAT recommendation, a live weight-belly meat relation was presented to the 1997 SCRS in document SCRS/97/80.

In 1997, an observer program started on board longliners in the Mediterranean to study the gear selectivity and to obtain on by-catch, discards and environmental and oceanographic factors.

The sampling and information network was strengthened in the Spanish South Atlantic area and Mediterranean with systematic coverage of the ports of Huelva, Barbate, Tarifa, Algeciras, Motril, Adra, Aguilas, Cartagena, Alicante, Palma, Castellón, San Carlos de la Rapita and Tarragona. Of note is the recent addition of the port of Cartagena to this network, particularly in view of its importance for bluefin tuna landings. Sampling of 29,003 bluefin tuna was carried out in the Mediterranean, of which 7,840 fish were sexed.

– Albacore

Data were collected corresponding to ICCAT Tasks I and II from the baitboat fleets in the Bay of Biscay, the Spanish South Atlantic region, and the Mediterranean. The collection of information on effort by time-area strata and size sampling of the Bay of Biscay baitboat fleet has been carried out by reporter-samplers located at the major Cantabrian ports (13) and Algeciras in the South Atlantic. The estimates of catch and effort by gear, month, and ICCAT statistical area are obtained from the surveys conducted at these ports, which represent a coverage rate of 85-90% of the total landings. Fishing logbooks were also collected from the baitboat fleet in the summer and fall fisheries to estimate effort by time-area strata.

The size distribution of the catches is obtained by means of random sampling stratified by commercial category. In 1997, some 7,591 fish were measured from the baitboat landings and 40,659 fish from the troll landings. The size ranges were from 45-117 cm.

Standardized catch rate indices were developed, relative in number of fish by age group for the Spanish baitboat and troll fisheries (SCRS/98/143).

In 1997, two AZTI+IEO research projects concluded. One of these projects on the "Application of Tele-detection to the Albacore Fishery in the Northeast Atlantic" was financed by the CICYT (Inter-ministerial Commission for Science and Technology), which studied the relationship between surface temperature conditions, the presence of gyros and fronts, and daily yields of the Spanish surface fleets. The other research project, coordinated by AZTI in collaboration with the University of the Azores and the IEO (EU DG XIV/011/95), which was financed by the EU, dealt with the "Standardization of Daily Yield of the Spanish Fleets and the Portuguese baitboat of the Azores from Fishing Logbooks", for the adult component of the stock (SCRS/98/148).

– Swordfish

In 1997, the collection of data continued to obtain ICCAT Task I and II information, by reporter/samplers at ports, voluntary IEO fishing logbooks, and observers on board long distance longliners.

The combination of these sources of information resulted in the collection of ICCAT Task II data by 5x5 degrees by month and fleet type (SCRS/98/109), as well as the updating of standardized CPUEs for the Atlantic and Mediterranean (SCRS/98/50 and SCRS/98/110) and the relation of some of these indices with environmental factors (SCRS/98/111).

There were 192,560 fish sampled in 1997, which represents an overall coverage of size sampling of 50% of the fish caught. This sampling coverage fluctuated in the range of 20% to 81%, depending on the ICCAT area considered. Biological sampling of swordfish continued to obtain size-sex variables by time-area strata. In 1997, some 11,000 fish were sexed.

In 1997, scientific tagging cruises were carried out in the northeast Atlantic directed at swordfish and associated species (IEO+EU project 96/031). Some 1,000 fish were tagged between both cruises, of which almost 200 were swordfish. Sharks and billfishes were also tagged.

The voluntary tagging by the commercial fleet in the Atlantic has continued to be encouraged. Close to 900 fish were released by the fleet in the Atlantic between 1997 and 1998, of which some 300 were swordfish (less than 125 cm LJFL). During this same period, scientific observers tagged and released about 150 fish, of which about 55 were swordfish. Diverse species of pelagic sharks and billfish were also tagged by the fleet and by scientific staff.

Contacts with the fleet continued and were intensified, with an aim to a quantitative and qualitative improvement in the recovery of tagged fish. In 1997, about 200 recoveries were made in the Atlantic by longliners. All the tags and their corresponding information have been transmitted to the respective tagging laboratories, basically in the United States, Ireland and Spain. In recent years, a considerable progressive improvement has been detected in the quantity and quality of the tagging information provided by the fleet. In addition, publicity has been prepared for the longline fleet on tagging and recovery techniques as well as on the use and possible recovery of electronic tags.

In 1997, the European research project (IEO+EU DG XIV-MED93/013) concluded. This project studied the stock structure of swordfish in the Atlantic and Mediterranean using mitochondrial DNA. The results have been integrated in a common data base together with data from other scientists (SCRS/98/127 and SCRS/98/128).

In 1996-1997, a project had been started to assess the potential use of swordfish parasites as biological markers. The preliminary results (SCRS/98/103) suggest that certain species could be useful in the future for this purpose while, on the contrary, the use of other species of parasites previously suggested was not advisable.

An observer cruise was carried out on board longliners in the Mediterranean to update the abundance indices and a project (DG XIV 97/74) is being developed to study the incidence of the different surface configurations on the catch of juveniles.

– Small tunas

Since early 1997, the EU DG XIV 96/96 project is being carried out. The objectives of this project are related to the study of biological parameters (reproduction, growth, stock structure) on these species.

4. Other research activities

4.1 Tropical tunas

– The purse seine fishery

The catches of the purse seine fleet that operates in the Atlantic Ocean are monitored and data are presented to ICCAT under the NEI category. This fleet encompasses vessels from various countries which usually do not provide official statistics to ICCAT. In 1997, seven of these vessels were monitored. Besides, periodic size sampling is carried out to determine the species composition and the size distribution of each one of the species caught. In 1997, some 20,814 fish were sampled, corresponding to 7,060 yellowfin, 9,901 skipjack, 1,835 bigeye and 2,018 other species.

– The baitboat fishery

As in the purse seine fishery, in 1997 catch and effort data from a baitboat included in the NEI category, were processed. The catches amounted to 357 MT (516 MT in 1996), broken down as follows: 48 MT yellowfin (106 MT in 1996), 148 MT bigeye (206 MT in 1996) and 161 MT skipjack (204 MT in 1996).

5. Application of the ICCAT conservation and management measures on tunas

– Swordfish

As regards the measures adopted by ICCAT, the Spanish fisheries administration has reported to the EU, for its transmission to the Commission, the measures of application derived from the incorporation in Community law of the corresponding measures, as well as the management measures adopted at the national level.

Once the application of the Ministerial Order of November 6, 1995, was consolidated for the regulation of the activity of the Spanish fleet directed at swordfish, progress continued towards management of the fishery through the establishment of a Fishing Plan and vessels quotas for the swordfish fishery in the Atlantic Ocean South of 5°North. In this way, through a resolution of the General Directorate of Fishery Resources of June 30, 1998, the annual plan of fishery activity for this fleet was approved, based on criteria of the allocation of effort and/or catch quotas.

The data indicate that in the North Atlantic Ocean, while the catch limit has been exceeded by 472 MT, there has been a change in trend since the level of catches was reduced by 7% as compared to that of 1996. In order to alter the situation, work is on going to adopt a management measure similar to that which has been adopted for the South Atlantic. However, the heterogeneity of the fleets involved has not permitted, up to now, finalizing a fishing plan or assigning vessel quotas.

The reporting of catch data, based on an obligatory scheme of periodic communication, permits monitoring the development of the fishery, for which on December 22, 1997, the Spanish Administration prohibited swordfish fishing in the North.

In the South Atlantic, while the catch limit corresponding to 1997 based on an ICCAT recommendation has been surpassed, catches have been reduced by 12%. The Spanish Administration prohibited swordfish fishing on December 19.

The provisional data for 1998, as an effect of the implementation of all the management measures, show a notable decrease in catches.

It should be pointed out that this fishery is faced with a crisis due to (1) the introduction of imported swordfish in Community markets from southeastern Asian countries that do not comply with the ICCAT conservation measures, and (2) the landings of fish from flag of convenience vessels. The lack of control of the commercial flow of products makes it difficult for the fishing sector to assume a reduction in catches as well as rules which are becoming more and more strict.

– Bluefin tuna

In the Mediterranean, the reduction in catches (about 17%) continued, due to the decline in fishing effort. On the other hand, the catches by surface gears have continued to decline, which has resulted in eliminating catches of fish less than 6.4 kg.

In the Atlantic Ocean, catches have increased in the South Atlantic region of Spain due to a higher yield of the traps, resulting in a 56% increase as compared to the previous year.

In order to improve compliance with the recommendations, three decrees were approved in 1997 and in early 1998

Spanish Royal Decree No. 1315/97 through which Spain established a fishing protection area in the Mediterranean Sea, to improve the conservation of species, such as bluefin tuna, and the need to monitor the fishing activities of vessels of third countries that do not comply with the ICCAT regulations.

Ministerial Order of February 17 which regulates tuna fishing in the Atlantic Ocean, through different instruments such as the establishment of an annual plan of fishing activity; dispatching fishing authorities to the vessels that participate in the fishery; the establishment of obligations of boat owners to periodically communicate data relative to fishing days, by area of effort, as well as catches by species and by fishing zones.

Spanish Royal Decree No. 71/1998 regulates the practice of fishing of tunas and tuna-like species in the Mediterranean, and establishes management measures similar to those for the Atlantic, and fishery monitoring measures, the most noteworthy being that relative to the obligation of having a fishing logbook and to complete a landing declaration. In the EU regulation, it is expected that this type of obligation will only be applicable in the Mediterranean starting in 1999.

– Tropical tunas

As regards yellowfin tuna and the recommendation to maintain effort at 1992 levels, Spain has already complied with this in 1996, registering another reduction in catches of 26% with respect to 1996.

In the case of bigeye tuna and the catch limitation to levels of previous years (1991-1992), while MSY levels are not determined, the decrease in catches is notable (29% with respect to 1996). The catch level is 6,411 MT whereas the 1991-1992 average is 18,069 MT.

This success is due, in part, to the self-imposed regulation agreed by the French and Spanish fishing sectors, through the establishment of a voluntary closure, from November, 1997, to February, 1998, in the Gulf of Guinea. This self-imposed regulation implies that vessels cannot, during the period of prohibition, fish using the so-called "objects" fishing method, which consists of placing buoys or artificial or natural floating objects.

Once the scientific evaluation is available, the results will be compared with abundance levels and the increase in sizes.

Lastly, in compliance with the recommendation on bigeye and yellowfin, Spain put into effect in June, 1997, an observer program that covered all the components of the fleet. The coverage rate attained was 24.56% of the vessels. This is a high figure, taking into account that in November the closed season started, which was respected by all the Spanish vessels.

6. Application of the ICCAT Bluefin Tuna Statistical Document Program in 1997

6.1 Bluefin tuna imports

In 1997, a total of 4,906 MT of bluefin tuna were imported and/or had entry in Spain. The breakdown is as follows: France (3,466 MT), Italy (1,023 MT), Portugal (415 MT), and Ireland (2 MT).

6.2 Bluefin tuna exports

Compliance with the ICCAT Bluefin Tuna Statistical Document Program in 1997 permitted a more in-depth analysis of the complexity of the application of the Program.

The problems that have been detected in the reporting of these documents concern the gap between the date the Chambers of Commerce validate the documents and the real export date which, in the months at the end of the year, is more notable. In order to clarify the completion of these documents, continuous contact is maintained with the official Chambers of Commerce, authorized to validate the documents.

The comparison of the amount of bluefin imports provided by the Government of Japan in its biannual reports with the bluefin exports from the Government of Spain, continues to show a difference. Steps are being taken to rectify this situation, in collaboration with the Authorities of Japan, through business trips to Japan.

The total number of documents validated by the Chambers of Commerce in 1997 was 751, which includes a total volume of bluefin tuna exports from Spain of 2,929,973 kg (live weight). Of this amount, 2,915,249 kg corresponds to Spanish catches (745 documents) and 14,723 kg (live weight) to French catches (6 documents validated by Spanish Chambers of Commerce, in accordance with the mutual validation agreement between Spain and France).

A breakdown, by areas (East Atlantic, Mediterranean), gears, product type (fresh, frozen) and the condition of fish can be obtained from the pertinent Spanish authorities.

7. Inspection scheme and activities

Inspection activities relative to the ICCAT Scheme and carried out by the Monitoring Authorities of the Kingdom of Spain centered in the Atlantic area and in the Mediterranean area. These activities are carried out throughout the year on vessels that catch and transport species mandated by the ICCAT Convention.

During the spring and summer months, coinciding with the fishing seasons for Atlantic bonito *(Thunnus alalunga)* in the northeast Atlantic and bluefin tuna *(Thunnus thynnus)* in the Mediterranean, the General Secretariat of Maritime Fishing, through the Under-Directorate General of Maritime Fishing and the Under-Directorate General of Fishing Inspection, and in collaboration the Navy (General Plan of Fishing Surveillance), increased the human and material resources for the inspection and monitoring of activities relative to these species.

– Man power

For the monitoring of fishing activities relative to the ICCAT Scheme, the General Secretariat of Maritime Fishing, through the Under-Directorate General of Fishing Inspection, designated a total of 47 inspectors.

– Materials (Maritime, land-based, aerial)

Maritime means include patrol vessels of the Spanish Navy designated to conduct monitoring activities within the General Plan of Fishing Surveillance. Land/based materials include 30 four-wheel drive vehicles which pertain to the General Secretariat of Maritime Fishing and which are distributed all along the Spanish coast. Three helicopters, which also pertain to the General Secretariat of Maritime Fishing, comprise the aerial support material for monitoring purposes.

– Results of inspections

For the Atlantic, a total of 74 vessels were inspected (63 at port and 11 at sea). O these, 13 vessels had infractions (11 at port and 2 at sea). 35). There were 35 aerial sightings, with no infractions noted. (Detailed information on the inspections carried out and on the activities of flag of convenience vessels at Spanish ports can be obtained from the Spanish authorities.)

Table 1. Summary of the activity of the Spanish surface longline fleet in the North and South Atlantic and Mediterranean Sea, 1997

ICCAT area (1)	*Catch (in number) (2)*	*Catch (in weight: kgs.) (3)*	*Effort (in hooks) (4)*	*# of fish sampled (5)*	*Coverage rate (%) (5/2)*
BIL94A	33,314	1,308,737	10,593	12,567	38.8
BIL94B	119,521	3,824,261	25,944	66,708	55.8
BIL96	81,362	4,474,573	8,892	33,997	41.7
BIL97	79,684	3,986,421	11,014	64,563	81.0
BIL95 (MED)	74,725	1,178,661	11,758	14,725	19.7
TOTAL	388,606	13,711,853	68,201	192,560	49.6

(1) ICCAT Areas: BILL94A + BIL 94B = North stock; BIL 96 + BIL97 = South stock; BIL95 = Mediterranean.
(2) Catch, in number of fish.
(3) Catch (in Kgs.) live weight.
(4) Nominal effort, in 10^3 hooks.
(5) Number of fish sampled.

NATIONAL REPORT OF GHANA*

1. Introduction

The tuna pole and line fishery was started in Ghana by the Japanese vessels in the early 1960s and subsequently attracted Ghanaian companies, which today own about 36 vessels. These are either partly owned in the form of joint ventures or fully owned companies.

1.1 The fishing fleet

The tuna resources within the EEZ of Ghana were exploited in 1997 by baitboats and purse seiners. There were 33 boats in operation in 1997 (28 baitboats and 5 purse seiners), which represents an increase of approximately 10% as compared to 1996 (30 vessels: 28 baitboats and 2 purse seiners) (**Figure 1**). All the vessels were Ghana flagged, with the gross registered tonnage of the baitboats between 250 and 500, and that of purse seiners ranging from 400-1000 GRT.

1.2 The resources

Tunas are grouped under the large pelagics, and are comprised of three main species: yellowfin *(Thunnus albacares)*, bigeye tuna *(Thunnus obesus)* and skipjack tuna *(Katsuwonus pelamis)*. These species that are found in Ghanaian waters are part of a large community in the entire Atlantic Ocean. Skipjack tuna was the most abundant of the catches in 1997, accounting for about 45% of the total landings. Baitboats landed 19,615 MT in 1997, while purse seiners landed 6,921 MT. In comparison, landings of skipjack tuna by baitboats and purse seiners in 1996 were 19,138 MT and 5,147 MT, respectively.

There was an increase of about 16,000 MT in 1997, as comparted to the total tuna landings in 1996 (37,255 MT). This notable increase can be attributed to the expansion of the purse seine fleet and its subsequent catches. Catches of yellowfin tuna increased almost two-fold, from 12,240 MT in 1996 to 23,249 MT in 1997. The breakdown by species landed in 1997 is shown in **Table 1**.

The mean baitboat CPUE in 1996 was 5.82 MT per day, whereas that in 1997 rose to 7.26 MT per day. However, the mean purse seine CPUE fell from 21.95 MT in 1996 to 13.66 MT in 1997. These observations of increased effort of purse seiners and its corresponding decrease in catch may indicate a decline in stock levels in the area fished, which is often slightly different and further off-shore than that of the baitboats. The increased CPUE for the baitboats indicates a stable trend in catches of the fleet. The trends in CPUE (catch per day fishing) for 1996 and 97 are shown in **Figure 1**.

2. Abundance

The International Commission for the Conservation of Atlantic tunas (ICCAT), of which Ghana is a member, is the body responsible for conducting research and management of tuna resources in the Atlantic Ocean.

ICCAT has assessed that the present level of exploitation of yellowfin, bigeye and skipjack tunas in the eastern Atlantic Ocean poses no danger for future exploitation of the resources. Skipjack catches in the region range from 100-150,000 MT per year, while the average annual landings of this species has been on the order of about 25,000 MT. Scientific findings on the skipjack resource indicate that the present catches can be doubled.

3. Exploitation

Tuna baitboats are the main exploiters of tunas in Ghanaian waters, using anchovy *(Engraulis encrasicolus)* as the main bait for their operations. Baitboat operations are limited, to some extent, in that these vessels periodically have to

* Original report in English.

come close in-shore for bait which is readily available, especially during the period from October to December. Baiting time on average is about 8-10 days per trip of approximately a month.

In addition to the use of anchovy to attract tunas, about 3,000 rafts (payaols) are used as fish aggregating devices. These devices of late have been known to attract juvenile tunas. ICCAT is taking steps to address this problem.

4. Marketing/processing

The majority of the tuna landed in Ghana is processed by canning by two companies, namely Pioneer Food Cannery owned by Starkist International, and Ghana Agro-Foods Company Ltd. Both companies are located at Tema. The Pioneer cannery started in June, 1994, processing an average of 160 tons of whole tuna per day, whilst the Agro Foods Company, which started operations in 1995, processes between 7 and 10 tons per day.

In 1997, seven (7) tuna purse seiners flying the Côte d'Ivoire flag berthed at the port of Tema to discharge tuna to the Pioneer Food Cannery. Information on their catch was collected for statistical purposes, for analysis at the CRO in Abidjan.

5. Research and statistics

The Marine Fisheries Research Division of the Fisheries Department is the Government agency responsible for tuna research and statistics in Ghana.

5. 1 Research

Sampling of the three major species of tuna was carried out from the Tema port to determine, among others, length frequency distribution to be used for stock assessment purposes. This sampling scheme conforms to ICCAT regulations. Length measurements for skipjack, yellowfin and bigeye tuna were taken from all fish wells on board vessels, while the species were being discharged at port. Sampling coverage of vessels was 90%. Preliminary analysis of the size ranges of skipjack, yellowfin and bigeye tuna caught by purse seiners and baitboats are shown in **Table 2**. Data on catch and effort were reported on ICCAT forms, and Task I, II and III were submitted accordingly.

5.2 Statistics

Fishing companies exploiting tuna resources submit their catch data at the end of each month to the Research Division. These data include information on landings by species and size, fishing effort (in days) and baiting time (days). Monthly estimates are computed from the data provided. In addition, logbook information on the vessels was obtained from Captains on board tuna vessels on a trip basis. These data are submitted to ICCAT for processing to ascertain stock levels in different regions.

The logbook recovery rate in 1997 was very low and their initial processing (by coding) was also low. Problems attributed to this low output in recovery were due to the lukewarm attitude of some fishing companies to submit books and the limited staff deployed in the field.

5.3 Billfish Research Program

Beach sampling of swordfish, Atlantic sailfish, blue marlin and white marlin, landed by drifnets at selected sites off the western coast of Ghana, was low. These data, which are also submitted to the Southeast Fisheries Center in Miami, USA, as part of the stock assessment program in the east Atlantic, needs to be revived. Lack of funds and proper supervision of staff have hindered the much needed research. **Table 3** shows catches of billfishes in 1997 (including shark catches).

6. Summary

On a whole, the tuna sector of the fishing industry in Ghana looks stable and there is room for expansion. However, there is a need to closely monitor operations of purse seiners whose mean CPUE (catch per day fishing) dropped in 1997

(see Table 4 and Figure 2). In this regard, more research is needed to fully understand the dynamics of the various species in relation to the mode of exploitation and environmental factors prevailing. A summary of Ghanaian tuna catches from 1971 to 1997 is given in Table 5 and Figure 3.

Table 1. Tuna species landed (MT) in Ghana, by gear, in 1997

Species	*Baitboat*	*Purse seine*
Skipjack	19,615	6,921
Yellowfin	16,677	7,626
Bigeye	649	110
Atlantic black skipjack	1,397	630

Table 2. Size range (cm) of tunas caught by Ghana in 1997

Species	*Baitboat*	*Purse seine*
Skipjack	32-60	31-69
Yellowfin	30-73	34-169
Bigeye	32-71	33-80

Table 3. Ghanaian billfish catches (MT) in 1997

Species	*Catch (MT)*
Swordfish	114.61
Atlantic sailfish	170.63
Blue marlin	446.40
White marlin	2.89
Sharks	702.96

Table 4. CPUE (MT/day fishing) in 1996 and 1997

	Month	*Baitboat*	*Purse seine*
1996:	January	7.67	--
	February	6.69	30.05
	March	5.35	26.28
	April	5.38	--
	May	5.85	24.53
	June	2.95	23.75
	July	3.08	--
	August	4.15	--
	September	5.51	18.84
	October	7.12	18.90
	November	9.21	20.69
	December	6.88	12.58
1997:	January	6.35	--
	February	5.88	16.14
	March	6.14	14.06
	April	6.82	17.50
	May	7.58	10.53
	June	7.16	16.67
	July	7.20	8.78
	August	6.28	10.93
	September	8.61	12.85
	October	8.72	13.64
	November	7.92	16.08
	December	8.48	13.13

Table 5 Summary of Ghanaian catches of tunas (MT), 1971-1997

Year	*Catch (MT)*
1971	27,376.0
1972	29,011.8
1973	34,290.0
1974	36,407.2
1975	19,878.0
1976	28,201.5
1977	30,005.9
1978	40,982.6
1979	44,738.7
1980	35,855.9
1981	45,172.7
1982	46,247.1
1983	40,028.9
1984	31,266.4
1985	34,406.8
1986	34,719.9
1987	33,465.1
1988	35,433.3
1989	32,294.3
1990	40,802.9
1991	37,794.6
1992	30,775.6
1993	36,855.6
1994	36,973.3
1995	33,905.0
1996	37,254.7
1997	53,624.8

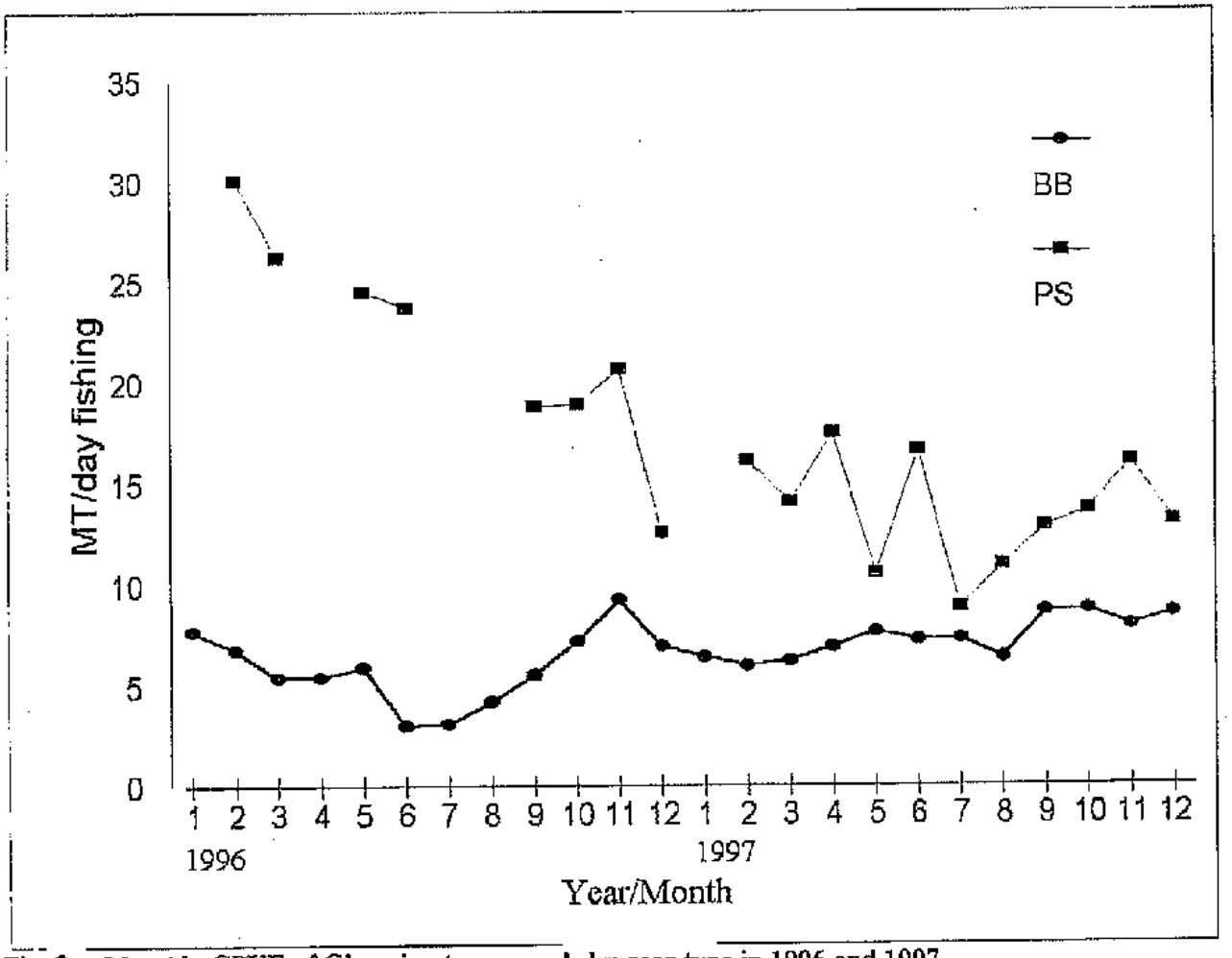

Fig. 2. Monthly CPUE of Ghanaian tuna vessels by gear type in 1996 and 1997.

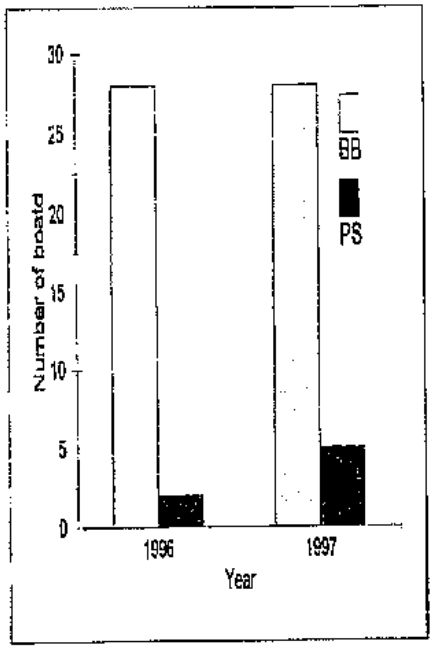

Fig. 1. Number of Ghanian tuna fishing boats by gear types operated in 1996 and 1997.

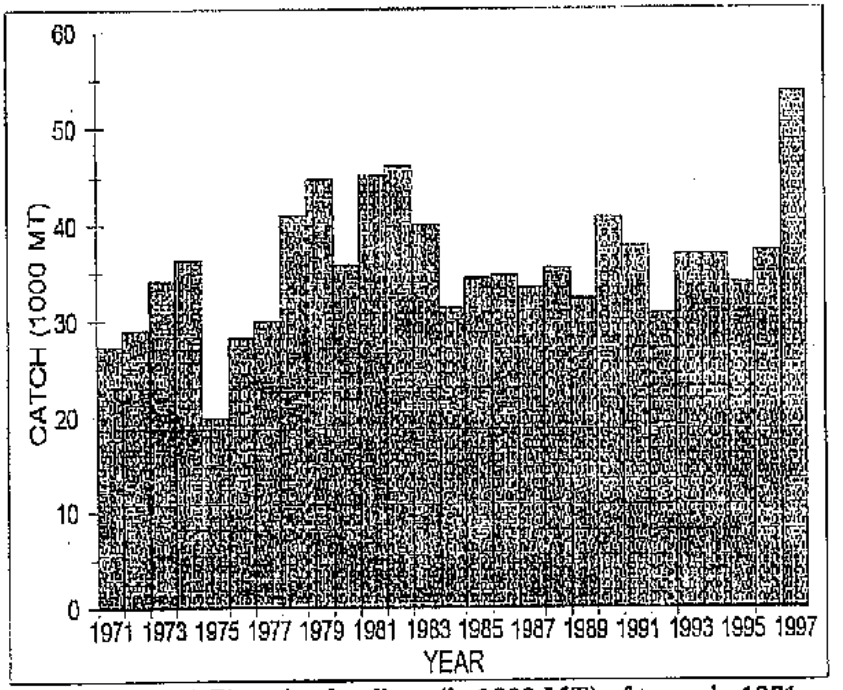

Fig. 3. Annual Ghanaian landings (in 1000 MT) of tunas in 1971 - 1997.

NATIONAL REPORT OF JAPAN*

by

Fisheries Agency of Japan
and
National Research Institute of Far Seas Fisheries

1. Fisheries information

1.1 Type of fisheries

Longline is the only tuna-fishing gear deployed by Japan at present in the Atlantic Ocean. Two other fishery types, baitboat and purse seine, ceased fishing in the Atlantic in 1984 and 1992, respectively.

1.2 Fishing effort trends

The number of Japanese longliners that operated in the Atlantic in 1997 was 234 (**Table 1**). This is a decline of more than 50 boats from the previous year, and the lowest of the past six years. On the other hand, the number of fishing days remained at a relatively high level in 1997 and was the second highest level (44,000 days, 7% less than in 1996). The average fishing days per boat also increased continuously, i.e., 118 days/boat in 1992 to 188 days/boat in 1997. This trend appears to reflect economic trends which have affected the Japanese longline boats, such as low tuna prices, a declining catch, the shortage of crew members, etc. A lower fishing rate of bigeye tuna in the eastern Pacific Ocean, which is the main fishing ground for the Japanese longline fleet, and the strengthened management measures imposed on the southern bluefin tuna fishing might have also contributed to the decline.

1.3 Statistical coverage

Logbook coverage from the Japanese longline fleet in the Atlantic has been very good (90-95%). The coverage rate for 1997 preliminary data is estimated to be about 75%. All statistics on catch in this report are raised so that they represent total statistics.

1.4 Catch trends

The provisional 1997 catch of tunas and tuna-like fishes (excluding sharks) in the Atlantic Ocean and the Mediterranean Sea by the Japanese fishery is estimated to be 40,517 MT (**Table 2**). This is a decline of about 11,000 MT (21%) from 1996. This catch level is much lower than that of the previous five years, even when (except in 1996), fishing effort was much lower than the 1997 level.

Tables 3 and 4 show catches, by species, in the Atlantic and the Mediterranean or the total for both areas for 1992-1997. Bigeye tuna, which is the most important species, accounted for about 70% (27,400 MT) of the total catch of tuna and tuna-like species. In terms of weight, yellowfin tuna, bluefin tuna and swordfish are the important species, in this order. In 1997, catches declined for almost all species : bigeye tuna (5,743 MT, 17%), yellowfin tuna (1,686 MT, 32%), swordfish (890 MT, 24%), southern bluefin tuna (854 MT, 70%), blue marlin (393 MT, 23) %), and bluefin tuna (250 MT, 7%).

The catch by area breakdown (either North/South or East/West) in **Table 4** indicates increased catches in the North Atlantic as well as in western Atlantic (near the border of the South Atlantic and the eastern Atlantic).

1.5 New developments or shifts in the fishery

Two major changes have been observed in recent years. One is the introduction of new materials for longline gear; nylon monofilament for main line, branch line and leader, and braided nylon and new synthetic material for the main line

* Original report in English.

(known as "thinner line" among fishermen since it is thinner than conventional Kuralon line). Among, these materials, braided nylon has been dominantly introduced followed by other new materials (e.g., aramid fiber). In general, 80 to 90% of the total distant water fleet has introduced one of these new materials. Although the results are still preliminary, catch rates of these new gears seem to be better than for conventional gear, but they tend to vary depending on area, time and target species. It is reportedly said that the introduction of these materials was aimed at achieving better catches as well as reducing the workload of crew members since the new materials are lighter than conventional ones. However, the number of hooks per set (equal to day) decreased by about 20% since hauling speed is slower. This means the new materials are cost-effective to some extent. On the other hand, it is reported that they are not as durable as conventional materials.

The collection of information on the material for main and branch lines started in 1993. Since there were many kinds of materials, it was thought not practical to cover all those materials in the statistics. Only nylon material is separated from others, which is the most popular material. The annual deployment rates by materials (nylon or others) are given in **Table 5** for 1994-1997. It is clear from this that the use of nylon increases in popularity from year to year. The use of nylon was between 30-40% in 1994, but it went to over 60% in 1995. In 1997, the percentage of nylon use for both lines was over 80%, while conventional plus other materials declined to 11%.

Another change occurring in recent years is the development of new fishing grounds (**Figure 1**) for bluefin tuna in waters South of Iceland (50°-62°N, 5°-30°W) starting in the autumn of 1994. Geographical bluefin catch distribution in 1997 is given in **Figure 2**. The fishing season shifted to earlier months, from October-November to late August-November in the most recent year. The size of fish in the catch was similar to that in the so-called central area (34°-50°N, 30°-45°W). The average weight (gilled and gutted) was reported at about 100-150 kg.

The geographical distribution of longline fishing effort in 1997 (**Figure 1**) shows that most of the fishing effort was exerted in the northeastern Atlantic, tropical eastern Atlantic as well as waters off South Africa. This tendency well reflects the fishermen's interest in their target species (bigeye, northern bluefin and southern bluefin tunas).

Except for the above two points, the operational pattern of the longline fleet was similar to that of the recent past.

2. Research and statistics

The National Research Institute of Far Seas Fisheries (NRIFSF) is in charge of the collection and compilation of Atlantic fishery data necessary for scientific research on Atlantic tuna and billfish stocks. All the statistical data have been routinely reported to the ICCAT Secretariat and the results of scientific research have also been presented at the regular meetings and inter-sessional workshops of the Standing Committee on Research and Statistics (SCRS).

2.1 Fishery data

The NRIFSF submitted final 1996 catch, catch/effort and part of the size frequency data (Task I, II and biological sampling) of the longline fishery to the ICCAT Secretariat. The compilation of the same data for 1997 has progressed as usual. The preliminary 1997 catch estimates are given in this report. The catch-at-size data for albacore, bigeye, bluefin and yellowfin tunas and swordfish were presented or updated to the latest year.

In accordance with the Commission's recommendation on the bigeye tuna observer program, adopted at the 1997 annual meeting, two observer trips on longline boats were conducted during April-July 1998. These trips were made in the northwest Atlantic off Canada and the United States. The total number of operations observed was 133. The summary report of the Japanese observer program, such as data collection, size measurements and biological sampling of tunas and other fishes, including sharks, were presented to the 1998 SCRS.

2.2 Tuna biology and stock assessment

Studies on biological and stock assessment carried out by the NRIFSF on Atlantic tunas and billfishes have continued. Among these, research related to the ICCAT Bluefin Year Program (BYP) was one of the major activities. The attempt to study ages of bluefin tuna using radiocarbon technique was introduced this year at the ICCAT Bluefin Tuna Stock Assessment Session (Genoa, Italy - September, 1998).

As for the ICCAT Bigeye Year Program (BETYP), the analysis of gonads collected by on-board observers is under way. Genetic analysis of the stock structure of bigeye as well as other species has been continued, and will be presented in the near future.

In 1998, the NRIFSF participated in the following, ICCAT-related meetings: the Preparatory Meeting for the Bigeye Year Program (Madrid, Spain, March 24 & 25), the Meeting of Working Group on Tropical Tuna Abundance Indices (Miami, Florida, USA, May 11 to 15), the Ad Hoc Working Group on the Precautionary Approach (Miami, Florida, USA, May 13 & 14) the Fourth Ad Hoc GFCM/ICCAT Joint Working Group on Stocks of Large Pelagic Fishes in the Mediterranean Sea (Genoa, Italy, September 7 to 12), and the SCRS Bluefin Tuna Stock Assessment Session (Genoa, Italy, September 14 to 23).

3. Implementation of ICCAT conservation and management measures

3.1 Catch quota management systems

-- Reporting by radio

The Fisheries Agency, Ministry of Agriculture, Forestry and Fisheries of the Government of Japan (FAJ) requires all tuna vessels operating in the Atlantic Ocean to submit the following information every ten-day period (early-, middle- and late-period of a month) by radio or facsimile to the FAJ: (1) The position (Longitude and Latitude) of each vessel so that the FAJ is aware of the movement of all vessels operating in the Atlantic Ocean; and (2) the catch weight of bluefin tuna, swordfish, blue marlin and white marlin (Ministerial order on April 2, 1975, and supplemented on December 13, 1991, for swordfish and February 20, 1998, for blue marlin and white marlin).

-- Introduction of vessel position and catch data reporting via satellite

The FAJ is developing a GPS/Inmarsat-A system which enables the FAJ to monitor the operation of each fishing vessel on a real time basis. In the system, vessel-specific data on position and catch are transmitted through a data-terminal, data processing equipment combined with GPS receiver and personal computer on board a fishing vessel. The data are compiled and analyzed by the FAJ in Japan.

Development of the system was initiated in 1992, and the operations have been conducted on a trial basis with installment of a data terminal on an increased number the vessels. About 130 Japanese longline vessels fishing for bluefin tuna in the Convention area have installed the data terminal. The FAJ is improving the system to conduct real-time monitoring on position and catch data instead of reporting by facsimile, for all Japanese longline vessels fishing for bluefin tuna, swordfish, blue marlin and white marlin.

-- Catch quota management

Catch quota: The FAJ sets the catch quota for western and eastern Atlantic bluefin as well as for northern and southern Atlantic swordfish, blue marlin and white marlin, by Ministerial Order in accordance with relevant ICCAT recommendations. Furthermore, the FAJ encourages its fishermen not to conduct direct fishing for swordfish in the Atlantic Ocean.

Fishing year: The FAJ establishes the "Fishing Year (August to July)" for purposes of proper quota management for bluefin tuna, swordfish, blue marlin and white marlin. That means, for example, that the 1997 quotas for these tunas were applied to the 1997 Fishing Year which started in August, 1997, and ended in July, 1998. Because ICCAT recommendations come into effect about six months after the adoption of a recommendation (generally, ICCAT meetings are held in November, so recommendations adopted in November of one year, come into effect in about May of the following year), the FAJ needs a certain period to legislate the ICCAT recommendations domestically.

3.2 Minimum size limits

In accordance with ICCAT recommendations, the FAJ, by Ministerial Order, prohibits the catch of undersized fish, with the exemption of a certain percentage of tolerance. The prohibition of the catch of undersized bluefin and yellowfin was also

established by a Ministerial Order on April 2, 1975, and the FAJ amended this Order several times to cover undersized bigeye, swordfish, etc. The latest amendment of this Ministerial Order was in the spring of 1997 to implement the 1996 ICCAT recommendation on bluefin weighing less than 1.8 kg.

It is noted that all Japanese pole and line vessels reluctantly ended their operations in the Convention area to observe the 1972 recommendation which prohibits any taking and landing of yellowfin tuna weighing less than 3 .2 kg because of their high by-catch rate.

3. 3. Time and area closure

Since 1975, the FAJ, as a domestic measure, has prohibited Japanese longline vessels from operating in the Mediterranean from May 21 to June 30, by Ministerial order. Then, in 1994, the FAJ amended this Order to alter the closed season to the period of June I to July 31 in accordance with the 1993 ICCAT recommendation. The FAJ also prohibited Japanese longline vessels from operating in the Gulf of Mexico.

3.4 Result of the implementation of the ICCAT Bluefin Tuna Statistical Document (BTSD) Program

From January 1 to June 30, 1998, Japan collected 6,136 BTSDs (6,077 documents for fresh/chilled products and 59 for frozen products). Of these, 4,657 BTSDs (or 77% of the total) were validated by non-contracting parties. By product weight, 1,148 MT of 4,897 MT (or 23% of the total) were imported from non-contracting parties. The converted live weight of tuna products which were imported from non-contracting parties is 1,360 MT, an increase of about 1,217 MT compared with that imported (2,577 MT) during the corresponding period in 1997. Chinese Taipei, the main exporting non-contracting fishing entity, exported 947 MT (live weight). Japan has not imported any bluefin tuna products validated by Belize (since 1996), Honduras (since 1994) and Panama (since 1998).

4. Inspection schemes and activities

4.1 Assignment of patrol vessels

Since 1976, Japan has dispatched patrol vessels to the north Atlantic and the Mediterranean every year for a certain period of time to monitor and inspect Japanese tuna vessels. The FAJ dispatched a patrol vessel to the North Atlantic and the Mediterranean in 1998. This vessel also collected information on fishing activities of non-contracting parties. The information collected was recorded on Sighting Information Sheets and submitted to the ICCAT Secretariat in October, 1998, in accordance with the 1994 ICCAT Resolution.

4.2 Random inspection of landings at Japanese ports

All Japanese tuna fishing vessels which land their catches at any Japanese port must report their landing plan in advance. The FAJ randomly inspects landings of those Japanese longline vessels to enforce the minimum size limit and the catch quotas of bluefin tuna and swordfish.

4.3 Management of transshipment at foreign ports

A permit issued by the FAJ is required for any Japanese tuna vessel to transship tuna or tuna products to reefers at foreign ports. The FAJ monitors the weight by species, time and place for each transshipment and, if necessary, conducts an inspection of landings at Japanese ports when reefers return to Japanese ports.

4.4 FAJ official stationed at Shimizu port

Since 1996, a FAJ official has been stationed at the fishing port of Shimizu, one of the largest tuna landing ports in Japan, to collect information on the tuna fishery, and to inspect landings of Japanese longline vessels at this port, etc.

5. Other activities

5.1 Annual catch statistics

Each longline vessel flying the Japanese flag and licensed to engage in tuna fisheries by the Ministry of Agriculture, Forestry and Fisheries is legally required to submit a catch report to the Ministry within 30 days after the end of the cruise or after the vessel has entered a port. Submission of this report was established by a Ministerial Order on January 22, 1963. The above-mentioned catch report includes daily information on the vessel's noon position, number and weight of catch by species, quantities of gear used, surface water temperature, etc. The information submitted on the catch report is examined and compiled into the data base by National Research Institute for Far Seas Fisheries.

5.2 Collection of biological data gathered on board longline vessels

Information necessary for stock analyses, such as length, weight and sex of fish caught, is collected by fishermen as a voluntary measure.

5.3 Collection of trade data

The Ministry of Finance collects trade data such as quantity, value, export country, etc. of imported products. Japan improved its Harmonized Commodity Description and Coding System (HS code) in 1993 responding to the 1992 ICCAT resolution to collect data on the various types of bluefin tuna products, e.g. fillet, meat (round, dressed) etc. and the status of products, e.g. frozen, fresh or chilled. Japan further improved its HS code in 1997 regarding swordfish to collect more accurate import data on this species.

5.4 Effort limitation

The numbers of longline vessels which can operate in the western Atlantic North of 35°N and in the Mediterranean has been limited. Furthermore, the FAJ requires longline vessels operating in the northern part of the eastern Atlantic Ocean to submit an advance notice of their planned operations in order to monitor fishing activities for bluefin tuna.

5.5 Restriction of re-flagging of vessels

No Japanese tuna longline vessel is authorized to operate on the high seas unless a license is issued by the Government of Japan. The license is not granted to vessels flying flags of States other than Japan. No Japanese vessel is exempt from FAJ's monitoring, not even vessels that conduct fishing operations in waters far distant from Japan, since a Japanese port is designated as its operational base and all the products are brought into Japan. (The export and lease of Japanese fishing vessels are closely controlled by the FAJ to avoid their use for operations which may diminish the effectiveness of international conservation measures.)

5.6 Legislation for the enhancement of the conservation and management of tuna stocks

A law was enacted in June, 1996, whose purpose is to implement the measures necessary to enhance the conservation and management of tuna stocks and to develop international cooperation for the conservation and management of tuna stocks. This law establishes that the Government of Japan may restrict the import of tuna and tuna products from a foreign country which is recognized by the relevant international organization as one that is not rectifying its fishermen's activities that diminish the effectiveness of the measures for conservation and management that have been adopted by the international organization.

The objective of this law is to support and strengthen ICCAT activities, ensuring the strength of tuna resource conservation and the stability of tuna stocks.

5.7 Prohibition of import of Atlantic bluefin tuna from Honduras, Belize and Panama

According to the 1996 ICCAT recommendation, Japan prohibited the import of Atlantic bluefin tuna and its products in any form from Honduras and Belize on September 3, 1997, and from Panama on January 1, 1998, in accordance with the necessary domestic procedures. Japan also started DNA examination of other types of imported tuna from Honduras, Belize and Panama to prevent the false import of Atlantic bluefin tuna.

5.8 Scientific observers

According to the 1996 ICCAT recommendation concerning bigeye and yellowfin tunas, the FAJ has dispatched scientific observers on board eight Japanese longline vessels. The results of these observations have been analyzed by the NRIFSF and reported to the 1998 ICCAT meeting.

Table 1. Annual number of Japanese tuna boats that operated in the Atlantic Ocean and Mediterranean Sea, 1992-1997

	1992	*1993*	*1994*	*1995*	*1996*	*1997**
Longline fishing effort:						
Number of boats	248	307	240	252	288	234
Fishing days (sets in 100)	292	399	380	399	471	439
Fishing days per boat	118	130	158	158	164	188
Purse seine fishing effort:						
Number of boats	2	0	0	0	0	0
Fishing days	230	0	0	0	0	0

*Preliminary.

Table 2. Japanese catches (MT) of tunas and tuna-like fishes, by type of fisheries, in the Atlantic Ocean and Mediterranean Sea, 1992-1997

Type of fishery 1992	*1993*	*1994*	*1995*	*1996*	*1997**	
Longline						
(Home-based)	48,515	52,917	55,930	55,161	51,439	40,517**
Purse seine	2,794	--	--	--	--	--
Total	51,309	52,917	55,930	55,161	51,439	40,517**

* Preliminary.
** Includes 8 MT of bluefin tuna caught and discarded in the western Atlantic by three longline vessels which continued bigeye tuna operations with scientific observers on board after the domestically-imposed bluefin fishing season ended.

Table 3. Catches (MT) of tunas and tuna-like fishes taken by the Japanese longline fishery, 1992-1997

	1992	*1993*	*1994*	*1995*	*1996*	*1997**
Atlantic						
Albacore	1,048	951	1,156	775	896	755
Bigeye tuna	34,128	35,053	38,502	35,477	33,171	27,428
Bluefin tuna	3,862	3,065	2,502	4,358	3,777	3,527
Southern bluefin	525	1,688	595	1,444	1,219	365
Yellowfin tuna	3,715	3,096	4,782	5,228	5,251	3,565
Swordfish	3,539	6,382	5,628	4,662	3,692	2,802
Blue marlin**	1,017	928	1,524	1,409	1,680	1,287
Black marlin	--	--	6	1	2	2
White marlin	248	82	92	57	112	68
Sailfish***	43	60	53	54	51	30
Spearfish	--	--	38	29	29	30
Others	265	815	513	850	783	460
Bluefin discards	--	--	--	--	--	8
Atlantic Sub-total	*48,390*	*52,120*	*55,391*	*54,344*	*50,669*	*40,327*
Sharks	--	--	3,216	2,192	1,364	1,187
Mediterranean						
Bluefin tuna	123	793	536	813	765	185
Swordfish	2	4	3	4	5	5
Bigeye tuna	--	--	--	--	--	--
Others	--	--	--	--	--	--
Mediterranean Sub-total	*125*	*797*	*539*	*817*	*770*	*190*
Sharks	--	--	5	8	3	2
Sub-total	***48,515***	***52,917***	***55,930***	***55,161***	***51,439***	***40,517***
GRAND TOTAL (incl. Sharks)	--	--	**59,151**	**57,361**	**52,806**	**41,706**

* Preliminary.
** Includes a minor amount of black marlin up to 1993, but separated since 1994.
*** Includes shortbill spearfish up to 1993, but separated since 1994.

Table 4. Area breakdown of Task I catches (MT) taken by the Japanese longline fishery, 1996-1997. The ICCAT area definition is used for tunas and billfishes. For other species, North and South, East and West, are separated at 5°N and 30°W, respectively.

Species	*West*	*East*	*North*	*South*	*Medit.*	*Total*
1996						
Bluefin tuna	436	3,341	--	--	765	4,541
Southern bluefin tuna	0	1,219	0	1,219	0	1,219
Albacore	397	505	466	435	0	902
Bigeye tuna	5,054	28,118	16,089	17,082	0	33,171
Yellowfin tuna	1,004	4,246	3,445	1,806	0	5,251
Swordfish	--	--	1,494	2,197	5	3,696
White marlin	37	75	80	32	-	112
Blue marlin	294	1,385	798	881	-	1,680
Black marlin	0	2	0	1	-	2
Sailfish	4	47	30	21	-	51
Spearfish	4	25	10	19	0	29
Skipjack tuna	0	0	0	0	0	0
Blue shark	287	755	683	360	1	1,044
Other sharks	97	220	216	102	2	320
Other fishes	13	769	32	751	0	783
Total 1996						**52,806**

Species	*West*	*East*	*North*	*South*	*Medit.*	*Total*
1997*						
Bluefin tuna	329	3,013	-	-	185	3,527
Southern bluefin tuna	0	365	0	365	-	365
Albacore	267	488	335	421	0	755
Bigeye tuna	4,229	23,198	12,468	14,959	0	27,428
Yellowfin tuna	790	2,775	2,406	1,158	0	3,565
Swordfish	--	--	1,437	1,365	5	2,807
White marlin	12	56	38	31	0	68
Blue marlin	217	1,070	596	691	0	1,287
Black marlin	1	1	1	1	0	2
Sailfish	17	13	16	14	0	30
Spearfish	1	30	8	22	0	30
Skipjack tuna	0	0	0	0	0	0
Blue shark	134	703	500	338	2	840
Other sharks	68	279	253	94	0	347
Other fishes	7	453	29	431	0	460
Bluefin discards	8	-	8	-	-	8
Total 1997						**41,706**

* Preliminary.

Table 5. Annual deployment rate of longline materials for the main and branch lines in the Atlantic, 1994-1997

Year	*Main line: Nylon*	*Branch lines: Nylon*	*Main and branch lines:*	
			Nylon	*Other*
1994	34%	41%	29%	54%
1995	61%	63%	51%	27%
1996	75%	76%	66%	16%
1997*	82%	82%	75%	11%

* Preliminary.

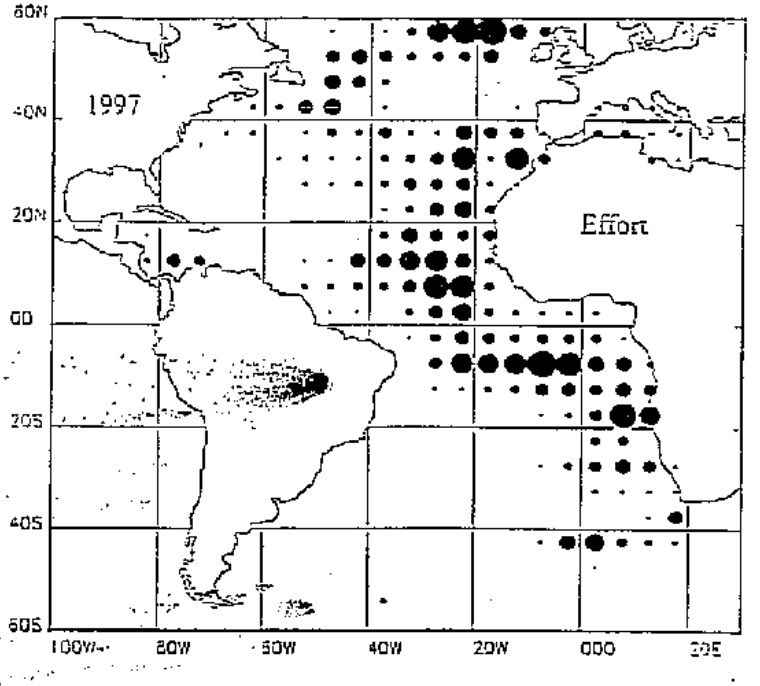

Fig. 1. Geographic distribution of longline effort (number of hooks) in the Atlantic, 1997.

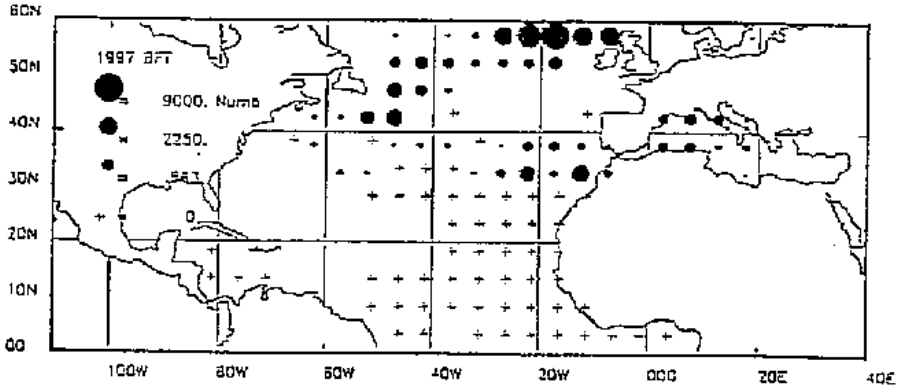

Fig. 2. Geographic distribution of bluefin catch in number in the Atlantic, 1997. Plus sign indicates no catch with fishing effort.

NATIONAL REPORT OF KOREA*

by

National Fisheries Research and Development Institute (NFRDI)

1. Fisheries information

Korean fisheries for Atlantic tunas and tuna-like species have shown a continuous gradual decline since 1977. From 1991 to 1995, the number of Korean tuna longliners active in the Atlantic was less than 10 each year with an average annual catch of 1,600 MT, which corresponds to about one-tenth that of the early 1980s (**Table 1**). In 1997, total catches of tunas and tuna-like fishes by the Korean fishery amounted to 1,924 MT, representing a decrease of 30% from the previous year's figure. The decrease in catch was due to the decreased number of vessels, from 16 in 1996 to 12 in 1997. The species caught by Korean longliners were: bigeye, bluefin, yellowfin, other tunas, and billfishes, of which the first three species constituted the major component of the total annual catch. The distribution of the longline fishing grounds was basically similar to that of previous years.

1.1 Bigeye tuna

Bigeye tuna has been the most important tuna species for the Korean tuna fishery since the beginning of the 1980s, when the deep-longline fishing technique was introduced. Despite the continuous decline in the catch of bigeye tuna, the proportion of this species remained stable at around 60% of the total catch until 1990. However, in recent years, the proportion decreased to about 40%. This change was mainly due to the initiation of the bluefin tuna fishery by Korean longliners. The 1997 catch of this species amounted to 796 MT, which represents a decrease of 36% as compared to 1996.

1.2 Bluefin tuna

Bluefin tuna, as one of the target species of the Korean tuna longline fishery in recent years, contributed about 32% to the 1997 total tuna catch. The catch of this species decreased from 683 MT in 1996 to 613 MT in 1997.

1.3 Yellowfin tuna

The yellowfin catch amounted to 257 MT in 1997, showing a similar level to that of the early 1990s. The proportion of this species to the total catch has decreased continuously in recent years.

1.4 Other tunas and billfishes

Minor quantities of albacore and southern bluefin tuna were caught in 1997, of which the latter were fished in waters off the southern tip of Africa. The remaining 13% of the total catch include swordfish, billfishes and other tunas, which have been considered as by-catch species. As in previous years, each billfish catch for 1997 was estimated based on Task II data.

2. Research and statistics

The National Fisheries Research and Development Institute (NFRDI) is responsible for tuna research and statistics in Korea. As in past years, the NFRDI collected and processed tuna catch and fishing effort statistics from fishing vessels operating in the Atlantic. Those data (in the Task I and Task II format) were submitted to the ICCAT Secretariat.

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* Original report in English.

3. Implementation of ICCAT tuna management measures

To implement the recommendations adopted by ICCAT, the Republic of Korea has introduced domestic regulations. These regulations include a minimum size limit for bigeye, yellowfin, bluefin tuna and swordfish. A new domestic regulation has been effective since 1995, with a view to protecting the spawning stock of bluefin tuna from June 1 to July 31 in the Mediterranean.

Table 1. Nominal catches (MT) of tunas and tuna-like fishes taken by Korean fisheries in the Atlantic Ocean, 1980-1997

Year	*No. of vessels*	*BFT*	*YFT*	*ALB*	*BET*	*SBT*	*SKJ*	*SWO*	*BUM*	*WHM*	*SAI*	*Others*	*Total*
1980	54	--	5,869	1,487	8,963	--	4	683	94	18	85	1,749	18,952
1981	56	--	6,650	1,620	11,682	--	47	447	126	85	65	1,584	22,306
1982	52	--	5,872	1,889	10,615	--	21	684	50	69	52	1,781	21,033
1983	53	3	3,405	1,077	9,383	--	530	462	131	15	3	1,215	16,224
1984	51	--	2,673	1,315	8,943	--	29	406	344	62	86	927	14,785
1985	45	77	3,239	901	10,691	--	20	344	416	372	101	1,293	17,454
1986	28	(156)	1,818	694	6,084	--	11	82	96	71	16	1,093	9,965
1987	29	(1)	1,457	401	4,438	--	6	75	152	27	21	1,048	7,625
1988	29	(12)	1,368	197	4,919	--	3	123	375	19	15	782	7,801
1989	33	(45)	2,535	107	7,896	--	6	162	689	135	33	944	12,507
1990	17	(20)	808	53	2,690	--	--	101	324	81	41	240	4,338
1991	9	(229)	260	32	801	--	--	150	537	57	30	267	2,134
1992	8	(101)	219	--	866	--	--	17	38	1	1	321	1,463
1993	4	(573)	180	--	377	--	--	--	19	2	1	308	887
1994	4	684	436	--	386	--	--	--	--	91	1	27	1,625
1995	4	663	453	--	423	--	--	--	61	1	--	114	1,715
1996	16	683	381	--	1,250	--	--	26	199	37	6	156	2,738
1997	12	613	257	5	796	10	--	33	70	24	1	115	1,924

( ) = Estimated by the ICCAT Secretariat (ICCAT Report, 1994, Vol. 2).

NATIONAL REPORT OF MOROCCO *

by

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1. Introduction

Since some time ago, the exploitation of tunas and tuna-species in Moroccan waters has been limited to the activity of the traps set along the migratory route of these species, and to the sporadic catches carried out using other fishing techniques, such as purse seine (utilized by the sardine boats since the 1950s), longline and other fishing gears.

In the early 1990s, new tuna fishing techniques were introduced in the sector, which resulted in an important increase in the catches of these species. The introduction of driftnets marked the origin of an important development of swordfish fishing in the Mediterranean. In addition, the development, since 1994, of an artisanal fishing in the Ksar Sghir region (in the Mediterranean), which used hand line as the fishing gear, permitted the catch of considerable amounts of large size bluefin tuna, which is especially solicited for the Japanese market.

2. Information on the fishery

The statistics of the national fishery for tuna and tuna-like species for 1997 are shown in **Table 1**. The reported tuna catches taken by foreign vessels in 1996 and 1997 are shown in **Table 2**.

2.1 National catches

-- Bluefin tuna

In 1997, the total bluefin tuna production amounted to 2,603 MT, of which 25% was from the Mediterranean. An increase of more than 50% was reported as compared to the average catch for the 1994-1996 period. Bluefin tuna are mainly taken by three fishing techniques:

Trap: In 1997, there were five traps in operation off the Moroccan coast (two in the Mediterranean and three in the Atlantic). These traps contributed to 40% of the total catches of bluefin tuna (i.e. 1,197 MT). The trap fishing season is between the months of April and June for the Atlantic traps and for a more extended period (April to October) for the Mediterranean traps. Traps also catch minor amounts of other species of tunas and tuna-like species.

Hand line: The hand line fishery has taken place in the Moroccan Mediterranean since 1994, by an artisanal fleet comprised of about 100 vessels (less than 5 m draft). This fishery contributes 30% (three-year average) to the total catches of bluefin tuna, or about 500 MT per year. This fishery, which targets large size bluefin tuna, continues during almost the entire year, with a halt in its activities of two to three months (April-May-June).

Purse seine: Bluefin tuna catches by purse seine are carried out mainly in the Atlantic by about 250 vessels that operate in a sporadic and seasonal manner. The tuna caught by this fishing technique are smaller in size than those taken by other fishing methods. According to the port, the average size of bluefin caught is between 20 and 40 kg, not exceeding 70 kg. It should be noted that the swordfish driftnet fishery takes incidental catches of bluefin tuna (<3%).

-- Swordfish

Swordfish fishing in the Mediterranean started in 1983. The reported catches since that time have been minor, at about 50 MT up to 1988. Since 1989, catches increased notably, exceeding 5,000 MT in 1997. This development coincides with the introduction of driftnets. About 230 coastal vessels operate using this fishing technique (with an average

* Original report in French.

GRT of 50 MT, and an average draft of 13 m). Of these vessels, 60% are based at Tangier and operate in the Moroccan Mediterranean. The catches taken in the Mediterranean in 1997 comprised 90% of the total catches of swordfish obtained by Morocco.

The longline fishery and other fishing methods constitute less than 10% of the total catches.

The fishing season for swordfish in mainly during the period between April and November.

-- Small tunas

Catches of small tunas (including skipjack) amounted to 6,550 MT, of which 95% were taken in the Atlantic. These species are caught mainly by surface gears, and secondly by the traps.

2.2 Foreign catches

-- Agreement between Morocco and the European Community

Two classes of vessels with European flags (Spanish and Portuguese) have been authorized to fish tunas under license to Morocco in the national EEZ:

Baitboats: About 30 tuna baitboats with Spanish flag fish tunas in the Moroccan Atlantic EEZ. Bluefin tuna comprise the major component of the catches. Reported catches of this species in 1997 rose to 462 MT. There were no reported catches of swordfish.

Longliners: For the longliners flying Spanish and Portuguese flags, bluefin tuna constitute a secondary catch. On the other hand, swordfish catches represent the major component. Available data show bluefin catches are on the order of 28 MT, while those of swordfish amounted to 1,130 MT.

-- Agreement between Morocco and Japan

There are 29 Japanese industrial longliners operating within the framework of the fishing agreement between Morocco and Japan. The reported catches in 1997 amounted to 341 MT of bluefin tuna and 11.5 MT of swordfish.

3. Research activities

Research activities centered on the study and monitoring of the Moroccan tuna fisheries, particularly the following:

-- Efforts were made to update and improve the collection of tuna fishery statistics.

-- A regional program was initiated, coordinated by the FAO-COPEMED Project, to study the biology and exploitation of tunas in the Mediterranean.

-- A Regional Center for Mediterranean Research was established, and its program of activities is centering mainly on the monitoring of tunas.

Table 1. Statistics on tuna fishing in 1997 (in MT)

Species	*Atlantic*	*Mediterranean*	*Atl + Med*
Bluefin tuna	2,068	535	2,603
Swordfish	267	4,900	5,167
Small tunas	6,127	423	6,550
TOTAL	**8,462**	**5,858**	**14,320**

Table 2. Catches of bluefin tuna and swordfish by foreign flag vessels, 1996-1997 (in MT)

Species	*Year*	*Gear*	*Flag*	*Atlantic*	*Mediterranean*
Bluefin tuna	1996	Baitboat	Spain	608	
		Longline	Japan	61	
		Longline	Spain	22	5
		Hand line	Spain	2	
Bluefin tuna	1997	Baitboat	Spain	463	
		Longline	Japan	342	
		Longline	Spain	2	3
Swordfish	1996	Longline	Japan	3	
		Longline	Portugal	10	
		Longline	Spain	1,073	28
		Hand line	Spain	0	
		Deep Trawl	Spain		1
Swordfish	1997	Longline	Japan	12	
		Longline	Portugal	123	
		Longline	Spain	1,008	
		Hand line	Spain	0	

NATIONAL REPORT OF RUSSIA*

by

Atlantic Scientific Research Institute of Marine Fisheries
and Oceanography (AtlantNIRO)

1. Introduction

The Atlantic Scientific Research Institute of Marine Fisheries and Oceanography (AtlantNIRO) and the All-Russia Scientific Research Institute of Fisheries and Oceanography (VNIRO) collect fishery and biological statistics on tunas and other objects of the tuna fishery, carry out research, and develop recommendations for tuna vessels. The statistical data presented in the report correspond to annual calendar periods.

2. The fishery in 1997

-- In the Sierra Leone EEZ

In 1997, tunas were fished by purse seiners in the EEZ of Sierra Leone and in the open central-eastern Atlantic. A total of 5,464 MT were caught during the year. Tuna were taken as by-catch by trawlers fishing small pelagic species in the economic zones of Morocco and Senegal. The bullet tuna by-catch from the zone of Morocco amounted to 464 MT, and that of skipjack tuna from the Senegalese zone was 31 MT (**Table 1**).

In the Sierra Leone EEZ, the fishery targeting tunas in 1997 was carried out by seven medium size purse seiners, whose registered carrying capacity is 181 MT (class 101-200). Tuna purse seine was the fishing gear used (1,450 m in length, 196 m in depth, and a mesh size of 90 mm). The fishery was carried out from March to June.

The total catch from the Sierra Leone zone amounted to 4,124 MT. The catch was comprised mainly of yellowfin tuna (95.1%), while 4.9% of the catch was comprised of skipjack tuna (**Table 1**).

The total fishing effort of all vessels amounted to 320 vessel days of fishing. The catch per vessel/day of fishing amounted to 9.7 MT in March, 12.1 MT in April, 10.2 MT in May, and 7.2 MT in June.

-- In the open central-eastern Atlantic

Seven medium size vessels took part in the fishery, and they periodically left the Sierra Leone zone in March-June when fishing conditions changed. In the latter part of the, from October to December, the fishery in the open sea was resumed.

The total catch from this ocean area amounted to 1,340 M, and was comprised of four species: yellowfin tuna (26.5%), skipjack tuna (68.0%), bigeye tuna (2.8%), and frigate tuna (2.7%) (**Table 1**).

In the open eastern Atlantic, purse seiners operated 239 days in the tuna fishery. The catch per vessel/fishing day varied widely and amounted to an average of 5.5 MT.

3. The fishery in the first half of 1998

In the first half of 1998, seven purse seiners caught 7,580 MT, according to preliminary data, including 5,200 MT of yellowfin tuna, 1,150 MT of skipjack, 95 MT of Atlantic black skipjack, 338 MT of bullet tuna, and 797 MT of frigate tuna (**Table 2**). Tuna vessels operated in the Sierra Leone zone and the adjacent open ocean areas from January to May.

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* Original report in English.

4. Scientific research

Material on tuna biology and distribution in the Sierra Leone zone and the open ocean area was collected from fishing vessels from December, 1997, to May. 1998. A total of 6,030 fish were measured, including 1,970 yellowfin tuna, 280 bigeye, 1,520 skipjack, 1,140 frigate tuna, and 1,120 Atlantic black skipjack. Biological analyses were carried out and 136 age samples were collected.

Data on tuna size composition, obtained during purse seine operations in 1997, were processed. The biological observer measured 1,810 individuals of tuna at fishing vessels. During the observation period, yellowfin tuna measuring 41-175 cm in length, skipjack of 39-65 cm, and bigeye tuna of 38-135 cm were found in the catches.

An analysis of materials relative to skipjack tuna biology, collected from 1959 to 1998 in the eastern Atlantic, was carried out. The data are summarized by fishing areas according to the ICCAT scheme. These data include: mass measurements of tunas by months; stomach contents by months; and stage of gonads maturity, summarized by months.

The data base on tunas was tested. The biological and commercial data base of longline and purse seine fishery catches (tuna, swordfish, sharks and associated species) includes the results of biological analysis by species. and the results of mass measurements of purse seine catches. The data base is updated regularly.

Table 1. Species composition of the tuna catches (in MT) and fishing effort in the Atlantic Ocean in 1996, by fishing grounds and fishing periods

	Sierra Leone area	*Open central east Atlantic area*	*Morocco area*	*Senegal area*	*Total*
No. of vessels	7	7			
Fishing Period	March-June	March-December			
Effort (days at sea)	390	239			
Catches (MT):					
Yellowfin tuna (YFT)	3,920	325			4,275
Skipjack tuna (SKJ)	204	911		31	1,146
Bigeye tuna (BET)		38			38
Frigate tuna (FRI)		36			36
Bullet tuna (BLT)			464		464
Total	**4,124**	**1,340**	**464**	**31**	**5,959**

Table 2. Tuna catches (MT) taken by Russian purse seiners during the first half of 1998

Species	*Catch (MT)*
Yellowfin tuna (YFT)	5,200
Skipjack tuna (SKJ)	1,150
Atlantic black skipjack (LTA)	95
Bullet tuna (BLT)	338
Frigate tuna (FRI)	797
Bigeye tuna (BET)	+
TOTAL	**7,580**

NATIONAL REPORT OF SOUTH AFRICA*

1. National fisheries information

– Legislation

In September, 1998, new legislation governing South Africa's fisheries was introduced as the *Marine Living Resources Act, 1998*. This Act was accompanied by a new set of Fisheries Regulations, and all South African fisheries will be subject to changes during the coming year. At this stage, it is too soon to assess how the implementation of the Act will affect the tuna fisheries.

-- Participants

During 1997, the South African tuna fishery continued to target southern albacore *(Thunnus alalunga)* off the west coast of South Africa, using pole and line. The vessels active in the fishery are mostly small bait boats, and include approximately 60 with no freezer capabilities, and 40 with freezers on board. In addition, there are a number of small (5m-8m) sports boats that fish for albacore and other tunas in the vicinity of Cape Point in the southwestern Cape.

In early 1997, there were 30 pelagic longline permits for tuna-directed fishing were issued, but to date less than one-quarter of these have been activated. These permits are being used for tuna directed fishing off the South African west coast (ICCAT area), and also for fishing on the South African southeast coast, and early indications are that there is a significant by-catch of swordfish associated with this fishery. No catch statistics are available yet for this fishery.

– Catches

Catch information from the South African tuna fleet has been difficult to validate in the past. South African scientists have acknowledged this fact, and have attempted to validate the catch information by checking the reported catches against information from dealers. This usually resulted in an adjustment to the overall catch information. During 1998, the South African Tuna Association undertook to investigate alternative checks on the accuracy of the catch data. Contacts were made with the Customs and Excise Section of the South African Revenue Services, who were able to supply information on the total albacore exports from the country registered against South African vessels. These customs data represent the most accurate source of information regarding the total South African catch to date. They have been used to correct the historical catch records for the past five years (**Table 1**).

The South African Sea Fisheries is hoping to ensure that, in the future, this data source will continue to be available, and will also provide data prior to 1993. In addition, Sea Fisheries and the South African Tuna Association are jointly involved in efforts to ensure that better data are obtained from tuna fishers. This initiative is also strongly supported by the provisions of the *Marine Living Resources Act, 1998* and the accompanying Fisheries Regulations.

– Foreign fleets

Japanese and Chinese-Taipei vessels continue to fish under permit in South Africa's EEZ. During 1997, a total of 111 permits was issued, 85 to Japan, and 26 to Chinese Taipei. Conditions associated with these permits are slowly evolving, and currently require satellite monitoring systems on all vessels. An observer program also is in advanced stages of planning.

* Original report in English.

2. Research and statistics

– Catch and effort data

The Linefish Section of the Sea Fisheries Research Institute (SFRI) continues to collect monthly catch and effort returns from South African tuna fishers, as part of the National Marine Linefish System.

– Length frequencies

Length frequencies are obtained from most catches landed. During 1997, there were 7,956 fish measured, and the length frequency data have been submitted to ICCAT.

3. Implementation of ICCAT conservation and management measures

– Informal consultation

In April, 1998, South Africa hosted an Informal Consultation to discuss the allocation of southern albacore quota under the 22,000 MT Total Allowable Catch (TAC). Although much progress was made in agreeing upon criteria to be used as a basis for allocating shares in a TAC, no final agreement was reached.

– Regulations

The new fisheries regulations are likely to affect the tuna fishery in the future. However, these regulations are in the early phase of implementation, and it is not yet possible to assess what form the changes are likely to take. A number of proposals have been submitted to change the quota status of albacore in the South African fishery, but to date these have not been formally adopted, primarily because implementation of the new legislation is in its early stages.

4. Inspection schemes and activities

– Inspections

As a signatory to the ICCAT Port Inspection Scheme, South Africa continues to conduct inspections of tuna vessels operating out of South African harbors. Between January, 1997, and December, 1997, ten inspections were conducted in Cape Town harbor. No foreign vessels were inspected, and all vessels were South African poling vessels, offloading predominantly albacore, with a few yellowfin and bigeye tuna. No undersized fish were observed.

Table 1. Previous and new, updated total catches of albacore *(Thunnus alalunga)* by South African flagged vessels, 1993-1997

Year	*Previous submitted catch (MT)*	*New, updated catch (MT)* *	*Factor change (%)*
1993	6,743	6,881	102
1994	5,268	6,931	132
1995	4,135	5,214	126
1996	2,178	5,634	259
1997	4,500	6,708	149

* The updated information was obtained from export records from Customs and Excise, supplied by the South African Revenue Services.

NATIONAL REPORT OF TUNISIA*

by

Aabdallah Hattour - INSTM

1. Introduction

The fishing for large pelagic species in general, and for swordfish and bluefin tuna, in particular, is gaining more importance. The catch is destined for the most part for export markets and plays an important role in the promotion of exports and, consequently, in the entry of foreign currency.

The two coasts of Tunisia are on the Mediterranean and throughout the course of its history Tunisia has been closely related to the sea. Many archeological testimonials, of an iconographic and a literary nature, confirm this close relationship.

Bluefin tuna have been caught since a long time ago in Tunisian waters. Proof of this are the traps set all along the coast, although only two of these are still active, one in the north and one in the south.

On the contrary, swordfish fishing has only been carried out for a few years to the north of the country, whereas previously this species was taken as by-catch.

2. The fishery

National landings of large pelagics and similar species are shown in **Tables 1, 2** and **3**. Besides the trap fishery, bluefin fishing is carried out by about 60 purse seiners (18 and 27 m; 180 to 600 hp). Bluefin are also caught by some small craft, using handlines. Catches in 1997 amounted to 2,200 MT.

Swordfish fishing is carried out by 40 longliners measuring from 9 to 24 m and from 45 go 430 hp, and these vessels are active all year long. Catches amounted to about 400 MT.

Other tunas, such as Atlantic black skipjack, frigate tuna, Atlantic bonito, and pomfret are caught by traps and by purse seiners. These catches were approximately 2,000 MT.

3. Catch data of large pelagics

Up to 1996, fishery statistics on large pelagic fishes were limited to voluntary reports from the vessel masters of the boat owners involved in this activity. All efforts concerning statistics are directed at other activities that the administrators consider to be more important, such as the troll fishery and coastal fishing.

Hardly any attention has been given to the catches of large pelagics, in spite of the unceasing demands for the installation of a sampling network that would facilitate information on this activity, and on the biological and population parameters relative to this species.

In 1997, The General Directorate of Fisheries and Agriculture, with a view towards improving management of all the fishery resources, put into effect a strategy for the development of fishing based on the rational exploitation of these resources. In order to do this, a statistical data collection system was developed, with special attention given to the fishery for large pelagics, due to their high market price, and above all, to Tunisia's becoming a member country to ICCAT.

The collection of 1997 data has improved as concerns the large pelagics.. The landings are better monitored and the boat owners are obliged to present their fishing logbooks, etc. It is hoped that improvements will continue, and that

* Original report in French.

staff will be contracted who will be in charge of the statistics and biological research, under the direction of the "Institut National des Sciences et Technologie de la Mer (INSTM)".

This retrospective analysis of data prior to 1997 has provided results on the overall catches and species composition that are different from those transmitted to FAO (Fishtat Files). The central service of the DGPA considered it important to introduce the necessary corrections. The official catch of the large pelagics is given in **Tables 1, 2 and 3.**

4. Research activities

Increasing importance is being given to research and monitoring of the fisheries for large pelagic species in Tunisian waters. Mention has already been made of the efforts accomplished to update and improve the collection of catch data on these species.

It is particularly important to mention the COPEMED project on large pelagic species which aims at determining the research areas, in accordance with ICCAT and GFCM recommendations, in order to improve research methods on fisheries, specifically as concerns statistical and biological data.

The INSTM plans to carry out the following activities:

- Review of the fisheries (location of fishing and definition of the level of exploitation).
- Biological studies on bluefin tuna and swordfish and similar species (improved identification of the spawning areas, assessment of the spawning stocks, intensification of tagging operations on juvenile fish, to monitor the migratory routes of those fish and also to be able to study the growth rates of these fish, sex ratio, fecundity, etc.).
- Studies on the stocks of bluefin tuna and swordfish and other tunas (genetic, meristic and morphometric studies, etc.).

Table 1. Tunisian revised catches of bluefin tuna (MT), by gear, 1990-1997

Gear	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*
Purse seine	114	1073	975	1997	2523	1617	2147	1992
Trap	249	243	175	92	169	223	154	95
Trawl	43	50	45	43	81	57	92	113
TOTAL	**461**	**1366**	**1195**	**2132**	**2503**	**1897**	**2393**	**2200**
Exports	461	447	516	440	660	522	876	496

Table 2. Tunisian catches of small tunas (MT), 1990-1997

Species	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*
Euthynnus	2113	1343	664	242	204	696	824	336
Sarda sarda	488	305	643	792	305	413	560	611
Auxis	985	985	35	20	13	14	13	263
Others			20	309	105	115	215	657
TOTAL	**3586**	**2633**	**1362**	**1636**	**627**	**1238**	**1612**	**1630**

Table 3 Tunisian swordfish catches (MT) 1990-1997

Species	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*
Swordfish	176	181	178	357	298	378	352	346

NATIONAL REPORT OF UNITED KINGDOM-BERMUDA*

The Bermuda commercial fishing fleet consisted of 194 vessels during 1997 with approximately one-third of these vessels actively fishing for tuna and tuna-like species. Most of this fishing is carried out in the inner 40 km of the Bermuda Exclusive Fishing Zone although longline operations worked considerably farther offshore.

The composition of the Bermuda domestic fleet has been modified to include some purpose-built longline vessels and at least one corporate entity has entered into a leasing arrangement.

During 1997, the total catch of tuna and tuna-like species was 185.5 MT. Details are presented in **Table 1.**

Research on the age-growth and reproductive aspects of pelagic species remain on-going. Bermuda is actively involved in the ICCAT Enhanced Program for Billfish Research as well as engaging in several regional research programs directed at pelagic species.

Table 1. Summary of catches of tuna and tuna-like species taken by Bermuda in 1997 (revised)

Species	*Weight (MT)*
Yellowfin tuna	55.4
Bluefin tuna	2.0
Blackfin tuna	3.5
Albacore	1.0
False albacore	6.0
Skipjack tuna	<1
Wahoo	105.0
Blue marlin	6.4
White marlin	1.2
Swordfish	5.0
Total	**185.5**

* Original report in English.

NATIONAL REPORT OF THE UNITED STATES *

by

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

Introduction

The following sections comprise the 1998 U.S. National Report to the International Commission for the Conservation of Atlantic Tunas (ICCAT) . Section I of this report presents 1997 landings estimates for species subject to ICCAT management authority. U.S. statistics, monitoring and research initiatives are described in Section 2. Section 3 addresses implementation of ICCAT conservation and management recommendations and 1998 modifications to U.S. domestic regulations. Inspection schemes and activities are described in Section IV, and Section V covers other activities, including enforcement systems, and scientific observer programs.

1. National fisheries information

Total (preliminary) reported U.S. catches of tuna and tuna-like fishes (including swordfish, but excluding billfishes) in 1997 were 29,174 MT. This represents an increase of 1,208 MT from 1996. The total Atlantic estimated swordfish catch (including dead discards) decreased from 4,320 MT to 3,840 MT. Of this total catch, 397 MT of swordfish were landed in the South Atlantic, with 21 MT discarded, while 2976 MT were landed in the North Atlantic, with 446 MT discarded. U.S. vessels landed an estimated 1334 MT of bluefin in 1997. Discards of bluefin declined again from 73 MT in 1996 to 52 MT in 1997, of which 15 MT were discards from the rod and reel fishery. Estimated landings from the U.S. fishery for yellowfin decreased from 7,743 MT in 1996 to 7,625 MT in 1997. Estimated skipjack landings decreased from 84 MT to 72 MT, and estimated albacore landings decreased further from 472 MT in 1996 to 343 MT in 1997. Estimated bigeye landings increased from 882 MT to 1,095 MT, a level more comparable to reported 1995 landings of 1,208 MT.

U.S. fisheries for Atlantic tuna and tuna-like species are managed through regulations issued under the authority of the Atlantic Tunas Convention Act (ATCA), which authorizes the Secretary of Commerce to implement regulations as may be necessary to carry out the recommendations of ICCAT. This authority has been delegated from the Secretary to the Assistant Administrator for Fisheries of the U.S. Department of Commerce. No regulation promulgated under ATCA may have the effect of increasing or decreasing any allocation or quota of fish or fishing mortality level that the United States agreed to pursuant to a recommendation of ICCAT. The Magnuson-Stevens Fishery Conservation and Management Act of 1996 (Magnuson-Stevens Act) also guides the management of large pelagic species in the United States. (See Section 3 for a description of domestic management actions pursuant to the Magnuson-Stevens Act).

1.1 Swordfish

The U.S. directed fishery for North Atlantic swordfish is limited to the following gear-types: longline, harpoon, drift gillnet, handline and rod and reel. Pelagic longline vessels account for approximately 98% of U.S. directed swordfish landings at present. The swordfish drift gillnet fishery was closed from December, 1996, through August, 1998, in order to address a suite of fishery management issues, including the reduction of marine mammal interactions. In the North Atlantic, there is an allowance of incidental swordfish landings for otter trawls (five swordfish per trip), drift gillnet vessels (two swordfish per trip) and longline vessels (15 swordfish per trip) during the directed fishery closures for these gears. There is no allowance for swordfish caught incidentally to other fisheries in the South Atlantic Ocean, nor is there a drift gillnet fishery in the South Atlantic. The National Marine Fisheries Service (NMFS) has proposed to implement a limited access system for the directed and incidental Atlantic swordfish fisheries (see Section 3).

* Original report in English.

Atlantic swordfish are marketed primarily on the domestic retail market as fresh fillets and steaks. U.S. ex-vessel prices are currently about $3.00/pound, although prices vary depending upon the quality of the product, as well as current market supply and demand conditions. Prices have also been affected by closures, which can result in temporal or localized gluts, and an increased year round supply of swordfish imports, as well as a boycott in the United States initiated by several conservation groups during 1998. Swordfish imports reported in 1997 totaled 15,598 MT and came from 33 countries. This was a significant increase from swordfish imports reported in 1996, due in part to improved species-specific reporting on U.S. Customs forms. In 1997, the United States established new tariff identification codes for fresh and frozen swordfish steaks and frozen fillets, some of which were previously imported as generic steaks or fillets, thus encouraging importers to provide specific and accurate information on the product forms. Swordfish import data have been presented to ICCAT are available upon request.

The United States has implemented a split-year fishing season of June 1-May 31, divided into two six-month seasons, to facilitate management in response to changing quotas. For the 1997 fishing year (June 1, 1997 - May 31, 1998), North Atlantic swordfish landings were 2,129 MT dw (2,831 MT ww). The U.S. share of the North Atlantic swordfish total allowable catch (TAC) in 1997 was 2,464 MT dw. The under-harvest of 3,35 MT dw will be added to the U.S. quota for 1998. As reported to the SCRS, the provisional estimate of the U.S. catch for the 1997 calendar year throughout the Atlantic is 3,839 MT ww, which includes an estimated 455 MT ww discarded. This reflects a 134 MT decrease in estimated discards of swordfish from the 1996 calendar year. As additional data become available through the observer program, alternative stratification schemes for estimating discards may result in revisions to the estimated yield.

A split-year fishing season has also been implemented in the South Atlantic Ocean, in combination with other management measures comparable to those in the North Atlantic (permitting, reporting, observers, etc.) In 1997, fishing year landings for the South Atlantic were 96 MT dw (127 MT ww) for the period June 1, 1997, through May 31, 1998. The U.S. share of the total allowable catch of swordfish in the South Atlantic for 1997 is 188 MT dw (250 MT ww). In 1997, calendar year landings in the South Atlantic were 397 MT ww, with 21 MT ww discarded, as reported to SCRS.

The total weight of swordfish sampled for sizing U.S. landings in 1996 by longline, gillnet, harpoon, otter trawl rod and reel and handline was 3,128 MT , 77 MT , 0.5 MT, 17 MT, 0 MT and 0 MT, respectively, as compared to 2,853 MT, 0.4 MT, 0.7 MT, 7 MT, 0.3 MT and 0.6 MT in 1997. Pair trawl gear was not used in 1996 or 1997. In 1996, the weight of the sampled swordfish landings. represented 90%, 100%, 100%, 100%, 0% and 0% of the U.S. total reported annual landings for longline, gillnet, harpoon, otter trawl rod and reel and handline gears, respectively, whereas 1997 sampled swordfish landings were 96%, 100%, 100% and 84%. 92%, and 44% of the U.S. total reported annual landings of swordfish for longline, gillnet, harpoon, otter trawl, trolling, and handline. Again, incorporation of late reports into the estimated 1997 landings figure will likely result in changes in the sampled fraction of the. catch.

1.2 Billfishes

Atlantic billfishes, including blue marlin, white marlin and sailfish, are landed only by recreational rod and reel fisheries under U.S. regulations. Prime areas for these fisheries include the Atlantic coast of Florida, the mid-Atlantic coast, the Gulf of Mexico, and the Caribbean, depending upon the species and the season. Over the past ten years, a "catch and release" approach has been widely adopted in the recreational rod and reel fishery for billfish, resulting in an estimated release rate of over 90%. An estimated 100,000 anglers participate in this fishery each year for at least one angling day. The recreational billfish fisheries of the United States are an important source of direct income to charter and headboat vessels, and an indirect source of income to firms that supply recreational fishery participants with associated goods and services. Angler consumer surplus estimates for billfish vary from $550 to $1,200 per trip, indicating that net economic benefits from the recreational fishery are significant.

Preliminary estimates of 1997 U.S. recreational landings for these billfish species, combining the geographical areas of the Gulf of Mexico (Area 91), the northwestern Atlantic Ocean west of the 60°W longitude (Area 92), and the Caribbean Sea (Area 93) are: 45 MT for blue marlin, 1.9 MT for white marlin, and .6 MT for sailfish. The recreational landings estimates for 1996 were 34.9 MT, 3.3 MT, and 1.2 MT, respectively, for the three species. Billfish landings are estimated using: (a) the SEFSC Recreational Billfish Survey, which provides the number of billfish caught during tournaments held along the U.S. Atlantic coast (South of 35° N latitude), in the Gulf of Mexico, and U.S. Caribbean Sea; and (b) the Large Pelagic Survey, conducted by NMFS, which provides estimates of recreational billfish harvest along the U.S. Atlantic coast (North of 35°N latitude).

Recreational landings estimates are considered conservative since all sources of billfish harvest by recreational anglers are not necessarily included in these estimates. These figures do not include any estimates of the mortality of

released (or tagged and released) billfish. Some components of the charter boat and non-tournament recreational fishery are not covered by these surveys and tournament data do not necessarily constitute a census of all tournaments. For these reasons, the recreational landings figures are minimum estimates. It is not yet known to what degree or for which species estimates of rod & reel landed catch should be adjusted, although studies are underway which could help to resolve this question. Revisions to the estimated historical landings of billfish may be reported in the future, based on ongoing analysis of the data.

Pelagic longline vessels that encounter Atlantic billfish must release them, whether living or dead. All commercial retention and sale of Atlantic billfish is prohibited by the United States. These discards are carefully monitored as another source of fishing mortality and reported to the SCRS. By-catch of billfish in the U.S. longline fleet is estimated using data from mandatory pelagic logbooks and observer data. The procedure for estimating the bycatch of blue marlin, white marlin, and sailfish for 1987-1997 was detailed in SCRS/96/97-Revised. Revisions to historical landings of billfish previously reported to ICCAT were based on review of the estimates conducted at the 1996 ICCAT Billfish Workshop held in Miami. Overall, Atlantic billfish discards in the U.S. pelagic longline fishery declined in 1997 to 138 MT for blue marlin, 71 MT for white marlin, and 58 MT for sailfish. Estimates of 1996 dead discards were 197 MT, 68 MT, and 72 MT, respectively, for the three species. The total of estimated catches and landings of Atlantic billfish in the United States has declined by approximately half over the past decade.

Information from a statistical survey (Marine Recreational Fishing Statistics Survey, MRFSS) of the US recreational harvesting sector conducted over a large part of the US coast is currently under evaluation for its application to estimating billfish catches by recreational fishers. Although billfish are "rare event" species in this survey and accordingly the estimates may suffer from bias and imprecision, the estimates do provide a basis for evaluating the potential degree of conservatism in the values reported for recreational (rod and reel) harvest. The sampling design for MRFSS is not optimized for billfish and it is generally thought that MRFSS estimates could overstate billfish landings. From this survey, for the period 1995-1997, the available estimates of recreational billfish landings (in numbers of fish), with associated coefficients of variation (CV, expressed as a percentage), for ICCAT Areas 92 (NW Atlantic) and 91 (Gulf of Mexico). Investigations into the possible reasons for differences will continue in the upcoming year and the results of these investigations may provide a basis for revising historical and recent estimates of billfish catches by the U.S. recreational sector.

Atlantic Tunas

Tunas are targeted by recreational and commercial fisheries along the Atlantic and Gulf coasts from Maine to Texas. Atlantic tunas permits are issued in six categories. The commercial categories are: General, Charter/Headboat, Harpoon, Purse Seine, and Incidental. The Angling category is the recreational category. There are approximately 17,900 vessels permitted to participate in the fisheries for Atlantic tunas. However, only 13% of those vessels with a commercial Atlantic tunas permit actually sold a bluefin tuna during 1997. (Recreational anglers are not permitted to sell their catch.) The directed fisheries for Atlantic tunas are limited by regulation to the following gear types: rod and reel, handline, harpoon, bandit gear, and purse seine nets. Longline and driftnets, are also allowed for tunas other than bluefin. Incidental catches of bluefin are allowed for vessels fishing with longlines, purse seine nets, fixed gear, and traps, subject to strict target catch requirements and incidental sub-quotas.

The majority of U.S. commercial landings of Atlantic bluefin tuna are exported to Japan, although the proportion being exported has declined. Ex-vessel prices in 1997 were lower than those for 1996, which overall were low compared to 1995. Ex-vessel gross revenues in the commercial bluefin fishery totaled more than $16.5 million in 1997. High quality bigeye and yellowfin tuna are also marketed fresh in Japan, with the balance sold on the U.S. domestic market. The recreational fishing industry primarily targets yellowfin and albacore, as well as bluefin in the 6.4 kg-107 kg category. These fisheries are an important source of income to charter and headboat vessels which charge a fee for the anglers they take onboard, and an indirect source of income to businesses that supply recreational fishery participants with associated goods and services. Total producer surplus for the bluefin tuna charter boat fishery was approximately $2.7 million in 1997, while total angler consumer surplus for the bluefin recreational fishery was approximately $19 million in 1997.

1.3 Western Atlantic bluefin tuna

The 1997 landings by gear were: 250 MT by purse seine, 98 MT by harpoon, 17 MT by hand line, 50 MT by longline (of which, 24 MT were from the Gulf of Mexico), 917 MT by rod and reel (of which, 176 MT was the preliminary estimate of the catch of the bluefin less than 145 cm. straight fork length (SFL) from off the northeastern U.S.), and 2 MT

were taken by other gears. In 1997, U.S. vessels fishing in the western Atlantic caught an estimated 1385 MT of bluefin tuna of which 52 MT were discarded dead.

In response to 1992 regulations limiting the allowable landings of small fish, in conformity with ICCAT agreements, enhanced monitoring of the rod and reel fishery was implemented in 1993 for the purpose of providing near real-time advice on catch levels in this fishery. This monitoring activity has continued through 1998 and generates estimates of bluefin landings by finer size categories. The preliminary estimates for the 1997 rod and reel fishery off the northeast United States (including the North Carolina winter fishery) for landings in several size categories were: 125 MT < 115 cm (of which less than 1 MT was <66 cm.), 51 MT <115-144 cm and 119 MT <145-177cm (which are revised estimates as of October 6, 1998). Additional rod and reel landings of bluefin >177 cm SFL were monitored through a sales reporting system. The estimated catch of 125 MT of bluefin <115 cm exceeds the limit on small fish that has been established by ICCAT (i.e., a tolerance of 8% of 1344 MT, or 107.5 MT).

The 8% limit on the landings of bluefin tuna less than 30 kg, which are restricted to the recreational fishery (no-sale), is implemented in the United States through a number of management actions. Management of the recreational fishery includes extensive permitting and reporting requirements, strict bag limits and "rolling season" openings and closures as the fishery moves up the coast. An extensive creel survey with weekly waves is used to collect catch and effort data (used for CPUE as well as for estimating landings), along with a mandatory call-in system for all recreational bluefin tuna landings. A pilot tagging program for reporting recreational bluefin tuna catch was implemented in the 1998 North Carolina winter fishery, and will likely continue in 1999, along with other possible state-federal cooperative reporting programs. These efforts to monitor and restrict the recreational catch, and to open and close the fishery in certain areas and times, have resulted in an average harvest of bluefin tuna less than 30 kg over the past six years that is slightly less than 8%, with landings less than 8% in 1994, 1995, and 1996, and greater than 8% in 1992, 1993, and 1997.

In addition to the landed catch, 302 bluefin (about 37 MT) were reported as discarded dead by U.S. longline vessels (73 MT were reported discarded dead in 1996); of those discards, an estimated 29 fish (about 6 MT) were caught in the Gulf of Mexico in 1997 (3 MT were discarded dead in 1996). Additionally, 305 bluefin (15 MT) were estimated to have been discarded dead by rod and reel fishermen. Data are not available to estimate dead discards in purse seine and harpoon fisheries. In 1997, reported discards of bluefin tuna totaled 52 MT, a decline from the 77 MT of bluefin discards reported in 1996 and the 142 MT reported in 1995.

1.4 Albacore

Historically, albacore has not been a major target of U.S. fisheries; reported catches prior to 1985 averaged only 22 MT. After higher catch levels throughout the early 1990s, U.S. catches have declined in recent years. Reported landings decreased by 129 MT from 1996. Albacore are often sought by recreational fishermen along the near-shore Atlantic coast. An estimated 28% was landed by rod and reel in 1997. There is some incidental catch of albacore reported from the longline fishery (targeting swordfish, yellowfin and bigeye), the drift gillnet fishery (targeting swordfish) and the handgear fishery (targeting other tunas). South Atlantic albacore catch is incidental to the directed swordfish fishery. The increase in U.S. landings in the South Atlantic, while still insignificant relative to total South Atlantic landings of albacore, is likely due to new reporting requirements.

1.5 Yellowfin tuna

Yellowfin is the principal species of tropical tuna landed by U.S. fisheries in the North Atlantic. In 1997, total estimated landings decreased to 7,615 MT from reported 1996 landings of 7,743 MT. This estimate is provisional and may change due to incorporation of late reports of commercial landings as they become available, and due to possible revisions in estimates of rod and reel recreational landings. Almost half of the estimated 1997 landings are attributed to the rod and reel fishery in the northwest Atlantic. These estimates are based on a statistical sampling survey of the recreational fishing sector and are not as precise as estimates of commercial landings based on a near-census of marketed catch. The 1997 commercial landings of yellowfin were estimated using detailed analyses. Based on comparisons between these detailed analyses and the less detailed estimates for earlier years, 1997 landings are estimated to be from 170 to 340 MT higher than they would have been if the less detailed process had been used. In 1997, 34% of the estimated U.S. yellowfin landings resulted from fish caught in the Gulf of Mexico, a slight increase from the past two years, at 23% in 1995 and 28% in 1996. In contrast, between 1991 and 1993, longline catches from the Gulf of Mexico represented 47-64% of the estimated U.S. total.

1.6 Skipjack tuna

Skipjack tuna are caught by U.S. vessels off the Atlantic coast primarily between Cape Hatteras, North Carolina, and Long Island, New York. Total reported skipjack landings decreased slightly from 84 MT in 1996 to 72 MT in 1997. Estimates of recreational and commercial harvests of skipjack are preliminary and may be revised in the future.

1.7 Bigeye tuna

In 1997, total reported catches and landings of bigeye tuna in the United States increased from 1996 levels, from 882 MT to 1,095 MT. Longline vessels accounted for approximately 73% of U.S. bigeye landings in 1997. Most bigeye tuna are landed along the Atlantic coast between Cape Hatteras, North Carolina, and Massachusetts. These provisional estimates of recreational and commercial harvests of bigeye continue to be reviewed and may be revised in the future.

1.8 Mackerels

Significant catches by U.S. fishermen have occurred since the 1850s on Spanish mackerel and since the 1880s on king mackerel. The major gears currently exploiting these species are handlines and gillnets. Purse seines were also used to harvest king mackerel during the 1980s. Gillnets have historically been the main commercial gear for Spanish mackerel. However, in recent years, the recreational fishery has become an important component in total catches for both species. The majority of king mackerel catches are taken off North Carolina and Florida and it is believed that a major production area off Louisiana is recovering. The primary Spanish mackerel catch areas include the Chesapeake Bay and Florida. Current fisheries are co-managed under the Coastal Migratory Pelagic Resources Fishery Management Plan enacted in 1983 and regulations adopted by the South Atlantic and Gulf of Mexico Fishery Management Councils and implemented by the NMFS. Annual catches are monitored closely and in-season management measures include commercial trip limits, seasonal and area quotas, and recreational per person daily bag limits. Because these species occur in both federal and state territorial zones of the United States, successful management has required participation by both federal and state management agencies. Currently, Spanish mackerel and the king mackerel stocks in the Gulf of Mexico are considered over-fished.

Annual yields of king mackerel have ranged from 4,365 MT to 7,746 MT between 1983 and 1996 with an average production of 6,860 MT since 1994. Annual catches of Spanish mackerel have ranged from 2,784 MT to 5,957 MT from 1983 to 1996 with an average catch of 3,726 MT since 1994. Harvest of both species has stabilized in recent years although large fluctuations in estimates of recreational catches in some years have occurred and overages in commercial landings and recreational quotas can occur. The stabilization in yields is thought to be the direct impact of regulations which have been implemented in an effort to sustain future production. The primary management factors contributing to fluctuations in annual recreational harvests include difficulties of enforcement of differential bag limits imposed in individual states, large inter-annual variances in recreational harvest estimates, and regulations that permit the sale of king mackerel from recreational charter boats after the closure of commercial fisheries. Critical research concerns regarding mackerels include sampling concerns related to adequate coverage of the age structure of the stocks and increasing the precision associated with the mackerel assessment abundance indices.

2. Statistics, monitoring and research

While data collection for Atlantic highly migratory species is carried out primarily by the NMFS, monitoring and research initiatives on highly migratory species are conducted by a combination of government, academic, and to a lesser extent, private research entities. U.S. permitting and reporting requirements are summarized in Section 111. Research priorities are gleaned from: SCRS annual reports; recommendations from the Advisory Committee to the U.S. Section of ICCAT; recommendations from the Highly Migratory Species, Billfish, and Longline Advisory Panels, and from interaction among researchers, fishery managers and constituents. Based on this input, the NMFS has recently developed a Comprehensive Research and Monitoring Plan for Atlantic highly migratory species. The primary objective of the research and statistics program is to improve the knowledge base necessary to design, implement, and monitor domestic and international management measures. During 1998, NMFS scientists also conducted numerous analyses to support the development of a combined Fishery Management Plan for Atlantic Tunas, Sharks and Swordfish, and an Amendment to the Fishery Management Plan for Atlantic Billfishes.

2.1 Statistics

-- Commercial fisheries

Atlantic tunas, sharks, and swordfish landings are monitored through a combination of vessel logbooks, port inspection and sampling, dealer reports and scientific observer coverage. Logbooks contain information on fishing vessel activity, including dates of trips, number of sets, area fished, number of fish and other marine species caught, released and retained. In some cases, socio-economic data such as volume and cost of fishing inputs are also provided. Landings data from licensed Atlantic tunas, swordfish, and shark dealers are used primarily for quota monitoring, but statistics on fish lengths and weights may also be used to determine average weights at size, which can vary substantially from year to year. Dealers are required to record each purchase of Atlantic bluefin tuna and report to NMFS within 24 hours from the purchase or receipt of the fish. The Dealer Report Form for bluefin includes the following information: dealer number, dealer name, date the fish was landed, harvest gear, fork length, weight (round or dressed), identification tag number, area where fish was caught, port where landed, federal fisheries permit number, vessel name, name of vessel's master, signature of vessel's master, date of signature. A biweekly dealer report provides additional socioeconomic data.

-- Recreational fisheries

Land-based surveys of recreational fishing activity, including dockside intercept surveys and telephone surveys, provide information for recreational fisheries on catch rates and fishing effort that is similar to that collected in the commercial fishery. The Large Pelagic Survey (LPS) and the Marine Recreational Fishing Statistics Survey (MRFSS) provide catch per unit effort data as well as catch and landings data for highly migratory species recreational fisheries. The LPS was designed specifically to track fishing effort and catch of large pelagic species from Maine to Virginia, while the MRFSS is a general sampling survey. LPS estimates are used for areas and times where LPS sampling took place while MRFSS estimates are used for areas and times where no LPS sampling was available. (Preliminary estimates of 1997 recreational landings for species other than bluefin do not incorporate LPS data.) In addition, recreational catch data from the State of Texas (where the MRFSS is not conducted) and from a Southeast Region NMFS charter boat survey are also used.

Recreational landings of billfish are estimated using: (a) the NMFS Recreational Billfish Survey, which estimates the number of billfish caught during tournaments held along the U.S. coast (South of 35°N latitude), in the Gulf of Mexico, and U.S. Caribbean Sea (i.e., U.S. Virgin Islands and Puerto Rico); and (b) the LPS, which provides estimates of billfish landings from May through October (North of 35°N latitude). Estimates of billfish landings compiled from these sources are considered underestimates of the total fishing mortality in the recreational fisheries and may be revised in the future. The draft Amendment to the Billfish FMP suggests several management alternatives to expand the collection of data from these fisheries.

2.2 Research activities

During 1997-98, the United States pursued a number of activities responsive to ICCAT recommended research. In addition to monitoring landings, discards, and size of swordfish, bluefin tuna, yellowfin tuna, billfish, and other large pelagic species through continued port and tournament sampling, logbook and dealer reporting procedures, and scientific observer sampling of the U.S. fleet, major research activities focused on several items. Research on development of methodologies to determine the genetic discreetness of large pelagic fishes in the Atlantic was continued. Larval surveys for bluefin tuna and other large pelagics in the Gulf of Mexico were continued. Research continued on development of new methods for estimating and indexing abundance of various large pelagic species, including application of fishery independent methods, such as aerial surveys, as well as robust estimation techniques for sequential population analyses. Research was also conducted on approaches for characterization of uncertainty in assessments and methods for translating that uncertainty into risk levels associated with alternative approaches. U.S. scientists continued to coordinate efforts for the ICCAT Enhanced Research Program for Billfish. Cooperators in the Southeast Fisheries Center's Cooperative Tagging Program tagged and released 3,260 billfishes (swordfish, marlins and sailfish) and 3,013 tunas in 1997. This represents a decrease of 3.2% from 1996 levels for billfish, and an increase of 24% for tunas. A more complete description of these research activities is available upon request.

A number of socio-economic research surveys and projects were conducted in 1997 and 1998, many with funding from NMFS. These include a survey of recreational anglers in the winter fishery in North Carolina (Ditton, Bohnsack, and Stoll, 1998). This survey attested to the significant economic contribution of the recreational bluefin tuna fishery.

particularly to the communities affected by the recent winter recreational fishery for bluefin tuna. A University of Rhode Island research project focusing on the bluefin tuna market included an econometric model examining factors that influence ex-vessel prices, focusing on changes in supply, quality, gear type and timing of harvest (Carroll, 1998). This research demonstrated that gains in gross revenues to fishermen may be possible through reduction in market gluts with measures that spread out the supply. Researchers at the University of Florida conducted the first-ever analysis of socio-economic data collected via a voluntary add-on to the pelagic longline logbooks (Larkin, Lee and Adams, 1998). This research provided important insights into fishing costs, revenues, and profitability by size of vessel, target catch, and other explanatory factors. A Georgia State University study focusing on the demand and supply of sharks surveyed fishermen on their fishing costs and profitability, and also found that these vary by vessel size (McHugh and Murray, 1997).

3. Implementation of ICCAT conservation and management measures

Regulatory amendments as published in the "Federal Register" during 1998 are available upon request. For the complete text of the U.S. Code of Federal Regulations (CFR) relating to ICCAT species, please refer to the 1996 National Report of the United States. The CFR will be substantially revised over the next year pending finalization of the new Fishery Management Plan for Atlantic highly migratory species (including tunas, sharks and swordfish) and the Fishery Management Plan Amendment for Atlantic Billfishes, and all regulations on highly migratory species will be consolidated.

3.1 Swordfish

ICCAT measures: The United States restricts total annual catches of swordfish in the North and South Atlantic to the U.S. quota as recommended by ICCAT [63 FR 12687; March 16, 1998; 63 FR 317 10; June 10, 1998]. Underage in North Atlantic landings from the 1997 fishing year will be added to the 1998 quota.

The ICCAT-recommended alternative minimum size of 119 cm LJFL (with zero tolerance) is in effect to improve enforcement capabilities. The NMFS has published a proposed rule to prohibit the import into the United States of Atlantic swordfish or Atlantic swordfish pieces weighing less than 33 pounds dressed weight (lb dw) (15 kg) unless the pieces are documented as coming from an Atlantic swordfish weighing 33 lb dw or greater; to require dealer permitting and reporting for importation of swordfish from any source; and to implement a certificate of eligibility program for all swordfish imports. These measures implement a 1996 ICCAT recommendation and facilitate tracking of swordfish trade. This action is necessary to enforce U.S. regulations on minimum size and to collect information relating to the trade in Atlantic swordfish which may hinder conservation efforts by the United States and ICCAT. In addition, the United States is proposing to close critical swordfish nursery habitat in the Florida Straits to longline gear from July through September.

Domestic measures: In September 1997, the NMFS listed North Atlantic swordfish as over-fished pursuant to the Magnuson-Stevens Act. A rebuilding program is being developed as part of the draft Fishery Management Plan for Atlantic HMS. The annual U.S. quota is currently divided between a directed fishery and an incidental fishery in the North Atlantic, while the quota for the South Atlantic is allocated solely to the directed longline fishery. The United States uses a fishing year (June 1-May 3 1) for both the North and South Atlantic, that has two six-month seasons in the North Atlantic only. The 1997 swordfish fishery was closed in the North Atlantic from April 12 through May 3 1, and from October 12 through November 30. Management measures for swordfish include permitting and reporting requirements for vessels as well as ex-vessel buyers. U.S. vessels are required to maintain logbooks; and to accept on-board observers when selected. The United States has implemented the same management measures for the South Atlantic swordfish stock that are currently in place for the North Atlantic stock, including the minimum size, wrap-around fishing year, vessel permitting, logbook reporting, and observer requirements. Regulations have been amended to establish annual quotas of 289 MT dw per year for U.S. vessels in the 1998-2000 South Atlantic swordfish fisheries.

The NMFS has proposed a limited access system that will establish a two-tiered system of directed and incidental permits in the commercial fishery for Atlantic swordfish. The objective is to reduce latent effort and prevent further overcapitalization. Eligibility criteria for these permits are based on current and historical participation, landings, and earned income from commercial fishing operations. NMFS estimates that approximately 250 vessels may be eligible for directed longline/drift gillnet permits, while additional vessels may be eligible for incidental catch permits.

3.2 Billfishes

ICCAT measures: The United States has implemented the non-binding resolution that calls for the voluntary release and tagging of all live billfish caught by commercial fishing vessels. U.S. commercial vessels have a 100% release rate

for all billfish, live or dead, and the release rate in the recreational billfish fishery exceeds 90%. Beginning in 1998, mandatory tournament reporting has improved catch statistics and information about post-release mortality of billfish.

A 1997 recommendation called for a reduction of at least 25% in landings of blue marlin and white marlin from 1996 levels, to be accomplished by 1998. In March 1998, the NMFS implemented this recommendation through an interim rule that increases the minimum size requirements in the recreational fishery to 96 inches (244 cm) LJFL for blue marlin and 66 inches (168 cm) LJFL for white marlin [63 FR 14030]. The minimum size for sailfish is 57 inches (145 cm) LJFL. This rule also established mandatory registration of tournaments. In September, 1998, the NMFS extended this provision, and also established a recreational bag limit of one marlin per vessel per day and increased the minimum size for blue marlin to 99 inches (251 cm.) LJFL [63 FR 51859]. This bag limit may be adjusted to zero with three days notice. There are no Atlantic billfish landings in U.S. commercial fisheries.

Domestic measures: In September, 1997, the NMFS listed Atlantic blue marlin and Atlantic white marlin as over-fished pursuant to the Magnuson-Stevens Act. Rebuilding programs have been proposed as part of the draft Amendment to the Atlantic Billfish Fishery Management Plan. The most significant regulation currently affecting the domestic fishery is the prohibition on the sale of Atlantic billfish. Commercial vessels are required to release billfish, dead or alive, by cutting the line near the hook without removing the fish from the water. Although a permit is not currently required for recreational billfish fishing, anglers must observe the minimum size requirements. All tournaments involving billfish (whether or not they are retained) must register with the NMFS at least four weeks in advance of the event. Tournament operators are subject to reporting requirements on billfish catch and effort.

3.3 Bluefin tuna

ICCAT measures: The United States has restricted total annual landings of bluefin tuna to the quota recommended by ICCAT (1,344 MT in 1998). The 1998 U.S. quota was increased to account for the 1997 under-harvest. The minimum size for bluefin is 27 inches (66 cm) in the United States. The 8% limit on the catch of bluefin less than 30 kg is implemented through a number of in-season management actions in the recreational fishery, although in 1997, landings of fish < 115 cm were approximately 9% of the U.S. total. U.S. regulations prohibit directed fishing for bluefin tuna in the Gulf of Mexico. Imports from Honduras, Belize and Panama are prohibited.

In recent years, there has been a steady decline in dead discards of bluefin from a high of 142 MT in 1995, to 74 MT in 1996, to 52 MT in 1997, of which 37 MT are from the longline fishery in 1997. Various factors have likely contributed to this decline including quota reductions in the directed shark and swordfish fisheries. In response to the 1996 ICCAT recommendation, the United States has performed analyses to examine the viability of different options for reducing bluefin discards. These options include changing the current target catch requirement, limiting the number of days per trip, and implementing time/area closures. Preliminary analyses indicated that longline discards of bluefin were particularly prevalent in certain areas and during certain time periods. Fluctuations in the number of discards in these areas may be due to the variability of the natural environment, particularly the location of the northern edge of the gulf stream. Finally, analyses indicate only a few sets catch large numbers of bluefin. Since these analyses revealed no statistically significant relationship between target catch and bycatch of bluefin tuna, there is no basis for modifying the target catch requirements at this time. In the fall of 1998, the NMFS will present the findings of these analyses and propose a preferred option to reduce bluefin tuna discards. The draft fishery management plan includes a limited access proposal for swordfish, shark and pelagic longline fisheries for tunas other than bluefin, which should also contribute to the U.S. effort to decrease discards.

Completion of the Bluefin Tuna Statistical Document (BTSD) is a requirement for lawful entry of bluefin tuna into the customs territory of the United States. In addition, bluefin tagging and information retrieval systems are designed to track the import and export of bluefin tuna. Together, these data collection and reporting systems comply with ICCAT recommendations regarding the BTSD Program. Complementary systems are in place for bluefin in the Atlantic and the Pacific. A compilation of U.S. import-export statistics is collected through the BTSD program and reported semi-annually to ICCAT (available upon request from the Secretariat).

Domestic measures: In September, 1997, the NMFS listed western Atlantic bluefin tuna as over-fished pursuant to the Magnuson-Stevens Act. A rebuilding program is being developed as part of the draft Fishery Management Plan for Atlantic highly migratory species. Currently, U.S. regulations prohibit the sale of bluefin less than 73 inches curved fork length (178 cm), prohibit the use of longlines as a directed gear-type for bluefin, and require mandatory reporting of bluefin landed in both commercial and recreational fisheries. U.S. regulations have also established recreational and commercial permits, fishing seasons, quotas and sub-quotas, as well as commercial trip limits and recreational bag limits.

A variety of daily catch limits and time-area closures have been implemented to improve management and monitoring of the U.S. Atlantic tunas fisheries.

In 1998, the NMFS amended the regulations governing the Atlantic tuna fisheries to: set bluefin fishing category allocations for the 1998 fishing year and establish effort controls for the General category (63 FR 27862; May 21, 1998); reduce the Angling category quota to account for a 16 MT overage of school size bluefin tuna during 1997 (63 FR 44173; August 18, 1998); and rescind the prohibition on the use of aircraft to assist fishing vessel operators in the location and capture of bluefin tuna, under a federal court order (63 FR 36611; July 7, 1998). No changes were made to the baseline sub-quotas for each category that were established in 1997. However, the 1996 ICCAT recommendation allows, and U.S. regulations require, the addition of any under-harvest or the subtraction of any over-harvest during 1997 to/from that same category in 1998.

3.4 Other Atlantic tunas

ICCAT measures: In response to the ICCAT recommendations regarding the level of fishing effort for yellowfin tuna, the United States has limited access in the purse seine fishery,-prohibits the introduction of new gear types, and has proposed limited access in the pelagic longline tunas fishery. The NMFS is also considering proposing to ban the use of drift gillnets in the Atlantic tunas fishery. Yellowfin and bigeye tuna catches in the United States are subject to a minimum size of 27 inches, with zero tolerance, equivalent to that of bluefin tuna and more stringent than the minimum size established by ICCAT. Commercial fishing vessels are required to accept scientific observers upon request, and NUTS is proposing that charter/headboat vessels also take observers, if selected. In response to a 1997 recommendation, the United States has provided ICCAT with a list of vessels greater than 80 Gross Registered Tons (GRT) fishing for Atlantic bigeye tuna.

Domestic measures: All commercial vessels targeting Atlantic tunas and ex-vessel buyers are subject to reporting requirements. An Atlantic tunas permit is required for both recreational and commercial fishing for yellowfin, bigeye, skipjack and albacore, and for commercial fishing for bonito. Ex-vessel buyers must also carry a dealer permit.

3.5 Sharks

ICCAT measures: The NMFS has fully complied with the ICCAT Resolution on cooperation with FAO with regard to study on the status of the stocks and by-catch of shark species. In the United States, shark landings are monitored through a system of logbooks, dealer reports, observer programs and statistical surveys of the recreational catch. Landings data by species are currently collected for over 24 species of sharks.

Domestic measures: For management purposes, shark species are classified as "large coastal," "small coastal," or "pelagic." Large coastal sharks have been classified as over-fished, and a rebuilding plan is being developed as part of the draft Fishery Management Plan for Atlantic HMS. In 1997, the NMFS reduced the annual commercial quota for large coastal sharks by 50% from 2,570 MT dw to 1,285 MT dw, established a commercial quota of 1,760 MT dw for the small coastal sharks, and reduced the recreational bag limit to two sharks per vessel per trip for all Atlantic sharks, with the additional allowance of two Atlantic sharpnose sharks per person per trip. All directed commercial and recreational fishing for five species of sharks (whale, basking, white, sand tiger, and bigeye sand tiger) is prohibited, although catch and release recreational fishing for white sharks is permissible. As a result of these restrictions, U.S. commercial landings of large coastal sharks decreased by 50% in 1997, and recreational landings decreased by approximately 12%. Total shark landings were 3,742 MT in 1997, a slight decline from the 3,996 MT in 1996.

A stock assessment workshop hosted by the NMFS in 1998 estimated that the current stock size of Atlantic large coastal sharks is between 30% and 36% of maximum sustainable yield (MSY). The catch in 1997 was estimated at 218-233% of MSY. These projections indicate that additional reductions in the effective fishing mortality rate are required to allow the resource to recover to MSY levels. The stock assessment provided new insight into minimum sizes and finer species classification that will enhance management. Continued collection of species-specific and size-specific catch and effort data from all nations, as well as fishery-independent measures of abundance, are needed to continue improving shark stock assessments. New assessments were not conducted for pelagic sharks or small coastal sharks due to insufficient data and time series.

In 1996, there were approximately 2,257 shark permit holders but logbook data indicate only 565 permit holders landed at least one large coastal shark. Additional permit holders may have reported landing other shark species but many permit holders did not land any sharks in 1996. This potential for increased harvesting capacity could substantially

intensify the "derby" fishing conditions that already exist in shark fisheries. In response, The NMFS is proposing a two-tiered limited access system that will reduce the number of permitted vessels in the commercial fishery based on historical participation and distinguishing between the directed -fishery and the incidental catch. It will also limit the transferability of those permits.

The Magnuson-Stevens Fishery Conservation and Management Act of 1996

Pursuant to the Magnuson-Stevens Act of 1996, the NMFS has formed three constituent advisory panels (APs) to identify and evaluate options for future management in the fisheries for Atlantic tunas, swordfish, sharks and billfish. The AP for highly migratory species was formed to assist NMFS in developing a fishery management plan (FMP) for Atlantic tunas, swordfish and sharks. Previously, sharks and swordfish were managed under individual FMPs; there was no FMP for Atlantic tunas. However, the fisheries for Atlantic tunas, swordfish and sharks share many issues, participants and concerns. Management under a single FMP will integrate common issues, ease the regulatory burden on fishery participants, and promote more holistic management of Atlantic highly migratory species. The Billfish AP was established to advise the NMFS on the preparation of an Amendment to the existing Billfish FMP. The Pelagic Longline AP has contributed to a report on the feasibility of implementing a comprehensive management system for the pelagic longline fishery. All meetings of the APs are open to the public.

The Magnuson-Stevens Act also revised the national standards which serve as guiding principles for fishery management in the United States. The new guidelines reflect requirements to rebuild all over-fished stocks to levels consistent with MSY, to specify criteria for identifying over-fishing, and to develop criteria for stock rebuilding programs. Fishery managers are required to use the best scientific information available, including information on marine ecosystems, bycatch, and fishing communities. These national standards form the foundation of a new Fishery Management Plan for Atlantic HMS including tunas, sharks and swordfish and an Amendment to the Fishery Management Plan for Atlantic Billfishes, which were prepared in draft form in October, 1998. The two fundamental objectives of these fishery management plans are to halt or prevent over-fishing and to rebuild over-fished fisheries to ensure the long-term sustainability of the stocks.

Rebuilding programs should do more than merely assure that the stock reaches the target level; rather, the goal is to restore the stock's capacity to remain at that level on a continuing basis, consistent with its natural variability. The biomass target is applicable only during the rebuilding phase of the management plan, and would signal recovery of the stock to a healthy condition. In the case of Atlantic highly migratory species, the biomass target for rebuilding over-fished stocks is set at the average biomass level which allows harvest of the maximum sustainable yield on a continuing basis. The biomass target for healthy stocks subject to on-going fishery management is the average biomass level, that will support harvest of the optimum yield on a continuing basis, provided that biomass is greater than or equal to B_{MSY}. Based on this biomass goal, a rebuilding trajectory is selected to guide consistent and reasonably rapid progress towards recovery.

Rebuilding plans should include explicit milestones expressed in terms of measurable improvement of the stock with respect to its over-fished status determination criteria. Section 304(e)(4) requires that the time period for rebuilding be as short as possible, but always less than 10 years, except in cases where the biology of the stock of fish, other environmental conditions, or management measures under an international agreement dictate otherwise. In cases where the stock cannot rebuild in 10 years, even if the fishing mortality rate were to be reduced to zero, the rebuilding time period may be adjusted upwards to the extent warranted by the needs of fishing communities and recommendations by international organizations such as ICCAT, as long as the rebuilding period does not exceed the time required to rebuild at zero fishing mortality rate plus one mean generation time for the species, or equivalent period based on the species' life history characteristics. If the stock can be rebuilt in less than 10 years with zero fishing, the time period for rebuilding may be adjusted up to a maximum of 10 years to account for the needs of fishing communities and recommendations by international organizations.

Under additional provisions of the Magnuson-Stevens Act, the NMFS must provide U.S. fishing vessels with a reasonable opportunity to harvest any allocation or quota that has been agreed to by the United States. Furthermore, fisheries managed under an international agreement must reflect traditional participation in the fishery, relative to other nations, by fishermen of the United States. In preparing any FMP or amendment for Atlantic highly migratory species, the NMFS must "evaluate the likely effects, if any, of conservation and management measures on participants in the affected fisheries, and minimize, to the extent practicable, any disadvantage to U.S. fishermen in relation to foreign competitors."

4. Other activities

4.1 NMFS enforcement

Fishing on ICCAT species is monitored and enforced by more than 50 NMFS enforcement agents and uniformed fishery patrol officers working from Maine to the Gulf of Mexico and the Caribbean. NMFS Enforcement Agents conduct investigations and inspections both dockside and offshore, including monitoring fishing and landing activities, enforcing regulations, and apprehending violators of federal law. NMFS agents conduct some at-sea enforcement activities on board Coast Guard vessels, state boats, and in some cases, unmarked vessels. However, due to the difficulty of conducting effective at-sea enforcement, the bulk of NMFS enforcement activities occur in ports when vessels are landing their catch. The Coast Guard conducts enforcement at sea using vessels and aircraft. A toll free phone number to contact the NMFS Enforcement "hotline" is available to encourage fishery participants to report violations.

The enforcement of U.S. regulations is carried out by the NMFS Enforcement Office in conjunction with the U.S. Coast Guard, and in some areas, state fishery agencies. In addition to enforcement in federal waters within the 200 mile Exclusive Economic Zone (EEZ), NMFS Enforcement conducts compliance and monitoring activities of highly migratory species fisheries beyond the EEZ. The authority to enforce regulations implemented under ICCAT is provided by several laws, including the Magnuson-Stevens Act and ATCA. Each year, the United States submits an enforcement report to the ICCAT Secretariat which is held on file for review by Contracting Parties. The 1998 report, (covering September 1, 1997, through August 31, 1998), which is available upon request.

In September, 1998, federal fisheries enforcement agents working with the U.S. Coast Guard conducted more than 200 vessel boardings and inspections during an eight-day opening of the tuna fishery. NMFS agents discovered several alleged violations of federal regulations, which involved taking of undersized fish, fishing on "no fishing" days, failure to possess tuna permits, taking more than the one fish bag limit, transferring tuna to another vessel, failure to return to port after catching a fish and failure to report fish taken in the recreational fishery. The NMFS is committed to strict enforcement of regulations for managing the bluefin tuna fishery.

4.2 Vessel monitoring systems and electronic logbooks

Monitoring of U.S. commercial fisheries will be further enhanced by the pilot Vessel Monitoring System (VMS) program recommended by ICCAT. The VMS initiative will allow NMFS to track the geographic distribution of fishing effort directed at HMS throughout the Atlantic. In addition to providing for timely monitoring of the fisheries, VMS will advance safety-at-sea for participating vessels. The NMFS published an advance notice of proposed rule making in order to request comments on the implementation this ICCAT recommendation in the United States [63 FR 19235; April 17, 1998].

Based on landings information from vessel logbooks, the NMFS estimates that there are approximately 11 U.S. vessels greater than 24 meters in length with a history of targeting tunas and swordfish outside the EEZ. Due to the small size of the U.S. vessels fishing for HMS on the high seas, the United States may have some vessels less than 24 meters in length participating in the program. Ten voluntary participants are expected to purchase and install a fully operational VMS onboard by January 1, 1999. Currently, about six vessels are reporting positions to the NMFS. Regulatory actions may result in delayed implementation for the balance of the vessels.

The United States is currently conducting a VMS pilot program that provides for the flexible offloading of swordfish following the closure of that fishery in the North Atlantic. Another application of VMS technology that is currently being considered in the United States, as part of the draft Fishery Management Plan for highly migratory species , is a proposed VMS requirement for all pelagic longline vessels. This measure could assist in the enforcement of proposed time and area closures to reduce bycatch of juvenile swordfish. If implemented, application would be coordinated with the ICCAT VMS program.

4.3 Fishery observer deployments

At-sea observer programs provide detailed information on the locations of fishing activities, fishing effort expended per unit time, other factors affecting fishing success, the composition of fish catches, species, sizes and amounts retained, biological condition of captured fish, and discard rates of target and bycatch species. Scientific observer coverage of the

U.S. pelagic longline fleet was initiated by the NMFS Southeast Fisheries Science Center (SEFSC) in 1992. In conjunction with the Northeast Fisheries Science Center (NEFSC, Woods Hole Laboratory, the SEFSC uses contracted and NMFS observers to collect catch data aboard longline vessels fishing in the waters of the northwest Atlantic Ocean, Gulf of Mexico, and Caribbean Sea.

Using fishing vessel performance information provided by the mandatory pelagic logbooks of vessel owners and operators, a list of randomly selected vessels was used to derive a target sampling fraction of 5% (about 800 observer fishing days per year) of the pelagic longline fleet in the Gulf of Mexico, Caribbean, and Atlantic Ocean. The SEFSC and NEFSC observed 699 sets in 1995, 362 sets in 1996, and 460 sets in 1997. A total of 3,317 sets were observed by personnel from the SEFSC and NEFSC programs from May, 1992, through December, 1997. Observers from the SEFSC have recorded over 67,000 fish (primarily swordfish, tunas, and sharks), marine mammals, turtles, and seabirds during this time period. There were no pair trawl or drift gillnet fisheries, and no foreign fishing activity in the U.S. Exclusive Economic Zone (EEZ) during 1997.

Since 1994, the NMFS has provided funds to the Gulf and South Atlantic Fisheries Development Foundation (GSAFDF) and the University of Florida to run an observer program for the southeast U.S. commercial shark longline fishery. Additional funding was provided through a Saltonstall-Kennedy grant in 1996. The program collects information on catch and effort, size/age and sex composition of the catch, landings, discards, and other biological information about the catch. The program is responsible for developing what is believed to be the largest biological data base in existence for western North Atlantic sharks. The voluntary program documented 2% of the entire U.S. commercial shark landings during the 1994-1997 period, observing a total of 5.5 million hook-hours of effort and more than 26,000 sharks (GSAFDF 1998).

4.4 Cooperative agreement between NMFS and U.S. Customs

A Memorandum of Understanding has recently been developed between U.S. Customs and the NMFS to facilitate the transmission of Customs data on a monthly basis. The NMFS has requested import data on fresh, chilled, or frozen bluefin tuna and swordfish. Bluefin and swordfish products in other forms (e.g. chunks, steaks, fillets) listed under separate item numbers from the Harmonized Tariff Schedule are also subject to the ICCAT import monitoring requirements. Recently, the NMFS obtained a new individual tariff code for swordfish frozen fillets to clarify imports of this product. As a result, reported swordfish imports nearly tripled in 1997, with the product that was previously entering the country identified only as "unspecified marine fish fillets" now identified as swordfish. Depending on the need for compliance monitoring and the actual level of imports of various highly migratory species products, the NMFS may request additional data.

Data received under this Memorandum of Understanding include port of entry, importer, consignee, weight of shipment, country of origin, and type of shipment. These data will help the NMFS to identify the major importers and points of entry for swordfish. In addition, the NMFS is working with U.S. Customs, to finalize procedures for handling bluefin tuna from Belize, Honduras, and Panama in response to import restrictions imposed by ICCAT. U.S. Customs is also assisting the NMFS in identifying major importers and points of entry for swordfish, in order to facilitate implementation of a prohibition on the sale of Atlantic swordfish below the minimum size. Data on import, export, and re-export of highly migratory species, including countries of origin, product form, and weight and value of shipments, are available through the web site of the NMFS Division of Statistics and Economics (http://kingfish.ssp.nmfs.gov)

4.5 Pelagic longline workshops

The NMFS is conducting an extensive series of workshops for longline vessel operators throughout the northeast and mid-Atlantic, scheduled from October, 1998, through February, 1999, to meet requirements of the Magnuson-Stevens Act, the Endangered Species Act, and the Marine Mammal Protection Act. The purpose of the workshops is to educate longliners on avoidance, handling, and release techniques for marine mammals and sea turtles and to provide information and receive feedback on different management options in the pelagic longline fishery. The NMFS also worked with a pelagic longline Advisory Panel to prepare a report to Congress outlining the feasibility of implementing several types of comprehensive management systems, and these workshops will reflect upon some of the issues raised in this report.

Table 1. Catches and landings, rounded to the nearest metric ton, of Atlantic tunas and tuna-like fishes, excluding billfishes, by U.S. fishermen, 1967-1997 [1]

Year	*BFT* [2]	*YFT* [3,4]	*ALB*	*BET* [3]	*LTA*	*SKJ* [3]	*BON*	*SWO* [5]	*SSM* [6]	*KGM* [6]	*OTH* [7]	*TOTAL*
1967	2320	1136	0	0	7	493	22	474	3577	2767	10	10806
1968	807	5941	0	18	6	3314	43	274	5342	2813	2	18560
1969	1226	18791	0	148	7	4849	98	171	4952	2814	1	33057
1970	3327	9029	0	195	158	11752	83	287	5506	3050	0	33387
1971	3169	3764	0	544	5	16224	90	35	4713	2571	50	31165
1972	2138	12342	10	212	212	12290	24	246	4863	2213	0	34550
1973	1294	3590	0	113	20	21246	261	406	4437	2710	0	34077
1974	3638	5621	13	865	51	19973	92	1125	4990	4747	1	41116
1975	2823	14335	1	67	67	7567	117	1700	5288	3095	19	35079
1976	1931	2252	0	28	5	2285	23	1429	6385	4053	30	18421
1977	1956	7208	2	331	53	6179	268	912	5453	3837	71	26270
1978	1848	9747	9	248	113	8492	224	3684	3310	2507	31	30213
1979	2297	3182	11	212	12	3102	502	4618	2926	6293	11	23166
1980	1505	2118	21	202	88	3589	195	5624	5429	10726	513	30010
1981	1530	1866	54	152	97	5373	333	4529	2748	12565	200	29447
1982	812	883	126	377	87	731	209	5410	3747	9863	962	23207
1983	1394	226	18	255	107	589	253	4820	2784	7069	453	17968
1984	1317	1252	25	408	41	817	217	4749	3904	7445	883	21058
1985	1423	6259	17	353	74	1786	109	4705	3984	6010	247	24967
1986	1655	5775	162	747	103	1004	83	5210	5957	5682	336	26714
1987	1543	9056	269	1008	118	650	130	5247	5071	5628	385	29105
1988	1505	10268	115	919	204	36	88	6171	5097	5810	410	30623
1989	1732	8350	260	762	128	56	278	6411	4444	4365	335	27121
1990	1769	5406	386	650	173	240	298	5519	4272	5940	390	25043
1991	1781	6856	485	962	227	787	468	4525	5884	6502	367	28844
1992	1128	7158	377	752	595	524	497	4236	5724	7091	545	28627
1993	1268	5199	452	982	1286	342	171	4191	5058	7746	1517	28212
1994	1238	8094	672	1328	1142	49	129	4074	4632	6186	886	28430
1995	1451	8131	545	1207	1312	81	116	4551	1554	3970	1371	24289
1996	1361	7743	472	882	2230	84	156	4320	2558	7020	1141	27966
1997	1385	7625	343	1095	2015	72	183	3840	3321	7930	1363	29174

1. Estimates of recreational catches off the northeast U.S. are included for all years for bluefin tuna and for all other tunas since 1986.
2. Includes estimated bluefin dead discards since 1986. (The 1986 estimate covered only some times and areas.)
3. Prior to 1981, figures include some catches of purse seiners flying other flags (Bermuda, Netherlands Antilles, Nicaragua, and Panama.
4. Includes small quantities of bigeye tuna prior to 1975.
5. Does not include recreational landings of Spanish mackerel (1967-83) or king mackerel (1967-78). 1996 landings preliminary.
6. This category includes blackfin and wahoo as well as the Task I category "other tunas".
7. 1996-97 data are preliminary.

NATIONAL REPORT OF URUGUAY *

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1. The fishery for tunas and tuna-like species

In 1997, the Uruguayan tuna fleet was comprised of seven longline vessels, based at the Uruguayan ports of Montevideo and La Paloma (**Table 1**). The fishing activities of these vessels was carried out mainly in Uruguayan territorial waters and in adjacent international waters. The target species was swordfish, and minor amounts of bigeye, yellowfin and albacore were also caught. By-catches includes marlins, sharks, oil fish and other pelagic fishes. There were also discards of sharks, among other pelagic fishes, turtles and birds, as well as some tunas and swordfish that were damaged (by sharks or other predators) or were small in size.

In 1997, a total of 1,329 MT (live weight) were landed, which was 121 MT less than in 1996 (**Table 2**). Of this total, 988 MT were tuna and tuna-like species, of which 760 MT were swordfish. A decrease was observed this year in tuna catches, mainly yellowfin, as can be seen in comparing the relative values by species for the last two years. Increases in catches were only observed for swordfish (13%) and billfishes (4%), caught by only one vessel of the fleet which exerted more effort and operated in a wider area. **Table 3** shows the annual catches of tunas and tuna-like species obtained by the national fleet since the start of the fishery.

2. Research and statistics

The National Institute of Fishing (INAPE) is the Uruguayan agency in charge of statistical monitoring and research on these resources. In 1997 and early 1998, efforts continued to develop new programs for the collection of information and the improvement of existing data collection schemes.

2.1 National tuna fleet

The information provided for the national fleet in the fishing logbooks still has some defects, which is the reason why the landing data were used to correct the statistics. Starting in 1998, the new fishing logbook will provide more information, and an improvement in the data quality is expected.

No size sampling was carried out at port due to the reasons expressed in last year's report, but it is expected that this activity will be reinitiated, with the help of new conversion factors.

As had been foreseen, some changes were made and regular sampling has started by the National Program of On-board Observers. The data collected includes such general information as gear, effort,, environmental data, etc., as well as the identification and reporting of total catches and size sampling. The results are being processed and will be transmitted to the Secretariat in due course.

2.2 Foreign flag vessels based at Uruguayan ports

The Uruguayan ports of Montevideo and La Paloma continue to be the base ports for the landing of foreign tuna vessels flagged to ICCAT Contracting Parties as well as to non-Contracting Parties. Recently implemented requirements by the Institute (Decree 149, Art. 32) include the collection of data on the names, flags and catches of these vessels. Detailed information on these can be obtained from the Uruguayan authorities.

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* Original report in Spanish.

3. Implementation of the ICCAT conservation and management measures

The Government of Uruguay approved a Decree on May 7, 1997, that updates the Law of Fishing, and which also includes the current legislation on minimum sizes for swordfish, and prohibits, since its entry into force (July, 1997), the adoption of new fishing projects whose target species is swordfish (Decree 149, Art. 36).

With regard to swordfish, the Government of Uruguay, through the INAPE, has made every effort to monitor compliance with the current recommendations, tending to maintain the total catch of this species within the limits established by ICCAT. In addition to establishing specific measures on each current permit, vessel quotas will be established for 1999, for all the vessels of the national tuna fleet.

Size sampling on board vessels will result in obtaining conversion factors, with an aim towards improving the monitoring of sizes at port. At any rate, the Uruguayan fleet, due to the gear it utilizes and its fishing area, usually catches adult fish.

4. Inspection

The INAPE is the official agency which has competence for all monitoring and surveillance of activities relative to fishing. Staff from the Institute carry out inspections at port, to monitor compliance by the Uruguayan fleet with current national management measures.

The tuna vessels flying foreign flags are monitored by ICCAT inspectors. In order to improve this work, new inspectors have been designated, and their names will be notified to the Commission. Adjustments continue to be made relative to the monitoring of these vessels, with the collaboration of the Port Prefecture, Naval Aviation and the Directorate of Maritime Traffic of the Uruguayan National Navy.

Table 1. Number of Uruguayan tuna vessels in operation, by GRT, 1996-1997

GRT	*1996*	*1997*
< 200	4	4
201-300	2	3
Total	6	7

Table 2. Catches retained and landed by the Uruguayan tuna fleet, 1996 and 1997 (MT, live weight)

	1996		*1997*	
Species	*MT*	*%*	*MT*	*%*
Swordfish	644	44	760	57
Bigeye tuna	124	8	69	5
Yellowfin tuna	171	12	53	4
Albacore	75	5	56	4
Billfishes	2	0	50	4
Sub-total	*1,016*	*70*	*988*	*74*
Sharks *	301	21	260	20
Others *	133	9	81	6
Total	**1,450**		**1,329**	

* product weight (DWT).

Table 3. Reported Uruguayan catches retained, by species, 1982-1997

Year	*SWO*	*BET*	*YFT*	*ALB*	*BFT*	*BIL*
1982	575	397	214	235	3	10
1983	1084	605	357	373	0	13
1984	1927	714	368	526	9	65
1985	1125	597	354	1531	16	44
1986	537	177	270	262	6	16
1987	699	204	109	178	0	6
1988	427	120	177	100	2	1
1989	414	55	64	83	0	1
1990	302	38	18	55	0	1
1991	156	20	62	34	1	1
1992	210	56	74	31	0	3
1993	260	48	20	28	1	0
1994	165	37	59	16	0	0
1995	428	80	53	49	2	0
1996	644	124	171	75	0	2
1997	760	69	53	56	6	50