INTERNATIONAL COMMISSION
for the
CONSERVATION of ATLANTIC TUNAS

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INTERNATIONAL COMMISSION FOR THE CONSERVATION OF ATLANTIC TUNAS

Contracting Parties (as of 1st January, 1996)

Angola, Brazil, Canada, Cape Verde, Côte d'Ivoire, Equatorial Guinea, France, Gabon, Ghana, Republic of Guinea, Japan, Republic of Korea, Libya, Morocco, Portugal, Russia, Sao Tomé & Principe, South Africa, Spain, United Kingdom, United States, Uruguay, Venezuela.

Chairman of Commission

Mr. R. CONDE DE SARO, Spain
(from November 17, 1995)

First Vice-Chairman of Commission

Mr. J. HACHÉ, Canada
(from November 17, 1995)

Second Vice-Chairman of Commission

Dr. L. KOFFI, Côte d'Ivoire
(from November 17, 1995)

Panel Membership (as of 1st January 1996)

Panel	Contracting Parties	Chairman
1	Angola, Brazil, Canada, Cape Verde, Côte d'Ivoire, France, Gabon, Ghana, Japan, Republic of Korea, Morocco, Portugal, Russia, Sao Tomé & Principe, Spain, United Kingdom, United States, Venezuela.	Côte d'Ivoire
2	Canada, France, Japan, Republic of Korea, Morocco, Portugal, Spain, United Kingdom, United States.	Morocco
3	Japan, South Africa, Spain, United States.	United States
4	Angola, Brazil, Canada, France, Japan, Republic of Korea, Portugal, Spain, United Kingdom, United States, Venezuela.	Japan

Council

No election was conducted for the 1996-97 biennial period.

Standing Committees

Standing Committees:	Chairman
Committee on Finance and Administration (STACFAD)	Dr. A. RIBEIRO LIMA, Portugal (from November 17, 1995)
Committee on Research and Statistics (SCRS)	Dr. Z. SUZUKI, Japan (from November 12, 1993)
Conservation and Management Measures Compliance Committee	Mr. PH. PÉRONNE, France (from November 17, 1995)
Permanent Working Group for the Improvement of ICCAT Statistics and Conservation Measures (PWG)	Mr. B. S. HALLMAN, USA (from November 12, 1993)

Secretariat
Estébanez Calderón, 3, Madrid 28020 (Spain)
Executive Secretary: Dr. ANTONIO FERNÁNDEZ
Assistant Executive Secretary: Dr. PETER M. MIYAKE

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, 1994-95, Part II (1995)"***, which describes the activities of the Commission during the second half of said biennial period.

This issue of the Biennial Report contains the reports of the Fourteenth Regular Meeting of the Commission, held in Madrid, in November, 1995, 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 is too great for them to be included in one volume, the Report for 1995 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

REPORT OF THE MEETING OF THE STANDING COMMITTEE ON RESEARCH AND STATISTICS (SCRS)

(Madrid, October 9-13, 1995)

1. Opening of the Meeting

1.1 Dr. Z. Suzuki, Chairman of the Standing Committee on Research and Statistics (SCRS), opened the 1995 SCRS Plenary Sessions on Monday, October 9, 1995. He welcomed all the scientists and introduced the Commission Chairman, Dr. A. Ribeiro Lima.

1.2 Dr. Lima welcomed all the participants. He noted that the Commission is celebrating its 25th Anniversary this year and he commended the progress made by the Committee over the past years. He emphasized that the work of the SCRS is the core of the Commission, and that all the management recommendations made by the Commission must be based on the scientific advice of the SCRS. He noted several important world developments which affect SCRS activities, such as the conclusion of the U.N. Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks and the Code of Conduct which FAO is in the process of adopting. He also hoped that the proposed Tuna Symposium in 1996 would be successful and mark a mile stone for tuna research. Dr. Lima's opening address is included as **Attachment A.**

1.3 Dr. Suzuki, the Chairman of the SCRS, thanked Dr. Lima, and noted that his presence as an indication that the Commission was paying more attention to the SCRS. He noted that the world view of fisheries has been changing and hence the work of the SCRS change to meet the new demands it faces. He also noted the proposal made at the 1994 Conference of the Parties to CITES to list sharks in its Appendix as an endangered species and the consequent requests by CITES to intensify shark research by regional agencies and FAO. The SCRS Chairman also commented on the new reporting procedure introduced this year for the SCRS. He noted that in 1995, no stock assessments were carried out on swordfish, bluefin tuna or albacore, but he considered that good progress had been made on the biology and the methodologies to assess these species.

2. Adoption of Agenda and Arrangements for the Meeting

2.1 At the time of adoption of the Agenda, the SCRS Chairman requested the Chairman's Advisory Group to report on the newly-implemented instructions to rapporteurs for the drafting of the species sections of the SCRS Report. Dr. J. Porter, who chaired this Group, referred to document INF/95/4-SCRS, and reported that the new system which the Group proposed consisted of separating the report into two parts: an "Executive Summary", to be made available in three languages and discussed at the Plenary, and a "Detailed Report", to contain all the new methodologies and procedures used to arrive at the conclusions presented in the Executive Summary. The Detailed Reports will be made available during the Plenary but will not be translated or discussion during the Plenary. The Detailed Reports will later be included in the ICCAT Collective Volume Series. Dr. Porter also explained that a glossary of technical terms had been developed by the Group in response to a request from the Commissioners.

2.2 The SCRS Chairman thanked the Group, and particularly Dr. Porter, for their work and for presenting these proposals in a concise manner. He agreed that these proposals should be implemented for the 1995 Report and decided that, after further evaluation, any necessary changes could be introduced at the end of the SCRS Plenary Session, if the Committee so wished.

2.3 A question was raised concerning the incorporation of the recommendations made for each species in the Committee's report, since these are only included in the Detailed Report. It was agreed that an Agenda item be added to include the major recommendations of the Committee to be presented to the Commission. This was added as Item 17, the numbering of all subsequent items were changed accordingly. At the same time, it was agreed that the Glossary developed by the Chairman's Advisory Group should be attached at the end of the SCRS Report (**Appendix 12**).

2.4 With the addition of Item 17 and the modification of the other item numbers, the Agenda was adopted (**Appendix 1**).

2.5 The following scientists served as rapporteurs for the 1995 SCRS Report:

YFT:	Yellowfin tuna	J. P. Hallier
BET:	Bigeye tuna	N. Miyabe
SKJ:	Skipjack tuna	J. Ariz
ALB:	Albacore	J. Santiago
BFT:	Bluefin tuna	B. Liorzou
BIL:	Billfish	E. Prince
SWO:	Swordfish	J. Porter
SBF:	Southern bluefin tuna	S. Tsuji
SMT:	Small tunas	L. Gouveja
Other SCRS Agenda Items:		P. M. Miyake

3. Introduction of Delegations

3.1 The scientific delegations of all the Contracting Parties were introduced. The List of Participants is attached as **Appendix 2.**

4. Admission of Observers

4.1 The observers were introduced and duly admitted, since they had all been invited in accordance with the criteria approved by the Commission. The list of observers is also included in the List of Participants (**Appendix 2** to this Report).

5. Admission of Scientific Documents

5.1 The Committee noted that 128 scientific documents were registered but some of these had not been presented by the deadline and hence were considered to have been withdrawn. A list of scientific documents is attached as **Appendix 3.**

6. Review of national fisheries and research programs

6.1 CANADA

In 1994, bluefin and swordfish regulations, consistent with ICCAT regulatory recommendations, were in effect. A Fishery Management Plan for porbeagle, shortfin mako and blue sharks was implemented in 1994.

In 1994, the Canadian nominal landings of swordfish were 1,675.7 MT, taken mainly by longline. The number of licenses is restricted to 77 and nearly all were active. Bluefin tuna landings were 391.6 MT, leaving 118 MT allowed by the ICCAT regulations uncaught. The 1995 bluefin quota is 654 MT which includes the uncaught quota from 1994 plus the allocation from ICCAT (535.6 MT). Shark and other tuna landings are maintained and Task I and Task II data were submitted for 1993.

Research responsibility for both swordfish and tuna resides at the Biological Station, St. Andrews, New Brunswick. In 1994 and 1995, tagging studies and biological sampling continued. In 1994, an age-specific index of relative abundance for the Canadian swordfish longline fishery was developed, and subsequently updated in 1995. In 1995, data entry of all bluefin tuna CPUE from log records from 1984-1994 was completed in preparation for the development of a new Canadian catch rate series. Research responsibility for sharks resides at the Bedford Institute of Oceanography, Dartmouth, Nova Scotia.

6.2 CAPE VERDE

A great variety of species constitute the resources. Tunas and small pelagic species comprise the major component of the catch. The vessels are multi-purpose.

Data from the artisanal tuna fishery are collected from 16 landing sites (44% of the vessels). Tuna landings are measures six times a month at these 16 landing sites, and size data are converted to weight and then extrapolated to the total catch of the vessels and by month for each island.

For the industrial vessels, logbooks for each trip are completed by fishing vessel captains or the observers.

Research work is being carried out within the framework of a project that covers the 1995-199696 period includes the following:

- Monitoring of the fisheries through catch and effort data.
- Analyses of size compositions of the tuna species.
- A study on reproduction, sex-ratio and the diet of yellowfin, bigeye and wahoo.
- The collection of data to calculate the size-weight relationship of wahoo.
- An experimental longline fishery cruise, targeting bigeye in the fourth quarter.

6.3 FRANCE

French catches of tunas in 1994 reached to 96,800 MT, a moderate increase of 12% as compared to the 1993 catch, but nonetheless a record catch for the decade. This increase is particularly important for Mediterranean bluefin tuna (12,138 MT, an increase of 109% over 1993), following an excellent fishing season for large fish. The bigeye catch by tropical purse seiners increased by 30% due, among other factors, to the development of the use of floating objects. For the other species, there were only moderate variations. Albacore catches have decreased by 14% following the adoption of 2.5 km limit for driftnets during the 1994 fishing season. Temperate tunas were caught by 32 purse seiners (bluefin tuna, albacore), 70 (35 pairs) mid-water trawlers (albacore, bluefin), 10 baitboats (bluefin) and 64 driftnets (albacore). Tropical tuna catches were made by 18 purse seiners, with a total catch of 71,400 MT, which was comprised of 32,020 MT of yellowfin, 28,635 MT of skipjack, 10,730 MT of bigeye, and 139 MT of albacore. In 1994, the seven French baitboats based in Dakar caught 7,323 MT, divided equally among the three species (yellowfin, skipjack and bigeye). There has been little change in this fishery apart from the decrease in the yields per day for the second consecutive year (5.7 MT/day in 1994 as compared with 7.4 MT/day in 1992).

French research on tunas is carried out by IFREMER for the temperate species and by ORSTOM for the tropical species, in cooperation with Côte d'Ivoire and Senegal. The main objectives of research on temperate species are: monitoring of the fisheries (statistics), biological research, such as the ageing of large albacore, the state of the stocks, by-catch, especially of marine mammals, and some research projects carried out within the framework of ICCAT. The same traditional fields of research were applied to tropical tunas, and very specific research was carried out on the association between baitboats and tuna schools (Dakar), a comparative analysis of fisheries and the environment, on a world-wide basis (San Diego, USA), studies on tunas in equatorial areas enhanced by Legeckis waves (Abidjan), by-catches of cetaceans (Montpelier). The results of these studies, in which ORSTOM scientists actively participate, are presented regularly to the SCRS.

6.4 JAPAN

The longline fishery is the only Japanese fishery currently operating in the Atlantic. The fleet operated in a wide area of the Atlantic between 58°N and 45°S. Less fishing effort was exerted in the middle latitudes (10°-25° in both hemispheres) as well as in the western Atlantic. The preliminary total catch in 1994 is estimated to be 55,600 MT, which is slightly higher (5%) than the 1993 figure. Bigeye, yellowfin and blue marlin catches increased by 3,600 MT, 1,600 MT and 560 MT, respectively. Bluefin, southern bluefin and swordfish catches, on the contrary, declined by 560 MT, 1,200 MT and 600 MT, respectively. Bigeye tuna made up the largest component of the catch (70% of the total), as has been observed in previous years.

Two changes were noted in this fishery. One is the introduction of new materials for lines used in longline operations. Several kinds of lines are used: nylon monofilament, braided nylon and the new synthetic lines. The

introduction of these materials was aimed at improving catches as well as reducing the work load of the crew members since such materials are lighter than the conventional gears. Limited information suggests that the efficiency of these new materials is generally higher than that of conventional materials, but this efficiency tends to fluctuate (often less effective), depending on area, time and target species. Another change is the development of new fishing grounds for bluefin tuna to the south of Iceland (45°-58°N/15°-30°W), which was first exploited in the autumn of 1994.

Research relative to the ICCAT Bluefin Year Program (BYP) is one of the major Japanese research activities. Genetic analysis of tissue samples collected from the larval survey in 1994 and from various fisheries in the Atlantic has continued, in collaboration with the scientists in those areas. Studies on the improvement of stock assessment methodology and standardization of CPUE are also important research subjects.

6.5 KOREA

The total catch by Korean longliners amounted to 1,805 MT in 1994, which represents a significant increase as compared to the previous year. This increase was due to the increase in the number of fishing vessels operating in the Atlantic. Bluefin tuna was the dominant species in the total catch, with 684 MT, and comprised about 38% of the total catch, followed by yellowfin (436 MT, 24%) and bigeye tuna (386 MT, 21%). The proportion of yellowfin in the catch increased compared to the previous year, while that of bigeye decreased significantly. The remaining 17% of the total catch included swordfish, other billfishes, and other tunas.

The National Fisheries Research and Development Agency (NFRDA) monitors all the fishing activities conducted by Korean tuna fishing vessels for the collection and submission of fishery data to ICCAT. Korea has introduced domestic regulations with a view towards implementing the resolutions or recommendations adopted by ICCAT.

6.6 MOROCCO

The total reported catches of tunas and tuna-like species in 1994 amounted to 4,271 MT, as compared to 2,829 MT in the previous year, a net increase of more than 30%. Coastal fisheries catches accounted for 3,427 MT, or 80% of the total, and trap fisheries reached 844 MT, or about 20% of the total. Moroccan Atlantic catches amounted to 1,985 MT, while Mediterranean catches were 2,286 MT, representing about 45 and 55%, respectively for the two areas.

The tuna fleet is mainly comprised of small longline vessels mostly using gillnet and, to a lesser extent, surface longline. Purse seiners take tunas as by-catch.

The National Office for Fisheries, under the aegis of the Scientific Institute of Maritime Fisheries has collected biostatistical data relative to tunas. Biological sampling of swordfish was also carried out within this framework and about 7,000 fish were measured. Similarly, due to the important landings of skipjack this year at the port of Safi, a demographic sampling study was conducted.

6.7 PORTUGAL

Portuguese catches of tunas and tuna-like species reached 13,400 MT in 1994, a reduction of 6,500 MT as compared to 1993. This reduction is due mainly to a very sharp decrease in catches in the Azores. The fishery operates mainly in the Azores and Madeira areas, where the baitboat fleets seasonally catch tunas using live bait. Baitboat catches in 1994 amounted to 2,604 MT of bigeye, 7,454 MT of skipjack and 906 MT of albacore. The longline fleet targeting swordfish caught 1,600 MT in 1994 and another fleet comprised of four longliners caught 437 MT of bluefin in 1994.

Research activities, sampling and the collection of statistics continued satisfactorily. Research has been carried out on temperate and tropical tuna species, on the behavior of tuna in relation to fish aggregating devices, and on baitboat fisheries. A program of experimental fishing with deep longline targeting bigeye is in progress in the Azores. The findings of this research are the subject of documents presented to the SCRS.

6.8 SOUTH AFRICA

Estimated South African tuna catches during 1994 decreased by 22% to 5,615 MT, of which 1,546 MT were caught in Namibian waters. Albacore is the only species of importance to the South African tuna fishery, contributing 94% of the total catch in 1994. Catches of yellowfin and bigeye tuna made as a by-catch to the pole fishery decreased slightly to 256 MT and 50 MT, respectively. No tuna catches were made with longlines or purse-seine nets. The recreational fishery using rod and reel for swordfish off Cape Point reported only 1 MT caught.

In response to the 1994 ICCAT recommendation for implementation of a 10% reduction in catches of southern albacore, South Africa has initiated steps to improve monitoring of her albacore catches. Current estimates indicate that South African catches in 1994 were slightly above the recommended catch limit (based on the average catches from 1989-1993). As initial steps, off-loading of albacore has been restricted to certain ports only, increased inspection effort is being specifically directed at albacore fishermen and consideration is being given to issuing specific permits for targeted albacore fishing. It is hoped that this improved monitoring will provide accurate records of total albacore catch and individual vessel performance, to facilitate the implementation of some form of Total Allowable Catch in the future.

During 1994, 11 inspections were conducted on South African tuna vessels in Cape Town harbor. These vessels off-loaded approximately 12,250 tuna, consisting almost entirely of albacore. A few bigeye and yellowfin tuna were weighed, and were all found to weigh in excess of 30 kg each. No inspections were conducted on foreign vessels in South African waters. Staff shortages also prevented any length-frequency sampling of Taiwanese catches during 1994, and length-frequency sampling effort was directed at South African boats off-loading in Cape Town and Hout Bay harbors, where a total of 2,123 albacore were measured.

6.9 SPAIN

Spanish catches of tuna and related species amounted to 154,237 MT in 1994, a 10% decrease with respect to the average catch in recent years, 1990-1993.

Yellowfin catches continued to decrease, bigeye catches were lower than in the previous three years 1990-93, and there has been no change in the level of skipjack catches. Albacore levels continue the decline which began in the early 1990s, reaching, this year, the lowest level in the historic series. Bluefin catches remain unchanged, while those of swordfish have increased slightly. Small tuna catches have decreased by 30% compared with catches over the last four years.

Bluefin catches in the Bay of Biscay during 1994 (1,294 MT) show an important decrease compared with the previous year in which the highest level of the last 28 years was recorded.

In the area of the Strait of Gibraltar, 1,136 MT were taken by traps, a slight reduction on last year's figure (1,244 MT) but stable for recent years. Catches in the Mediterranean Sea in 1994 (2,725 MT) increased, mostly resulting from purse seine catches. Observations on purse seiners continued to be carried out in the Mediterranean in 1994.

The albacore fishery in the Cantabrian Sea and adjacent waters of the northwest Atlantic caught 14,528 MT in 1994, a slight reduction on last years catches, following the declining trend of recent years.

Part of the baitboat fleet moved to the area around the Azores and southwest of the Iberian Peninsula in the autumn and caught 2,305 MT.

Swordfish catches taken by surface longline in the Atlantic (north and south) amounted to 13,964 MT in 1994. Of this amount, 6,027 MT were taken in the north Atlantic, which represents an even greater decrease (37%) with respect to the reference year 1988. In the south Atlantic, the 7,937 MT were caught in 1994, indicating that catches in this part of the ocean are continuing to increase; this increase is now 18% above last year's figure.

The swordfish fishery by surface longline in the western Mediterranean remains stable at the average levels of catch and fishing effort for recent years, with 1,401 MT caught with fishing effort similar to that of 1993.

The observer program on board longliners which catch swordfish in the Atlantic is still in progress.

Baitboat catches in the Canary Islands area for 1994 are the highest in the historical series, reaching 15,667 MT, of which 9,325 MT were bigeye, 4,772 MT skipjack, 1,328 MT yellowfin, 160 MT albacore, 56 MT bluefin tuna, and 25 MT of other species. A spectacular increase in bigeye catches which more than doubled, was due to the new fishing methods used by the largest sector of the fleet and which consisted of maintaining a school underneath the boats during the entire fishing season.

The 1994 total catch of the tropical fishery was 97,121 MT, a 13% decrease as compared to the previous year. These catches were comprised 44,681 MT of skipjack (a reduction of 18% on the 1993 figure), 39,032 MT of yellowfin (a decrease of 7%), 11,974 MT of bigeye (12% decline), 725 MT of albacore, and 709 MT of frigate tuna.

There has been no change in the number of boats (30) since last year.

6.10 UNITED STATES

The total (preliminary) reported U.S. catches of tuna and tuna-like fishes (excluding billfishes) in 1994 were 29,267 MT. This represents an increase of 2,268 MT (8% increase) from 1993. Estimated swordfish catch decreased 318 MT to 3,873 MT. Provisional landings from the U.S. fishery for yellowfin in the Gulf of Mexico decreased in 1994 to 2,054 from 2,937 in 1993. U.S. vessels fishing in the northwest Atlantic landed an estimated 1,371 MT of bluefin, an increase of 187 MT compared to 1993. Provisional skipjack landings decreased by 293 MT to 49 MT from 1993 to 1994, estimated bigeye landings increased by 346 MT in 1994 compared to 1993 to an estimated 1,328 MT, and estimated albacore landings increased from 1993 to 1994 by 220 MT to 672 MT.

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 1994 and 1995 focused on several items. Research continued on development of statistically based sampling programs for estimation of the U.S. recreational harvests of large pelagic species, the reproductive biology of Atlantic swordfish and bluefin tuna, and development of methodologies to determine the genetic discreetness of large pelagic fishes in the Atlantic. Larval surveys for bluefin tuna and other large pelagics in the Gulf of Mexico was continued. A larval survey of the western sub-tropical Atlantic was conducted to investigate larval densities of swordfish in the region.

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. U.S. scientists coordinated increased efforts for the ICCAT Enhanced Research Program for Billfish. Cooperators in the Southeast Fisheries Center's Cooperative Tagging Program tagged and released 4,780 billfishes (swordfish, marlins and sailfish) and 1,791 tunas in 1994. This represents a decrease of 34% from 1993 levels for billfish, and a decrease of 7% for tunas.

6.11 TAIWAN

In 1994, 172 Taiwanese longline vessels (93 conventional longliners, 69 super cold freezer vessels and 10 small longline vessels) operated in the Atlantic and Mediterranean Sea. A total catch of 61,648 MT were taken by these vessels. Of these catches, albacore (28,888 MT: 4,967 MT for the north stock and 23,921 MT for the south stock), bigeye tuna (19,479 MT), and yellowfin tuna (6,260 MT) comprised the main target species (about 88.6% of the total), and 724 MT of bluefin tuna were taken in the Mediterranean Sea. Comparatively, these represent a 15,359 MT increase in the catches of tunas and tuna-like species since 1993.

The Department of Fisheries, Council of Agriculture, has introduced in the national regulations, the ICCAT management measures, such as the Bluefin Tuna Statistical Document Program, the Regulation on the closed season in the Mediterranean Sea, the total allowable catch of bluefin tuna, and the reduction of conventional longline effort in the south Atlantic, etc. A considerable change in the processing of fishery data involved the transfer of this work from the Institute of Oceanography, National Taiwan University, to the Overseas Fisheries Development Council. More detailed information on the Taiwanese fisheries is provided in document SCRS/95/97.

7. Reports of 1995 inter-sessional scientific meetings

— ICCAT Planning Session for the Bluefin Year Program (BYP) (Genoa, Italy - March 13-14, 1995)

Although it was recommended that the BYP Planning Session be held either with the bluefin methodology meeting or with the GFCM/ICCAT meeting, the Session was held in early 1995, to facilitate the early implementation of the Program by some countries. Dr. J. L. Cort, who convened the BYP Session, presented the report of the meeting to the Committee (COM-SCRS/95/14). The objective of the meeting was to modify the on-going BYP program plan for the future, based on actual past performance.

Dr. Cort reported that past progress was reviewed, and based on this review some changes in the Bluefin Year Program were proposed, including a request for some financing by the Commission. The purpose of this funding proposal is to establish a clearing house for some research activities, such as the collection of biological samples in the east Atlantic and Mediterranean ($10,000), the collection of biological materials from scientific experimental fishing in Moroccan waters ($20,000 from ICCAT and $20,000 from the Moroccan Government), and support for larval surveys and biological sampling from the Turkish fishery ($20,000 from ICCAT and $20,000 from the Turkish Government).

The Committee considered that the BYP is an important program and that the Commission should seriously consider funding a part of its cost from the Commission's budget. In this respect, the Committee noted that EU-funded bluefin tuna research coincides with the objectives of the BYP, and that it was useful in supplementing ICCAT BYP research work. The Executive Secretary informed the Committee that the Commission had recently received US$ 5,000 from Taiwan, to be applied specifically towards bluefin tuna research.

It was noted that the revised Program Plan was not yet completed and the SCRS Chairman requested the Program Coordinators, Drs. Cort and Tsuji, to work on this during the SCRS session.

While understanding the special circumstances which warranted holding the BYP session early in 1995, Canada requested that, in the future, such important research planning sessions should be scheduled well in advance to facilitate the participation of as many scientists involved as possible.

— ICCAT Working Group on Vessel Monitoring (Seattle, Washington, U.S.A. - May 17-18, 1995)

This ICCAT Working Group meeting, which is part of the PWG, met in Seattle, Washington, U.S.A. Unfortunately, the Secretariat was unable to participate in this meeting since a specific budgetary allocation had not been made by the Commission. The Assistant Executive Secretary summarized the meeting Report (COM-SCRS/95/16). The Working Group reviewed various vessel monitoring systems using satellite adopted by several countries. Some of the systems include monitoring the catch information together with the position of the vessels. Satisfactory progress was reported and the work will continue in future.

-- Ad Hoc GFCM/ICCAT Joint Working Group on Stocks of Large Pelagic Fishes in the Mediterranean Sea. Mediterranean Swordfish Data Preparatory Meeting (Bari, Italy - September 13-19, 1995)

This meeting was organized once the Secretariat ascertained that the availability of data warranted such a meeting. The meeting was held in Bari, Italy, at the invitation of the University of Bari, and was partially funded by European Union (EU). The Report of the meeting (COM-SCRS/95/15) was presented by the Group's Chairman, Dr. J. Porter (Canada). Considerable progress was made in compiling data on Mediterranean swordfish catch, effort and size. Unfortunately, the majority of the catch and effort data presented to the meeting were in summarized form and the Group considered that more precision would have been obtained if more detailed data (i.e., by trip) had been made available. The catch-at-size was updated to 1994 and aged by sex, since there was sufficient information to separate the data by sex, based on sex ratio by size data.

The catch rates available were standardized and basic VPA runs were conducted. The initial VPA results showed that definitive conclusions were pending the availability of more precise and improved data. Yield per recruit was also conducted on a preliminary base. While the results were not conclusive, they do show some warning signs. The meeting was quite successful and accomplished as much as possible with the present data base.

-- Organizational Meeting for the 196 ICCAT Tuna Symposium (Bari, Italy - September 20-21, 1995)

The Organizational Meeting for the 1996 ICCAT Tuna Symposium was held in Bari, immediately following the GFCM/ICCAT meeting. This meeting was partially funded by the EU. The Chairman of the Group, Dr. Z. Suzuki, presented the Report of the Meeting (COM-SCRS/95/20). Members of Symposium Steering Committee and the Moderators for Symposium Agenda items attended the meeting. An invitation to host the Symposium in San Miguel, Ponta Delgada (Azores, Portugal) was received from the Regional Autonomous Government of Azores. The draft Agenda was modified, Moderators were designated or confirmed, outlines of the Overview papers for each Agenda Item were reviewed, the Symposium Announcement was drafted, and possible contributors and invited scientists for each Agenda Item were proposed. The Symposium budget was drafted and is included in the Report.

-- ICES Study Group on Elasmobranches (Copenhagen, Denmark - August 15-18, 1995)

Drs. H. Nakano and Y. Uozumi (Japan) attended the ICES Study Group on Elasmobranches, held in Copenhagen, Denmark, August 15-18, 1995, as observers representing ICCAT. Dr. Nakano presented his report to the SCRS as well as the Report of the ICES Study Group (SCRS/95/11). The Group established a list of species in the northeast and northwest Atlantic which require study. The Study Group reviewed Elasmobranch fisheries, as well as the various aspects of statistics, biology and the environment relative to sharks, and the methodologies for stock assessments. The Group drew up a future plan and requested the collaboration of other organizations. Dr. Nakano noted that ICES research was more limited to the bottom species of elasmobranches and indicated that ICCAT was expected to carry out a major role in the study of pelagic species of elasmobranches.

At the SCRS Plenary Session, a question was raised as to whether ICCAT should commit itself to the responsibility of assessing the stocks of Elasmobranch species. The Committee agreed to discuss this subject further at the Working Group on By-catch, and recognized that this was one of the mandates given to that Group.

-- 55th Meeting of the Inter-American Tropical Tuna Commission (IATTC) (La Jolla, California, U.S.A. - June 13-15, 1995)

Dr. A. Fonteneau, who attended this meeting as an observer in representation of ICCAT, presented his report (SCRS/95/9). He observed that the total catches for the Pacific are not clearly available as those for the Atlantic, thanks to the "Statistical Bulletin".

Fishing effort in the eastern Pacific has been reduced in the last ten years since many boats have moved to the western Pacific. Porpoise mortality associated with tuna fishing has been reduced to a minimum level so that even the environmental groups consider that the porpoise mortality problem has been solved. Discussion of the flotsam fishery was a major point of concern of the IATTC at that meeting, particularly in view of the high catches of juvenile yellowfin and bigeye and the massive discards of increasing by-catches of small non-target species. Also of particular concern was the increasing amount of small bigeye taken by the surface fishing fleet in the Pacific.

-- Annual Meeting of the Indo-Pacific Tuna Program (IPTP) (Colombo, Sri Lanka - September 23-29, 1995)

Dr. A. Fonteneau, who attended the meeting of the IPTP recently held in Sri Lanka, presented his report to the SCRS (SCRS/95/10). The new Indian Ocean Tuna Commission, which has been established within the framework of FAO, will become operative in 1996. Active research in a manner similar to that of ICCAT includes tagging of yellowfin tuna. The stock assessments are not yet at an in-depth level. The yellowfin catches in the Indian Ocean have increased rapidly and are now exceeding the Atlantic catches.

Dr. Fonteneau further reported that the statistics for the industrialized fishery are of a high quality. However, as regards the artisanal fisheries, which are much larger than those in the Atlantic, he reported that the data on these fisheries are quite inaccurate. ORSTOM scientists have combined environmental data with the catch data base and formulated a data base package which is user friendly and quite useful. As a result of flotsam fishing and the use of satellite information fishing was more efficient, but caused some difficulty in studying abundance. The IPTP scientists found that the fishery atlas prepared by the IPTP Secretariat for the Indian Ocean was very interesting and useful. He is also of the opinion that Task I type catch data should be kept in the data base format and that the availability of such data to the scientists is very convenient.

8. Review of the progress made by the Program of Enhanced Research for Billfish

8.1 Document COM-SCRS/95/13, the Report of the 1995 Billfish Contributions and Expenditures, was presented to the Committee by the Western Atlantic Program Coordinator, Dr. E. Prince (U.S.A.). Details on the progress made in research are reported in SCRS/95/51, 68 and 105 for the east Atlantic. Documents SCRS/95/63, 106 and 107 describe research carried out for the west Atlantic. Due to difficulties in 1995 in obtaining full funding from the private sector to meet the budget, only a part of the 1995 Program Plan had been accomplished. However, substantial improvement has been noted in billfish data, in particular, the observer coverage for the Venezuelan longliners has been very high and high quality data have been accumulated over the past few years.

8.2 Shore-based sampling continued in various locations in the east and west Atlantic. Cooperative tagging of billfish also continued. The Delegate of Mexico stated that many billfish caught by longliners have been released without tags and he inquired about the possibility of releasing the fish with tags. The Coordinator responded that tags can be supplied and hence the Mexican longline fishermen can participate in the billfish tagging program.

8.3 After reviewing the Report, it was adopted by the Committee and is attached as **Appendix 4**.

9. Review of the progress made by the Bluefin Year Program (BYP)

9.1 The SCRS Chairman noted that several reports on national activities relative to the Bluefin Year Program had been presented at this session. The Western Atlantic Coordinator, Dr. S. Tsuji (Japan) summarized BYP activities for the west Atlantic (COM-SCRS/95/14, SCRS/95/36 and 38 for the earlier part of the year, and SCRS/95/25 for the more recent period).

9.2 Dr. Tsuji noted that Japanese research on BYP has concentrated on the analysis of samples obtained during the joint larval surveys conducted in 1994. About 80% of the samples have been sorted and analyzed; the preliminary results are given in SCRS/95/25. She noted that the basic analysis will be completed in six months. It was also noted that research and analysis by the U.S. and Italy were also progressing at a similar rate. A proposal was made to hold a meeting in early 1996 in order to collate all these studies among the countries concerned.

9.3 The Delegate of Canada reported that joint efforts for attaching "dummy" archival tags on giant bluefin in captivity were made, but were unsuccessful, and that Canadian historical catch rates were being developed. The U.S. reported progress made on the larval collection, studies of reproductive biology at the New England Aquarium, joint research on the genetics of bluefin among several laboratories, and the continuing aerial surveys in the northwest Atlantic and Strait of Florida. The U.S. contributions to the BYP are summarized in SCRS/95/38 and 74, and detailed in various documents presented to the SCRS. The U.S. tagged more than 750 medium to large bluefin tuna in the west Atlantic. One highlight of U.S. activities relative to the BYP was the holding of a workshop on tags at the University of Miami in August, 1995 (SCRS/95/95). The effect of mixing of two fractions on the stock assessments was discussed in depth. Criteria for designing an archival tag for current and future use were developed and are included in the Report (SCRS/95/95).

9.4 The Eastern Atlantic Coordinator, Dr. J. L. Cort (Spain), presented a summary of the progress achieved in the east Atlantic. The Report of the BYP Meeting (COM-SCRS/95/14) summarizes the progress made up to that time. The National Reports of Spain (SCRS/95/34) and Morocco (SCRS/95/37) also cover this subject. The Coordinated Research Group for Large Pelagic Stocks, organized by the EU, and another similar Group by the Italian Government, have conducted intensive surveys of bluefin tuna in the Mediterranean areas. These surveys included: size and tissue sampling from juveniles in the Ligurian Sea, sampling of catches from the Tyrrhenian Sea area and the Ionian fishery, as well as some genetic studies on bluefin tuna based on hard tissue. Larval samples collected in 1994 during the joint cruises with the Japanese are also being analyzed.

9.5 The Delegate of Morocco stated that research efforts on bluefin tuna are reported in SCRS/95/37. Improvement on biological information from fish kept in captivity was commented upon (Morocco-Japanese joint program). Biological sampling from bluefin landed in Turkish waters is being carried out and studies of hard part samples from Turkish waters suggest a possibility of a sub-stock there (SCRS/95/34). Spanish ageing studies using the hard parts also advanced.

9.6 The Delegate of France reported that the purse seine fishery is the only French bluefin fishery in the Mediterranean and that the EU has funded a Program to improve statistics from this fishery. Catches by this fishery have been estimated for the first time by 5x5 area and effort data also became available. France also participated in

genetic studies. It was clarified that the catch and effort data by 5x5 are not based on logbook records, but on landing records. Hence, the division into smaller strata is not possible. Also, effort data are still only in positive catch days.

9.7 A question was raised concerning how the recovery rates of very small bluefin tuna tagged in the Mediterranean compare those of the Bay of Biscay. It was reported that fish tagged in 1994 in the Mediterranean area were recovered in the Bay of Biscay in 1995. Tagging conducted in 1991 on juvenile bluefin tuna produced very poor results. It was noted that in 1994-95 considerably more recoveries had been reported.

9.8 The BYP Progress Report is attached as **Appendix 6.**

10. Executive Summaries on Species

YFT - YELLOW 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. Sizes exploited range from 40 to 170 cm FL, with smaller fishes (juveniles) mainly limited to the surface waters and large fishes to the surface and sub-surface waters. Since yellowfin tagging has been carried out in the North American sport fishery since 1986, yellowfin are very often recovered in the west, but also regularly in the east Atlantic. Taking in account this west-east transatlantic migration as well as other knowledge (size frequency distribution with time and space, spawning grounds, etc...), a single stock for the entire Atlantic Ocean is accepted as a working hypothesis. A general migratory pattern is hypothesized as follows. The main spawning ground is in the gulf of Guinea on the Equator, from December to March. From there the juveniles move towards more coastal waters near the African coast where they swim east or west. Then at the pre-adult stage (60-80 cm; 1.5- 2 year old fish), they migrate west towards the American Coasts to come back to the Eastern Atlantic spawning grounds at about 110 cm. Growth rates are variable with size and an increase in growth rate takes place at the time of their leaving the nursery to start their westerly migration. At larger sizes, males are highly dominant in the catch.

YFT-2 Description of fisheries

Yellowfin is fished from 45°N and 40°S by surface (purse seine, baitboat, troll and handline) and by subsurface gears (longline) (**YFT-Figure 1**). Troll and handline gears, even if they are still practiced in artisanal fisheries, have never played an important role in yellowfin catches. Baitboats were more important in the past than now and have always targeted juveniles in the coastal waters (5 kg average weight) in association with skipjack, juvenile bigeye and small tunas. Baitboat fisheries are still active in Dakar, Ghana (Tema) the Canary islands, Cape Verde, Madeira, Azores, Venezuela and Brazil.

Purse seine (mostly FIS and Spanish) started in eastern Atlantic in the 1960s and their development was rapid in the 1970s. At the same time, they extended their fishing area from coastal to offshore areas, especially on the equator where they catch large yellowfin gathered for reproduction. In coastal areas, the purse seine fisheries catch juveniles in mixed schools. This gear is very efficient as it catches a wide range of fish (50 to 160 cm) with a low frequency of intermediate size fish (70-100 cm) which might, for most of them, migrate to the west. Venezuelan purse seiners, fishing mainly in coastal zones of the western Atlantic, catch a majority of intermediate size fish.

From 1990 onwards, Spanish, and later FIS, purse seiners developed fishing of log-associated schools fishing, using artificial floating objects. This resulted in an increase of the catches of skipjack and small size tunas (yellowfin and bigeye) as well as by-catches, and an extension of the fishing grounds westward.

Large yellowfin are also caught by longliners. However, the main effort of longliners operating on an Atlantic scale is directed towards other species (bigeye, swordfish, bluefin). Also, the proportion of yellowfin taken by longline in the total Atlantic catch is becoming less important (10%), with one third being taken in the east and the rest in the west.

Eastern Atlantic landings, after the 138.000 MT record of 1981 and 1982 reached another all time record in 1990 (152,000 MT) and then fluctuated from 123,000 to 109,000 MT. Purse seine accounts on average for 80% of the total catch (**YFT-Figure 2**). In the western Atlantic, catches are more or less stable since 1983 with an average of about 37,000 MT, for which purse seine accounts for 40% on average but with quite large fluctuations (6,800 to 25,700 MT), baitboat for 15% and longline for 30% (**YFT-Figure 3**). Total Atlantic yellowfin catch reached an all-time maximum in 1990 (177,500 MT) and six of the ten highest catch values recorded since 1981 belong to the period 1989-94 (**YFT-Figure 4**).

Effective effort is standardized to class 5 FIS purse seiners and adjusted by taking into account an annual increase in fishing power of 3% since 1981. This adjustment of the fishing effort is influenced by many improvements to purse seine fishing including the use of floating objects, bird-radar, sonar, etc., and is supported by data analysis. From 1985 to 1994, this effective effort for the whole Atlantic was stable, at around 38,000 fishing days for the 1985-1990 period, and more variable at around 49,500 days for the 1991-1994 period.

YFT-3. State of the stock

According to the 1994 SCRS recommendation, the 1995 SCRS focused its attention on bigeye tuna. Therefore, very few analyses were conducted on yellowfin and the following information is mostly a summary of previous SCRS meetings.

Yellowfin stock assessments have been carried out since 1993 based on the hypothesis of one unit stock in the Atlantic. The different production models used in the analyses, show for recent years, a stock that is at a level close to its maximum exploitation. Therefore, given the present fishing conditions, any increase in effort would result in over- fishing.

With the 1969-94 data set, the production model using m=1 to estimate equilibrium gives an MSY of 152,000 MT, which is very close to the 1994 landings of 151,000 MT and equal to the average landings of the 1991-94 period (**YFT-Figure 5**). The optimum mortality rate is established at 55,600 fishing days.

No other production model was used this year. Since the 1994 SCRS, the non-equilibrium production model, used for the 1963-93 period, estimated the MSY at 149,000 MT with a 1994 biomass at 105% of the biomass needed to produce MSY with a range from 81 to 130% (**YFT-Figure 6** and the summary table). The corresponding fishing mortality rate (**YFT-Figure 7**) is then 0.92 times the fishing mortality rate at MSY, which is assessed at 50,000 days. Taking into account the variability of the estimated values, the results of the different models of the 1994 and 1995 SCRS are quite similar, and it can be concluded that the stock is fully exploited.

No virtual population analysis for Atlantic yellowfin were conducted. From these different analyses it was observed that recruitment fluctuated, without any trend, that the spawning biomass, after a decreasing trend in the 1970s and the early 1980s, a consequence of increasing fishing mortality rates, began to recover from 1985 onwards because of a decreasing rate of fishing mortality associated with several high recruitment levels which occurred in the early 1980s. Fishing mortalities given by the different models showed the same fluctuations, and in particular a slight increase since 1985. The virtual population analyses showed results which agreed with the fisheries data and the information provided by the models and which can be summarized as such: the stock is fully exploited.

At the 1994 SCRS Meeting, it was reported that there was an important decline in small sized yellowfin in 1993. Thus, that year, the number of yellowfin less than 3.2 kg was estimated by the 1976-94 series. This number declined considerably in 1994 as compared to 1993, to a value that was 21% less than the average of the series. The decline in 1994 in fishing mortality of these small yellowfin do not modify the conclusions on yield per recruit.

Yield-per-recruit analyses carried out in indicate that present fishing mortality would be close to the F_{max} while an increase in effort would decrease the yield per recruit. On the other hand, an increase in size at first catch will increase the yield per recruit. However, it is noted that the size composition of yellowfin taken by the entire fishery did not change so much, despite the 3.2 kg size limitation adopted by the Commission in 1973.

YFT-4. Outlook

The Committee noted that the application of the size at first catch at 3.2 kg would increase the yield per recruit by 11%, but it also recognized the difficulty in implementing this regulation as this size yellowfin are almost always mixed with similar size skipjack and small bigeye.

Since yellowfin catches are at the MSY level, effective effort is close to the optimum level and the fishing power of the purse seiners is increasing, effective effort of this fishery (in number of constant purse seiners) would be expected to exceed F_{opt} in future years.

YFT-5. Effects of current regulations

The adoption in 1973 of a minimum size of 3.2 kg for yellowfin with a tolerance level of 15% by number of fish has not decreased the catch of juveniles. In 1994, the proportion of yellowfin less than 3.2 was 47 % for an average of 48% for the 1975-1994 series.

YFT-6. Management recommendations

The Committee maintained its recommendations not to increase the fishing mortality of Atlantic yellowfin tuna, or its equivalent in effort. It also recommended finding effective ways to reduce fishing mortality on small-sized yellowfin.

ATLANTIC YELLOWFIN SUMMARY

	Results of 1994 SCRS	*Results of 1995 SCRS*
Maximum Sustainable Yield (MSY)		
Equilibrium model	153,700 MT[1]	152,000[2]
Non-equilibrium model	149,000 MT (123,000-164,00 MT)[3]	not estimated
Current (1994) Yield	149,700 MT	151,000 MT
Current (1994) Replacement Yield	(123,0000-164,000 MT)[4]	not available
Relative Biomass (B_{1993}/B_{MSY})	1.05 (0.81-1.30)	not estimated
Relative Fishing Mortality: F_{1993}/FMSY	0.92 (0.67-1.34)	not estimated
Management Measures in Effect	3.2 kg minimum size	3.2 minimum size

1. Equilibrium model assuming shape parameter for production function (m=1) calculated at 1994 SCRS using data from 1969-1993.
2. Equilibrium model assuming shape parameter (m=1) calculated at 1995 SCRS using data from 1969-1994.
3. Non-equilibrium production model fit to data 1969-1993 at the 1994 SCRS, assumes production function shape parameter m=2, 80% confidence limits.
4. Replacement yield in 1994 estimated within the 80% confidence interval estimated MSY from the non-equilibrium production model since B_{94}/B_{MSY} was estimated at 1.05.

YFT-Table 1. Reported landings (MT) of yellowfin tuna in the Atlantic, by region and by gears.
REV. 4 (As of Oct. 6, 1995)

	1965	1966	1967	1968	1969	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
TOTAL	68131	58754	60244	83032	92755	73412	73239	93474	94782	106838	124489	124734	130970	134000	127397	130833	154424	163583	162315	113057	149109	133384	137290	127837	155280	175185	154348	144440	146131	150952
EAST ATLANTIC	54397	43254	52613	73733	80440	59227	57572	78250	79837	92297	108161	110942	117517	119223	114136	117790	138064	138191	125015	76569	111751	106093	110434	98969	123005	151759	123006	113129	109467	110451
-SURFACE	26778	30720	35484	51880	59992	43162	42915	60199	59403	72892	92755	98183	101879	107956	107381	105290	130128	128255	118913	67901	104159	102111	105803	91517	116647	145455	118411	110001	105916	105165
BAITBOAT	18486	15050	16761	22135	15673	9660	10576	13141	14746	19696	9658	12794	10943	8980	13714	7675	9788	13211	11507	14634	16067	15303	16730	15868	11962	15633	15566	12759	14691	15444
ANGOLA	1928	1319	884	1087	385	346	477	601	600	833	55	1005	1883	1984	793	538	748	1370	706	199	339	59	51	190	67	292	509	441	208	149
CAP VERT	0	0	0	0	0	346	296	455	445	410	360	115	104	470	581	864	646	801	949	862	747	1322	907	471	885	502	660	224	191	399
FIS	12700	13050	14350	18650	14027	7456	7428	7411	5493	6274	2866	3682	3391	2801	2175	2142	2953	3034	2728	3460	2874	3797	3778	4386	2340	3783	4559	2899	1564	2542
GHANA	0	0	0	0	0	0	0	2	112	274	682	791	609	311	1186	1695	2534	5606	4951	5475	8873	8206	8941	8375	6855	8230	7119	7192	10847	9966
JAPAN	1279	479	1303	2151	992	811	1955	3496	6500	7066	1144	4941	2588	1446	962	495	1701	1231	966	136	0	0	0	0	0	0	0	0	0	0
KOREA	0	0	0	0	0	0	0	0	711	1714	2678	999	1235	1372	3866	1413	963	387	144	233	84	0	0	0	0	0	0	0	0	0
PANAMA	0	0	0	0	0	0	0	445	99	1086	840	1030	860	353	197	16	78	348	59	0	0	0	0	0	0	0	0	0	0	93
PORTUGAL	0	0	0	0	0	0	0	0	0	0	1	3	0	0	4	0	0	33	8	1257	33	259	277	180	181	177	77	182	125	120
SAFRICA***	0	0	0	0	0	0	0	0	0	7	4	0	0	0	3805	435	69	16	306	563	293	16	45	0	452	265	19	63	257	256
ESPANA	2579	202	224	247	269	701	420	731	786	2032	1028	228	273	243	145	77	96	385	690	2449	2824	1644	2731	2266	1182	2384	2623	1758	1498	1767
OTHERS	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	0	1	152
PURSE SEINE	8279	15658	18722	29745	44314	33387	32218	46948	44554	53093	83013	85260	90552	98098	92291	97026	114993	111820	103502	50860	86576	84512	86141	73117	102200	127673	100828	95465	89558	89623
CAYMAN I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	602	1460	100	0	0	0	0	0	0	0	0	0	0	0	0
FIS	6500	8900	9000	12700	14446	16667	18641	23833	26194	31932	43803	47942	46557	52391	45601	52230	52132	42683	37742	4486	9430	13959	13713	16915	28467	41901	28749	28635	33980	32037
GHANA	0	0	0	0	0	0	0	0	0	0	81	154	0	0	0	223	2975	4191	2738	3491	3677	3611	1003	0	0	0	0	0	0	0
JAPAN	1134	4812	5224	7463	4714	1114	1960	2477	1232	777	129	0	0	0	0	0	0	810	1245	1271	2626	2332	2803	2221	2090	1702	1447	837	0	0
MAROC	0	0	0	0	0	0	0	0	0	290	1048	1574	2167	3440	2986	3243	4817	4540	2331	614	2270	2266	1529	0	0	0	0	0	0	0
NORWAY	0	0	0	0	0	0	0	0	344	0	0	0	0	0	0	0	0	0	0	0	0	0	418	493	1787	1790	0	0	0	0
PORTUGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	125	180	62	208	948	1315	266	0	31	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	0	0	0	0	0	3200	1862	2160	1503
ESPANA	600	1300	2900	3100	5427	6386	7409	8563	13269	14045	23685	33195	35252	33393	39938	38682	51332	53779	51147	37508	64031	60230	63362	47894	60458	66201	55679	48636	41918	39032
USA	0	0	918	5827	18791	9029	3764	12021	3017	5621	13960	1706	6400	8131	2884	1614	1472	636	0	0	0	0	0	0	0	0	0	0	0	0
USSR	0	0	0	0	0	0	0	0	0	0	0	89	0	91	63	7	92	903	1247	1824	3447	1425	695	2162	3676	3425	0	0	0	0
NEI_1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3121	5388	1104	0	0	2077	3140	5436	12513	11736	15477	11500	17051
OTHERS	45	646	680	655	936	191	444	54	498	428	307	600	176	527	639	363	505	109	349	296	1095	658	541	292	286	141	17	18	0	0
OTHER SURFA	13	12	1	0	5	115	121	110	103	103	84	129	384	878	1376	589	5347	3224	3904	2407	1516	2296	2932	2532	2485	2149	2017	1777	1667	98
ANGOLA	13	12	1	0	5	15	21	10	3	6	0	0	202	312	111	20	211	97	82	38	11	0	0	56	0	0	1	0	0	0
CAP VERT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4635	2691	3392	1958	1154	2004	1768	1997	1985	1634	1272	1202	1467	0
OTHERS	0	0	0	0	0	100	100	100	100	97	84	129	182	566	1265	569	501	436	430	411	351	292	1164	479	500	515	744	575	200	98

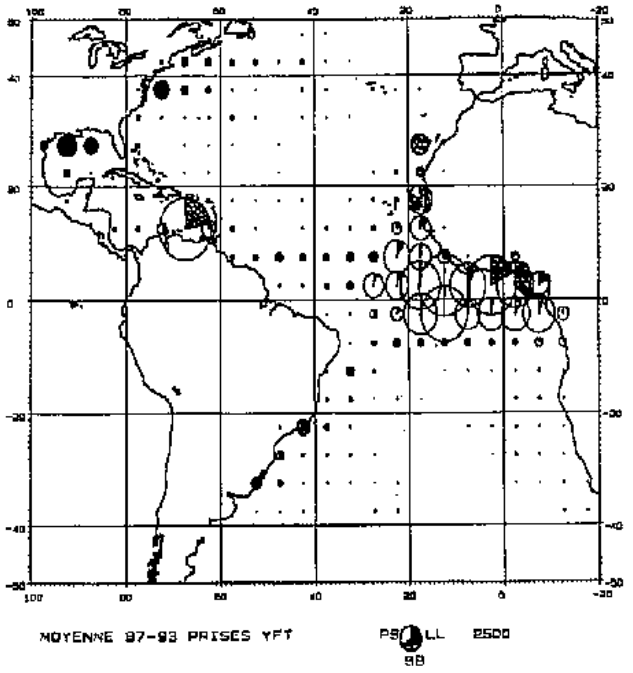
YFT-Table 1. Reported landings (MT) of yellowfin tuna in the Atlantic, by region and by gears.
REV. 4 (As of Oct. 6, 1995)

	1965	1966	1967	1968	1969	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
-LONGLINE	27619	12534	17129	21853	20448	16065	14657	18051	20434	19405	15406	12759	15638	11267	6755	12500	7936	9936	6102	8668	7592	3982	4631	7452	6358	6304	3722	2475	3130	5284
CHITAIW	0	800	1900	6600	7000	3900	3400	3500	1500	1000	1300	600	184	180	168	63	382	180	400	77	121	225	163	155	67	906	382	157	334	562
CUBA	535	367	2412	1224	940	1120	1360	3240	4500	3026	1700	1800	2900	1939	2568	4927	2542	2142	1567	1171	1135	694	769	1417	438	679	0	0	0	0
JAPAN	26549	10597	10137	9755	6366	2496	1577	2342	1319	670	1748	297	59	276	279	1722	1162	2774	851	2937	3139	1302	1718	3587	3792	4185	3020	2124	2627	4259
KOREA	0	0	0	1600	4200	8020	6900	7800	8297	10118	7626	6637	9825	7253	2583	3936	3325	3623	1485	1684	1584	965	1221	1248	1480	324	259	174	169	436
PANAMA	0	0	0	0	0	0	0	65	3610	2086	1176	1862	876	1124	542	1645	263	1088	1623	2239	1273	327	180	0	0	0	0	0	0	0
USSR	535	770	2680	2674	1942	529	1420	1104	1186	2505	1856	1563	1794	495	514	147	214	101	35	344	321	426	580	1045	570	190	0	0	0	0
OTHERS	0	0	0	0	0	0	0	0	22	0	0	0	0	0	101	60	48	28	141	216	19	43	0	0	11	20	61	20	0	27
-UNCL GEARS	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	873	653	421	2
OTHERS	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	873	653	421	2
WEST ATLANTIC	13572	15500	7631	9299	12315	14185	15667	15224	14945	14541	16328	13792	13453	14777	13261	13043	16360	25392	37300	36488	37358	27291	26856	28868	32275	23426	31342	31311	36663	40501
-SURFACE	0	0	218	114	0	0	0	3410	2276	1617	1995	679	1457	4743	3637	5664	4797	15112	29402	27005	25767	13387	16506	13705	18438	12396	21462	19069	24274	28841
BAITBOAT	0	0	0	0	0	0	0	0	26	1278	408	0	0	1012	605	392	1917	2970	3603	3698	4252	3648	5468	5822	4834	4718	5359	6342	6453	6832
BRASIL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	117	392	917	1036	1778	1298	2176	751	1560	1596	1376	953	1169	2726	3157	2617
JAPAN	0	0	0	0	0	0	0	0	26	1180	312	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESPANA	0	0	0	0	0	0	0	0	0	0	0	0	0	980	300	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	98	96	0	0	0	0	0	1000	1912	1825	2400	2076	2897	3908	4226	3458	3765	4190	3616	3296	4215
OTHERS	0	0	0	0	0	0	0	0	0	0	0	0	0	32	188	0	0	22	0	0	0	0	0	0	0	0	0	0	0	0
PURSE SEINE	0	0	218	114	0	0	0	3410	2250	339	1577	634	1073	3662	1035	5135	2822	12112	25749	23203	20994	8324	6665	6034	11647	6800	14414	11359	16081	16213
COLOMBIA	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	0	2404	0
FIS	0	0	0	0	0	0	0	2600	1677	339	440	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESPANA	0	0	0	0	0	0	0	489	0	0	762	0	266	1049	752	0	0	0	1957	3976	1000	0	0	0	0	0	1451	1290	810	0
USA	0	0	218	114	0	0	0	321	573	0	375	473	807	1606	283	473	322	82	112	1080	4387	647	82	42	35	267	996	376	208	25
VENEZUEL*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4397	2500	12030	23503	17814	15607	7677	6583	5992	11612	6533	11967	9693	12659	16188
OTHERS	0	0	0	0	0	0	0	0	0	0	0	161	0	1007	0	265	0	0	177	333	0	0	0	0	0	0	0	0	0	0
OTHER SURFA	0	0	0	0	0	0	0	0	0	0	10	45	384	69	1997	137	58	30	50	104	521	1415	4373	1849	1957	878	1689	1368	1740	5796
USA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	29	0	38	59	215	1342	4295	1808	1896	718	1581	1159	1637	5168
VENEZUEL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1811	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OTHERS	0	0	0	0	0	0	0	0	0	0	10	45	384	69	186	130	29	30	12	45	306	73	78	41	61	160	108	209	103	628

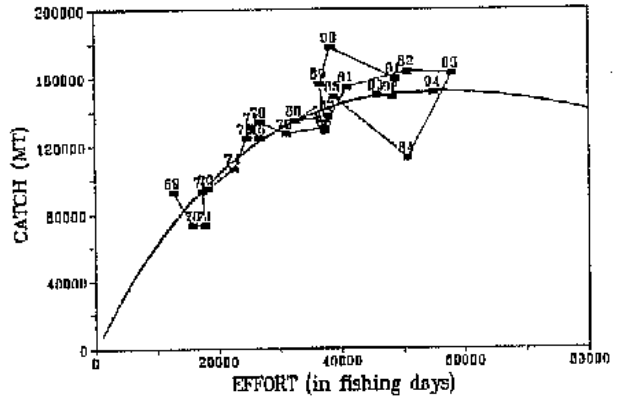
YFT-Table 1. Reported landings (MT) of yellowfin tuna in the Atlantic, by region and by gears.
REV. 4 (As of Oct. 6, 1995)

	1965	1966	1967	1968	1969	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
-LONGLINE	11384	12964	4877	7693	10359	13886	15368	11515	12367	12574	13946	12626	11355	9551	9179	6636	11271	9814	6870	7959	10526	12402	9820	14096	12920	9989	8408	10408	9930	10980
BRASIL	696	464	812	812	464	812	347	233	153	232	260	681	928	795	1076	521	1159	935	887	484	515	1057	653	898	1075	604	446	400	619	684
BRASTAI	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	120	625	1141	460
CHITAIW	0	300	775	1262	3798	3171	970	1205	1155	1327	1062	1136	145	160	750	545	385	360	77	495	647	1023	600	1228	532	2108	892	1591	3380	5698
CUBA	219	443	580	652	615	480	340	360	0	374	600	1200	900	661	232	689	1997	1481	793	2538	1906	2081	1062	98	91	53	0	0	0	0
JAPAN	10369	11757	2687	4158	3600	4313	9052	4155	2484	2805	2444	3069	1408	1647	1707	1117	2983	3288	1218	1030	2169	2103	1647	2395	3178	1734	1698	1591	469	474
KOREA	0	0	0	670	1782	3486	3001	3278	4547	5400	7718	4574	6522	4259	4414	1933	3325	2249	1920	989	1655	853	236	120	1055	484	1	45	11	0
PANAMA	0	0	0	0	0	0	0	28	1978	1114	1191	1283	582	719	0	807	262	675	62	246	0	319	145	0	0	0	0	0	0	0
USA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	43	0	76	113	1654	3784	4682	8418	6418	4420	4276	5607	3352	2899
VENEZUEL	0	0	0	0	0	1624	1508	1856	1921	1210	563	626	827	1306	1000	1000	1000	484	1248	1665	1626	910	646	731	497	258	338	450	692	0
OTHERS	100	0	23	139	100	0	150	400	129	112	108	57	43	4	0	0	117	342	589	399	354	272	149	208	74	328	637	99	266	765
-UNCL GEARS	2188	2536	2536	1492	1956	299	299	299	302	350	387	487	641	483	445	743	292	466	1028	1524	1065	1502	530	1067	917	1041	1472	1834	2459	680
MEXICO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	0	0	612	1059	562	658	33	283	345	112	433	742	855	0
VENEZUEL	2088	2436	2436	1392	1856	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OTHERS	100	100	100	100	100	299	299	299	302	350	384	487	641	483	445	727	292	466	416	465	503	844	497	784	572	929	1039	1092	1604	680
UNCL REGION	162	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	1	0
-SURFACE	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	0	1	0
OTHERS	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	0	1	0
-LONGLINE	162	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	0	0
OTHERS	162	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	0	0
-UNCL GEARS	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	0	0	0

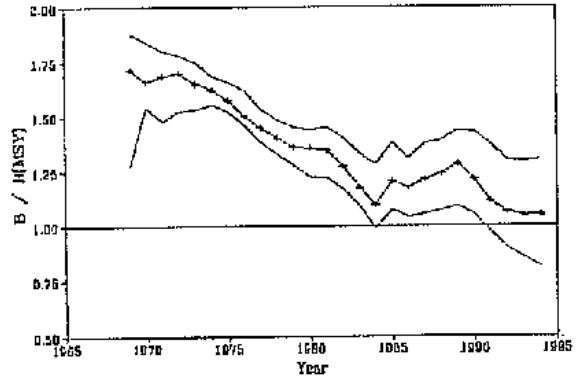
++ Catches less than 0.5 MT
* Changed based on SCRS/95/39
** Unknow catches
*** Figures for South African baitboat landings for 1984 through 1992 are SCRS estimates and differ from Task I reported catches. They may represent uder-estimates. They are being reviewed by South African and Portuguese scientists.



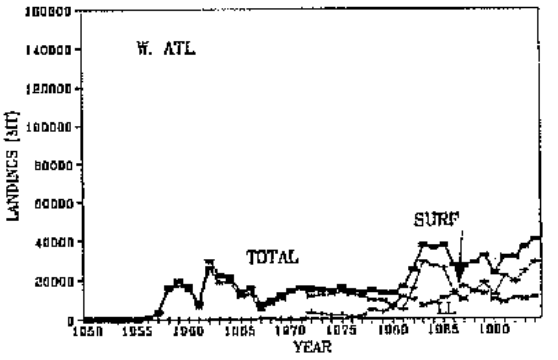
YFT-Fig. 1. Distribution of Atlantic yellowfin catches by gear and by 5° rectangles (1983-=1993)



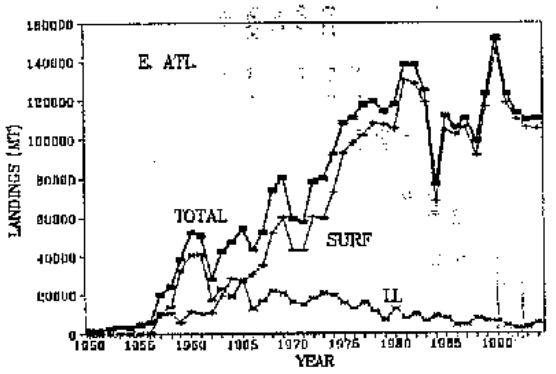
YFT-Fig. 5. PRODFIT model: equilibrium production model for total Atlantic yellowfin (m=1, k=4). The modl is fit to the nominal (standardized to closws 5 FIS purse seiners) and considering an annual increase in fishing power of 3% since 1981.



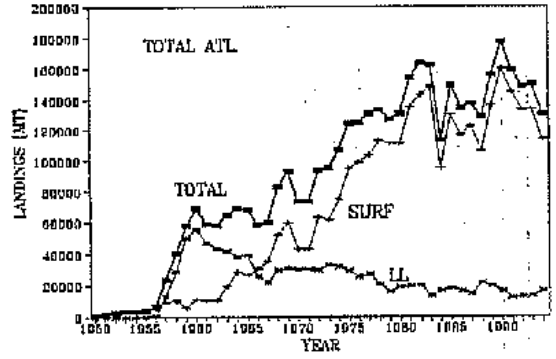
YFT-Fig. 6. Estimated relative biomass (B/B_{MSY}) with approximate 80% confidence intervals. Computed from ASPIC run for total Atlantic hypothesis.



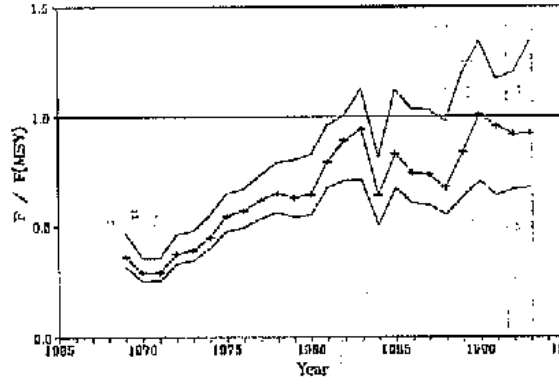
YFT-Fig. 2. West Atlantic yellowfin landings (MT) by gear (1950-1994).



YFT-Fig. 3. East Atlantic yellowfin landings (MT) by gear (1950-1994)



YFT-Fig. 4. Whole Atlantic yellowfin landings (MT) by gear (1960-1994).



YFT-Fig. 7. Estimated relative fishing mortality rate (F/F_{MSY}) with approximate 80% confidence intervals. Computed from ASPIC run for total Atlantic hypothesis.

BET - BIGEYE TUNA

BET-1. Biology

Bigeye tuna are known to distribute widely in the tropical and temperate waters of the Atlantic Ocean between 45°N and 45°S. Species identification is difficult when bigeye are young because of their similarity to yellowfin as regards external characteristics. Bigeye spawn in tropical waters. Fish tend to migrate into temperate waters as they grow. From catch information by surface gears, the Gulf of Guinea is known to be a major nursery ground for this species. This species dwells in deeper waters than other tuna species, and feed on various prey organisms such as fish, mollusks, and crustaceans, etc. Bigeye exhibit relatively fast growth, reaching about 100 cm at the beginning of their fourth year, and this is when they start spawning. Young fish form schools close to the sea surface mostly mixed with other tunas such as yellowfin and skipjack, but large bigeye are seldom caught with other species in purse seine sets.

Based on known information, such as the spatio-temporal distribution of fish, a single total Atlantic-wide stock is assumed for stock assessment purposes.

BET-2. Description of fisheries

The stock has been exploited by three major gears (longline, baitboat and purse seine) and by many countries throughout its range of distribution **(BET-Figure 1)**. Longline and baitboat fisheries have long histories which date back to before 1960. Major baitboat fisheries exist in Ghana, Senegal, Canary Islands, Madeira and Azores. The Japanese and Taiwanese fleets currently make up the major component of the bigeye longline fisheries. The Korean fleet considerably reduced its activity in the Atlantic since 1990. The tropical purse seine fishery operates in the eastern Atlantic and off Venezuela in the western Atlantic, and is mainly comprised of French, Spanish and other fleets. Since 1990, operations by purse seiners flying flags of convenience became significant. Bigeye tuna is a primary target species for the longline and baitboat fisheries, with the exception of the Ghanaian baitboat fishery. However, for the purse seine fishery this species is not targeted but is caught with its target species, i.e., yellowfin and skipjack. The size of fish caught by the fishery varies among fisheries: medium to large, small to medium and small fish for the longline, directed baitboat and purse seine fisheries, respectively. The corresponding average weights are 45 kg, 20-30 kg and 5 kg for those fisheries.

The total catch remained more or less constant up to the late 1980s, but increased considerably and reached its highest level of 110,000 MT in 1994 **(BET-Figure 2)**. This increase during 1990 to 1994 is attributable to the significant increase in purse seine (20,000 MT) and longline catches (17,000 MT). It was reported that the increased use of drifting artificial fish aggregating devices (FADs) in purse seine operations was a primary cause of this increase in the purse seine catch, although other technological advances may have contributed as well. It is known that fish caught from schools associated with FADs are comprised of small-sized tunas, including bigeye. Dumping of small tunas at sea, including bigeye, has been observed in the tropical purse seine fleets. Since the magnitude of dumping is not precisely known and some uncertainty exists in the estimation of species composition, there is possible bias in the reported catch for that size. The increase in the longline catch is primarily due to a rapid shift of target species from albacore to bigeye and to the increase in the longliners operating in the Taiwanese longline fleet and, to a lesser extent, to the increased catch of the Japanese longline fishery.

BET-3. State of stocks

Production model analyses were conducted using an abundance index standardized from the Japanese longline fishery which accounts for 20 to 50% of the total catch. The estimated MSY was 65,000 MT (80% confidence limit: 50,000-78,000 MT) for the non-equilibrium production model, and 72,000 MT (95% confidence limit: 68,000-76,000 MT) for the equilibrium production model. The total catch was similar to the MSY in 1992. However, it substantially exceeded that level in the following two years. Current biomass is slightly below MSY level for both models (92% for the non-equilibrium model), and current F surpasses F_{MSY} by 71% and by 68% for non-equilibrium and equilibrium models, respectively **(BET-Figures 3 and 4)**.

Selectivity at age and recent F level trends were estimated by forward Virtual Population Analysis (VPA), assuming an arbitrary level of constant recruitment. F for age 1 almost tripled during the last four years **(BET-Figure 5)**. F on older ages more than doubled, on average, reflecting the recent increase in the longline catch. However, there is uncertainty in the estimation of recent F trends, due to uncertainties in catch at age.

Yield-per-recruit analyses indicate that intensifying the current fishing pattern does not provide any increase in yield. This situation is the same as last year' analysis, which showed yield per recruit can be increased by the increase in the age at first capture to age 2 coupled with a simultaneous increase in fishing mortality. The multi-gear yield-per-recruit analysis suggests that some gain could be obtained by reducing F for the small-fish fishery and a concurrent increase in F for the large-fish fishery (**BET-Figure 6**).

BET-4. Outlook

Stock assessment results were used to evaluate several harvest scenarios. The results showed that: (1) maintaining the status quo F will result in a continued decline in biomass and a decline in catches; (2) maintaining current levels of catch would increase F and bring about a more drastic decline in biomass; (3) in order to stop the decline in biomass, a 50% reduction in F may be necessary, particularly for small fish (ages 0-2). Such a reduction in F will be accompanied by reduced catches for a number of years.

BET-5. Effects of current regulations

The bigeye minimum size regulation of 3.2 kg, in effect since 1980, was adopted to reinforce the same regulation on yellowfin. It has been clear that the equatorial surface fleets (baitboat and purse seine) continue to land a large quantity of juvenile bigeye tuna less than 3.2 kg. About 65% of the total number of fish caught in 1994 was below the minimum size.

BET-6. Management recommendations

Since 1993, the total annual bigeye catch has substantially exceeded all current MSY estimates. This rapid increase in catch was due to the purse seine and longline fisheries. The projection conducted this year indicates the 1994 level of fishing will not only reduce the population size to far below that of the MSY level, but also the catch in the near future due to over-fishing.

It should be noted again that a further increase in the catch of small fish, which may come about from the intensive operations on small fish associated with floating objects by purse seine fishery, will lead to a reduction in yield per recruit.

For these reasons, the Committee strongly recommended to reduce the catch to levels below MSY. This overall reduction in catch must be accompanied by a reduction in the catch of small fish.

ATLANTIC BIGEYE TUNA SUMMARY

Maximum Sustainable Yield (MSY)[1]	65,000 MT (50,000-78,000 MT)[3]
Maximum Sustainable Yield (MSY)[2]	72,000 MT (68,000-76,000 MT)[4]
Current (1994) Yield	110,170 MT
Current (1994) Replacement Yield[1]	65,000 MT
Relative Biomass (B_{1994}/B_{MSY})[1]	0.92 (0.67-1.25)[3]
Relative Fishing Mortality (F_{1994}/F_{MSY})[1]	1.71 (1.05-2.44)[3]
Relative Fishing Mortality (F_{1994}/F_{MSY})[2]	1.68
Management Measures in Effect	3.2 kg minimum size

[1] Non-equilibrium model.
[2] Equilibrium model.
[3] 80% confidence limits.
[4] 95% confidence limits.

BET-Table 1. Total reported landings (MT) of bigeye tunas in the Atlantic.

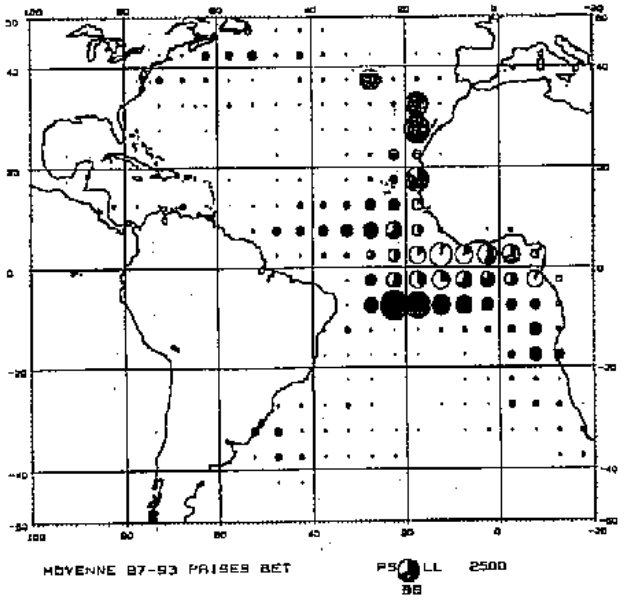
Rev 3 (As of 18:10 Oct. 6, 1995)

	1965	1966	1967	1968	1969	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
TOTAL	39234	24979	24738	23030	35772	41313	55057	46521	56480	63667	60787	44875	54494	52351	45591	63301	67530	73464	60339	69194	74080	59614	49131	58423	69064	71229	71723	77823	95983	110091
-SURFACE	9822	5339	11526	4227	12739	13906	15957	13994	18538	24558	19954	17455	25349	23897	18317	21918	26139	21653	26834	27650	25293	25219	20311	17425	19122	26543	38392	35678	44713	48621
BAITBOAT	9822	5319	11434	3791	9769	10517	11841	9304	13620	17922	14651	9939	12758	14629	9493	12125	9685	6922	9796	11401	17654	15604	12671	9209	12393	16946	17136	15755	16057	17624
FIS	10	40	1730	150	2360	1459	1348	1069	1224	981	1329	1365	2569	3611	2038	2450	2198	1832	2062	2146	4034	3228	2679	2507	2040	2739	2223	1700	2188	2193
GHANA	0	0	0	0	0	0	0	0	30	73	84	140	237	121	183	260	472	432	300	1330	1407	1432	1113	1214	2158	4160	3656	2804	2699	2483
JAPAN	125	2	381	646	264	215	520	929	1732	1878	141	872	1007	562	193	445	1047	616	49	27	0	0	0	0	0	0	0	0	0	0
KOREA	0	0	0	0	0	0	0	0	189	455	331	176	480	534	717	1272	592	194	0	46	13	0	0	0	0	0	0	0	0	0
PORTUGAL	8670	4132	8051	1596	5619	5132	2887	3962	5855	10945	6813	2929	4522	5350	3287	3482	2647	1837	3774	3903	6390	7253	4920	2724	5279	6144	5578	5612	5493	2857
ESPANA	1017	1145	1272	1399	1526	3600	6991	3080	4422	3170	5719	4225	3561	3850	2975	4034	2405	1534	2455	2821	4956	3469	3615	2588	2761	3814	5484	5518	4901	9848
VENEZUEL																						83	94	118	66	59	56	87	123	0
OTHERS*	0	0	0	0	0	111	95	264	168	420	234	232	382	601	100	182	324	477	1156	1128	854	139	250	58	89	30	139	34	653	243
PURSE SEINE	0	20	92	436	2970	3389	4116	4690	4918	6636	5303	7067	11875	9094	8343	9204	15656	14476	16903	16063	7554	9286	7148	7859	6371	9407	20979	19481	28304	30434
FIS	0	20	10	5	1285	2426	2624	2885	3218	4220	3572	5120	6401	5374	5270	3833	5822	5242	7311	2108	581	1038	1226	1654	1221	2284	4047	5519	11210	10730
JAPAN	0	0	82	413	1253	296	521	658	328	206	16	0	0	0	0	0	0	30	22	533	502	281	386	400	121	207	868	594	0	0
ESPANA	0	0	0	0	284	472	427	935	1259	1345	1648	1696	4819	2999	2444	4396	7598	7496	6190	10760	5378	7408	5260	5396	4899	6060	12572	11602	14717	11974
USSR	0	0	0	0	0	0	0	0	0	0	0	0	0	79	3	0	979	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	361	200	37	1156	1115	508	121	170	101	22	53	321	169	326	140
NEI_1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	338	1141	157	0	0	85	20	93	785	3158	1384	1700	7488
OTHERS	0	0	0	18	148	195	544	212	113	865	67	251	655	642	626	614	1057	1333	1083	1390	585	438	21	288	15	18	13	213	351	102
OTHER SURFA	0	0	0	0	0	0	0	0	0	0	0	449	716	174	481	589	798	255	135	186	85	329	492	357	358	190	277	442	352	563
OTHERS	0	0	0	0	0	0	0	0	0	0	0	449	716	174	481	589	798	255	135	186	85	329	492	357	358	190	277	442	352	563
-LONGLINE	29412	19640	13212	18803	23033	27407	39100	32527	37942	39109	40833	27420	29145	28454	27274	41383	41391	51779	33461	41492	48669	34330	28726	40941	49707	44580	33191	41917	51037	61459
BRASTAI	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	70	555	1081	294
CHITAIW	0	595	2231	5344	7483	7555	5479	4990	3818	3097	3950	3274	2978	2628	2200	2266	1670	1900	1436	818	1079	995	1317	1300	717	4899	766	4749	11881	19479
CUBA	89	300	217	886	1027	4100	3200	2000	2600	2400	1900	1300	1800	2300	2300	1385	711	521	385	447	239	167	190	151	87	62	0	0	0	0
JAPAN	28538	17576	8549	10286	10266	8993	20258	18078	19954	20862	17391	7298	9137	9301	11957	20477	21044	32867	15141	24310	31601	22800	18575	31664	39419	35024	29488	34128	35107	38655
KOREA	0	289	320	263	1857	4079	7353	5730	5829	7376	10162	6747	7610	9182	7305	8963	11682	10615	9383	8943	10691	6084	4438	4919	7896	2690	802	866	377	486
PANAMA	0	0	0	0	0	0	0	64	2684	1792	1987	1953	1158	1990	477	4504	2452	2933	2732	1952	1104	631	375	0	0	0	0	0	0	0
ESPANA	0	0	0	0	0	0	0	0	0	0	1515	1515	1356	0	0	0	7	250	72	36	6	7	0	0	0	481	481	481	0	0
USSR	385	680	1820	1677	2200	2580	2729	1637	2961	3367	3652	4907	4086	2058	2041	2618	1681	635	352	1233	870	1071	1887	1077	424	95	0	0	0	0
VENEZUEL	0	0	0	0	0	0	0	0	0	0	0	21	464	244	347	300	1484	962	2372	1972	1696	932	85	113	27	49	99	14	355	238
USA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	200	368	348	537	755	556	557	576	857	577	763	840
OTHERS	400	200	75	347	200	100	81	28	96	215	276	405	556	751	647	869	659	1096	1388	1413	1035	1106	1104	1161	580	704	628	547	1473	1467
-UNCL GEARS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	44	52	118	65	94	57	235	106	140	228	233	11
OTHERS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	44	52	118	65	94	57	235	106	140	228	233	11

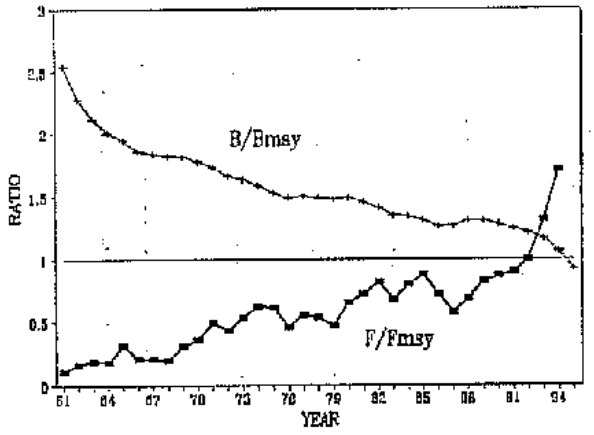
* Figures for South African baitboat landings for 1984 through 1992 are SCRS estimates and differ from Task I reported catches. They may represent uder-estimates. They are being reviewed by South African and Portuguese scientists.

++ Catches less than 0.5 MT

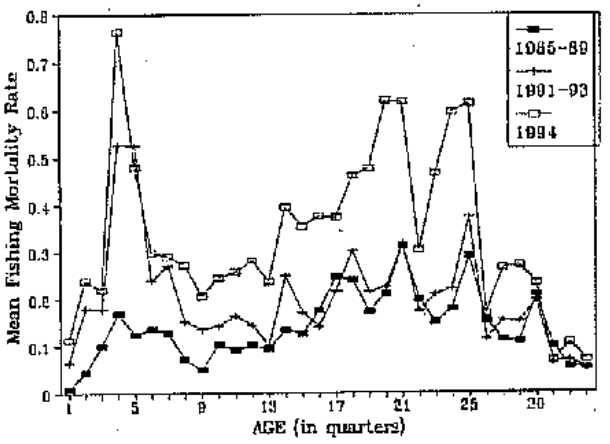
** Unknow catches



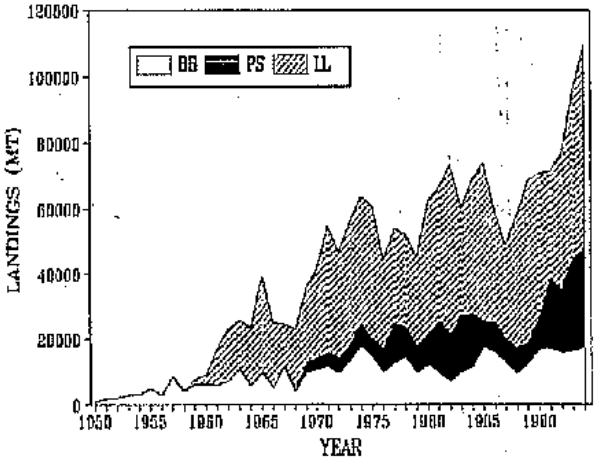
BET-Fig. 1. Geographical distribution of bigeye catch by major tuna fisheries. Solid, hatched and blank part in circles denote catches for longline, baitboat and purse seine fisheries, respectively.



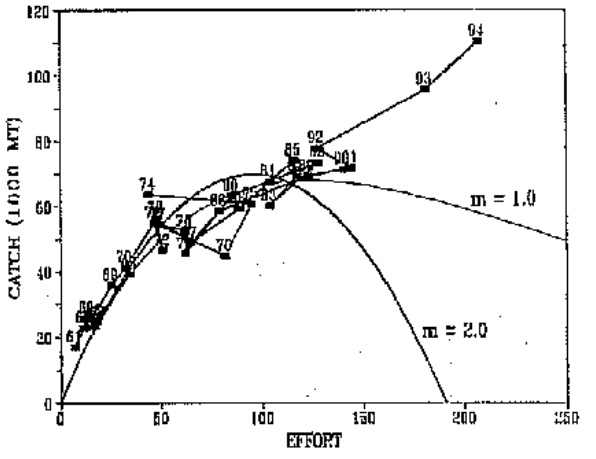
BET-Fig. 3. Trajectory of relative bench marks (F/F_{MSY} and B/B_{MSY}) for bigeye stock estimated by non-equilibrium production model. Base case with abundance index estimated for central area with GLM model.



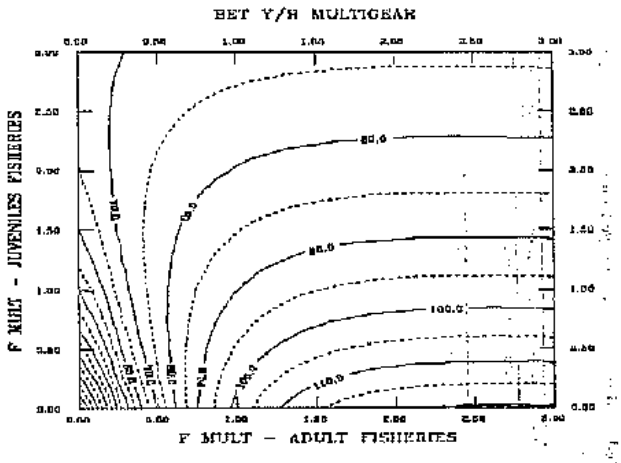
BET-Fig. 5. Fishing mortality rates at age for bigeye estimated by forward VPA.



BET-Fig. 2. Reported accumulative total landings of bigeye tuna in the Atlantic, by major categories of gears.



BET-Fig. 4. Production curve (shape parameter = 1.0 and 2.0) estimated by equilibrium production model plotted with catch and effort series. Base case with abundance index estimated for central area with GM model.



BET-Fig. 6. Results of multi-gear yield per recruit analysis. Large fish fishery and small fish fishery correspond to longline and islands baitboat fisheries and other fisheries, respectively. F vectors used in this analysis are taken from the forward VPA.

SKJ - SKIPJACK TUNA

SKJ-1. Biology

Skipjack tuna is a cosmopolitan species distributed in the tropical and subtropical waters of the three oceans forming schools. 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. While skipjack growth is variable and seasonal, it is more rapid for fish from the tropical zone than for fish from the equatorial area. i.e., considerable variability is observed in the average sizes of annual growth. Skipjack are active predators that feed on numerous prey, which conditions the opportunistic character of this species.

Since the stock structure of skipjack in the Atlantic Ocean is not known, two management units (east and west) have been established, 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)**.

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-Figure 2a and 2b)**. Reported catches are considered under-estimated, due to the discards of small-sized tunas, which include skipjack, by the purse seine fleets. Catches in the Atlantic Ocean in 1994 reached 174,152 MT **(SKJ-Table 1)**.

In the east Atlantic, the most important fisheries are purse seine, particularly those of the Spanish, French and NEI fleets, followed by the baitboat fisheries of Ghana, Portugal, Spain and France. Skipjack fisheries underwent important changes in 1991, with the introduction of fishing with floating objects and the expansion of the baitboat fishery towards the west, at latitudes close to the Equator, following the drift of floating objects and the development of a new live bait fishing method in which the pole and line acts an object, fixing and fishing a school during the entire fishing season, in waters off Senegal, Mauritania, and the Canary Islands. In 1994, 145,049 MT of skipjack were caught in the eastern Atlantic, which represents a slight decline with respect to the 159,763 MT taken in 1993 **(SKJ-Figure 2a)**.

In the western Atlantic, the most important fishery is the Brazilian baitboat fishery, whose only target species is skipjack. Cuban and Venezuelan vessels also participate in this fishery. As regards the purse seine fisheries, whose catches are considerably lower than those of the baitboat fisheries, catches were only taken by the Venezuelan and U.S. fleets. Catches in 1994 amounted to 28,912 MT, which are below those of 1993 (33,502 MT). This decline is shown in the purse seine catches, whereas the baitboat fleets increased their catches with respect to the previous year **(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, it can be observed that effort remained stable with respect to 1993 **(SKJ-Figure 2a)**. In any case, variations in vessel carrying capacity are not equivalent to the same variations in fishing mortality.

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 this assessment showed under-exploitation of the stock. Observing the development of the vessel carrying capacity **(SKJ-Figure 2a)** 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 51,400 MT, which represents a 37% decline. However, it is not known whether this has been accompanied by a similar decline in effective effort, or if on the other hand effective effort has increased, taking into account that the individual fishing power of the purse seiners has increased with the continuous introduction of technological improvements and, since 1991, the massive introduction of floating objects to aggregate tunas. This new fishing strategy has not changed the size distribution of the catches, while it has changed the fishing area, which has been extended towards the west and south, following the drift of the floating objects, and it has possibly changed catchability. Therefore, the current state of the eastern stock is not known, considering that this species, because of

its biological characteristics (short life span, rapid growth, few ages present in the fishery, high natural mortality, etc.) is subjected to moderate rates of exploitation, although locally there are high fishing mortality rates in specific areas.

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

The eastern Atlantic CPUE has undergone a continuous increase, while that of the western Atlantic has been fluctuating without trend **(SKJ-Figures 2a and 2b)**.

SKJ-4. Outlook

No definitive conclusion can be reached on the state of the eastern and western Atlantic stock. However, the Committee considered that, given the characteristics of this species*, the current level of exploitation can be maintained, but given the important changes that have occurred in the purse seine fisheries in the eastern Atlantic also the situation in the western Atlantic, the fishery should be carefully monitored and an assessment should be carried out, using adequate, specific methods for this species.

SKJ-5. Effects of current regulations

There are currently no regulations in effect for skipjack.

SKJ-6. Management recommendations

No management recommendations were proposed.

ATLANTIC SKIPJACK SUMMARY *

	East	*West*
Maximum Sustainable Yield (MSY)	Not estimated	not estimated
Current (1994) Yield	145,049 MT	28,912 MT
Current (1994) Replacement Yield	Not estimated	not estimated
Relative Biomass (B_{1994}/B_{MSY})	Not estimated	not estimated
Relative Fishing Mortality: F_{1994}/F_{MSY}	Not estimated	not estimated
Management Measures in Effect	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.

SKJ-Table 1. Reported landings (MT) of skipjack in the Atlantic, by region, gear and country.

REV. 5 (As of October 7, 1995 - 12:45)

	1965	1966	1967	1968	1969	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
TOTAL	24136	22833	24359	48375	29309	50255	78438	77351	78391	117297	56027	69345	110577	108115	89696	111358	130880	155528	133681	126780	118661	121339	114738	140427	116037	140991	199276	149574	183496	167252
SURFACE - EAST ATLA	22569	21010	21555	45696	27442	47628	76248	74346	75174	113279	51900	65458	107128	100885	83119	98766	107919	122366	101351	91198	78416	89998	90741	116708	89604	114719	165591	118800	149763	138149
-PURSE SEINE	3316	6148	7941	24157	14349	29831	48833	48774	49855	74208	35387	33061	57683	58680	36966	56734	66473	74824	64243	61795	48348	58353	51134	67613	47260	73732	117369	77541	111367	98033
CANADA	14	0	644	923	146	585	1230	7	1189	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CAYMAN I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	289	1800	30	0	0	0	0	0	0	0	0	0	0	0	0
CONGO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1250	200	0	5	10	8	8	8	8	11	12	9	9	10	0
FIS	900	2200	1550	5100	2587	7833	13103	13596	7954	22641	10540	14903	28496	22590	15320	22588	24318	26754	25823	9189	10352	11151	15157	13704	11035	13644	28714	18787	36522	28635
GHANA	0	0	0	0	0	0	0	0	160	0	174	96	0	0	0	317	2682	3915	2807	3674	2869	1677	768	0	0	0	0	0	0	0
JAPAN	1802	1448	2171	6255	679	3519	6222	3386	1544	910	143	0	0	0	0	0	0	1410	1440	1102	2098	2031	1982	3200	2243	2566	4792	2378	0	0
MAROC	0	0	0	0	0	0	0	0	0	0	0	535	1663	1891	1863	5001	3017	3956	2348	862	1002	1220	928	0	0	84	18	78	0	0
RUSSIA	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	1175	1110	540	1471
ESPANA	600	2500	3100	8700	6190	6142	11854	19533	17762	30584	16861	15561	21529	24508	17418	24222	31307	34650	27623	44627	29421	39477	29707	44202	29462	43189	65156	42768	54306	44681
USA	0	0	476	3179	4747	11752	16224	12152	21246	19973	7369	1766	5859	6797	2073	2608	2800	79	0	0	0	0	0	0	0	0	0	0	0	0
USSR	0	0	0	0	0	0	0	0	0	0	0	0	0	2402	76	18	0	1489	563	1000	1404	1679	547	1822	1915	3635	0	0	0	0
NEI_1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1560	3383	927	590	540	1372	3732	2263	10516	17504	12411	19982	23246
OTHERS	0	0	0	0	0	0	200	100	0	100	300	200	136	492	216	441	349	981	251	404	604	570	665	945	331	86	1	0	7	0
-BAITBOAT	19173	14862	13600	21532	13004	17683	27246	25289	25087	38953	16448	28710	42386	41365	44645	38134	38918	44488	34873	28075	29849	30009	38580	47763	40934	39501	47060	39895	37190	39913
ANGOLA	1322	2764	1965	4159	1798	941	1927	1494	1311	3365	640	1514	3785	3239	3617	3465	2254	2247	318	45	128	55	80	30	79	69	66	41	13	2
CAP VERT	0	0	0	0	0	1124	962	1477	1446	1332	1170	825	748	1284	998	2094	1581	1584	1338	1049	1961	860	2052	1350	934	767	1309	727	625	804
FIS	2700	3300	3730	7320	3569	4219	5592	3699	3227	4425	1783	2136	2642	3313	3282	3179	2608	4378	2655	3805	3293	1894	1957	2725	4176	3455	1474	1347	2117	2663
GHANA	0	0	0	0	0	0	0	0	128	701	1252	2103	3492	2866	4007	4720	4945	14250	20540	16181	16213	19180	22848	26009	22163	26600	30327	23168	25544	23531
JAPAN	6318	4354	3735	7306	4926	7481	11730	10149	12980	18672	3664	15042	16845	14614	14686	12304	12935	8520	4562	402	0	0	0	0	0	0	0	0	0	0
KOREA	0	0	0	0	0	0	0	0	922	2123	4469	1948	3600	8132	12017	6718	7538	2827	1553	687	153	0	0	0	0	0	0	0	0	0
MAROC	3153	1475	933	850	145	1115	120	1	72	28	270	3	2188	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PANAMA	0	0	0	0	0	0	0	676	159	979	1854	2467	3970	2980	1750	1735	144	2541	1611	0	0	0	0	0	0	0	0	0	88	129
PORTUGAL	2228	2348	2547	1138	1738	959	4200	3710	2206	1904	569	2068	4388	4379	2958	1719	2696	4751	999	3879	2396	5422	8162	14178	7715	3954	7987	7412	5582	7454
ESPANA	3452	621	690	759	828	1844	2715	4083	2636	5357	776	604	728	558	1330	2162	4151	3366	1255	2026	5668	2514	3369	3438	5838	4645	5894	7195	3217	5270
OTHERS*	0	0	0	0	0	0	0	0	0	67	1	0	0	0	0	38	66	24	42	1	37	84	112	33	29	11	3	5	4	60
-OTHER SURFACE	80	0	14	7	89	114	169	283	232	118	65	3687	7059	840	1508	3898	2528	3054	2235	1328	219	1636	1027	1332	1410	1486	1162	1364	1206	203
GHANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	292	775	231	107	1029	842	0	1411	731	588	588	588	588	588	588	0
USSR	0	0	0	0	0	0	0	0	0	0	0	3633	6674	454	1085	2973	1750	2468	660	0	0	9	0	0	0	0	0	0	0	0
OTHERS	80	0	14	7	89	114	169	283	232	118	65	54	385	386	131	150	547	479	546	486	219	216	296	744	822	912	614	882	650	203

SKJ-Table 1. Reported landings (MT) of skipjack in the Atlantic, by region, gear and country.

REV. 5 (As of October 7, 1995 - 12:45)

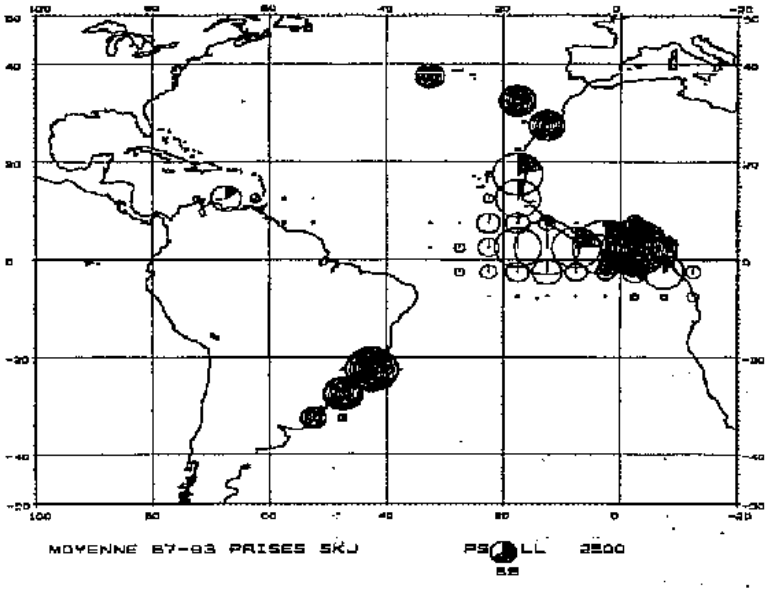
	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
SURFACE - WEST ATLA	1545	1791	2787	2642	1857	2400	1900	2858	2758	3347	3381	3661	3229	6970	6187	12483	22724	32187	31326	34836	39930	31005	23847	23553	26091	25713	32813	30371	33502	28912
-PURSE SEINE	64	40	32	135	102	0	0	1258	361	100	374	700	600	3461	1489	3072	4654	9705	11121	17958	11191	4954	4964	2315	2466	3241	8527	8509	12794	5712
COLOMBIA	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	0	2074	0
ESPANA	0	0	0	0	0	0	0	120	0	0	103	0	266	1050	752	0	0	0	209	2610	500	0	0	0	0	0	1592	1120	397	0
USA	64	40	32	135	102	0	0	138	0	0	196	519	301	1632	737	980	2573	6	588	817	1785	977	635	5	36	227	749	496	274	20
VENEZUEL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1890	1900	9533	10023	14089	8906	3977	4329	2310	2430	3014	6186	6893	10049	5692
OTHERS	0	0	0	0	0	0	0	1000	361	100	75	181	33	779	0	202	181	166	301	442	0	0	0	0	0	0	0	0	0	0
-BAITBOAT	981	951	1155	1607	1255	1800	1600	1400	1921	2972	2836	2800	2400	2812	4365	9351	17999	22402	20057	16771	28490	24811	18675	21057	23292	22246	23972	21442	20293	22977
BRASIL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1818	6070	13913	18156	15643	13086	25052	22542	16153	17227	20550	20026	20424	18863	17570	20372
CUBA	981	951	1155	1607	1255	1800	1600	1400	1500	1800	2300	2800	2400	1800	2000	2255	1086	1134	1700	1248	1632	1277	1101	1631	1449	1443	1596	1638	1600	1600
JAPAN	0	0	0	0	0	0	0	0	421	1126	438	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PANAMA	0	0	0	0	0	0	0	0	0	0	0	0	0	31	161	1026	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESPANA	0	0	0	0	0	0	0	0	0	0	0	0	0	981	300	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	46	98	0	0	0	0	0	3000	3112	2714	2437	1806	992	1421	2199	1293	777	1952	941	1123	1805
OTHERS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-OTHER SURFACE	500	800	1600	900	500	600	300	200	476	275	171	161	229	697	333	60	71	80	148	107	249	1240	208	181	333	226	314	420	415	223
BRASIL	500	700	1500	800	400	400	100	0	0	0	0	83	188	633	246	0	0	0	0	39	44	613	130	89	200	104	124	260	205	194
OTHERS	0	100	100	100	100	200	200	200	476	275	171	78	41	64	87	60	71	80	148	68	205	627	78	92	133	122	190	160	210	29
SURFACE - UNCL REGIO	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	0	0	0
LL+TRAWL - ALL ATLA	22	32	17	37	10	18	58	76	97	188	214	48	101	56	13	12	78	41	600	47	30	26	11	14	32	107	47	24	11	7
OTHERS	22	32	17	37	10	18	58	76	97	188	214	48	101	56	13	12	78	41	600	47	30	26	11	14	32	107	47	24	11	7
UNCL GEARS - ALL ATL	0	0	0	0	0	209	232	71	362	483	532	178	119	204	377	97	159	934	404	699	285	310	139	152	310	452	825	379	220	184
OTHERS	0	0	0	0	0	209	232	71	362	483	532	178	119	204	377	97	159	934	404	699	285	310	139	152	310	452	825	379	220	184

SKJ-Table 2. Carrying capacity (1000 MT), by gear, of east Atlantic surface fleets.

YEAR	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
TOTAL BB+PS	**36.5**	**32.2**	**42.3**	**54.1**	**46.0**	**53.5**	**68.4**	**62.0**	**67.6**	**69.6**	**77.1**	**81.8**	**61.3**	**52.3**	**49.5**	**45.8**	**43.9**	**44.3**	**46.5**	**56.6**	**55.7**	**51.5**	**51.4**
TOTAL BB	**7.3**	**7.6**	**13.0**	**13.2**	**9.7**	**13.7**	**15.5**	**14.7**	**12.8**	**11.8**	**11.7**	**11.5**	**11.3**	**10.8**	**11.0**	**8.8**	**9.2**	**9.6**	**9.9**	**9.9**	**9.9**	**10.0**	**10.0**
FISM	2.7	2.1	2.0	1.8	1.5	1.3	1.3	1.4	1.3	1.3	1.3	1.2	1.2	1.1	1.0	0.5	0.7	0.8	0.9	0.6	0.6	0.7	0.7
TEMA-BASED	3.2	4.0	8.7	9.2	7.3	11.0	12.8	11.6	9.7	8.7	8.1	8.0	7.2	6.6	6.6	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
SPAIN (CANAR.)	0.6	1.0	1.9	1.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
ANGOLA	0.3					0.5	0.5	0.5	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
CAP VERT.									0.2	0.2	1.0	1.0	1.0	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
PORTUGAL	0.5	0.5	0.4	0.6	0.3	0.3	0.3	0.6	0.6	0.5	0.3	0.3	0.9	0.9	1.2	1.4	1.6	1.8	2.0	2.3	2.3	2.3	2.3
SPAIN (TROP.)																		0.1	0.1	0.1	0.1	0.1	0.1
TOTAL PS	**29.2**	**24.6**	**29.3**	**40.9**	**36.3**	**39.8**	**52.9**	**47.3**	**54.8**	**57.8**	**65.4**	**70.3**	**50.0**	**41.5**	**38.5**	**37.0**	**34.7**	**34.7**	**36.6**	**46.7**	**45.8**	**41.5**	**41.4**
FISM	9.2	12.4	14.5	17.2	17.5	14.6	17.6	16.5	17.2	16.8	16.3	16.8	4.8	3.0	3.0	5.1	6.0	6.0	7.0	12.7	10.1	10.1	10.8
SPAIN	5.2	7.1	8.4	12.6	16.8	20.7	24.4	25.9	29.5	30.6	31.7	38.0	33.5	30.3	27.3	23.7	20.5	19.5	19.7	22.8	23.6	18.7	18.5
U.S.A.	11.9	2.9	5.5	10.4	1.7	4.2	10.5	3.2	2.2	1.6	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
JAPAN	1.9	1.9	0.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.4	0.8	0.8	0.8	0.8	0.4	0.4	0.4	0.3	0.0	0.0
U.S.S.R.	0.1	0.1	0.1	0.1	0.1	0.1	0.2	1.0	3.0	3.9	4.9	4.9	4.9	5.4	5.4	5.4	5.4	5.4	4.2				
RUSSIA																				4.2	4.2	4.2	3.3
OTH.**	0.9	0.2	0.2	0.4	0.2	0.2	0.2	0.7	2.9	4.9	10.8	10.2	6.4	2.0	2.0	2.0	2.0	3.4	5.3	6.6	7.6	8.5	8.8

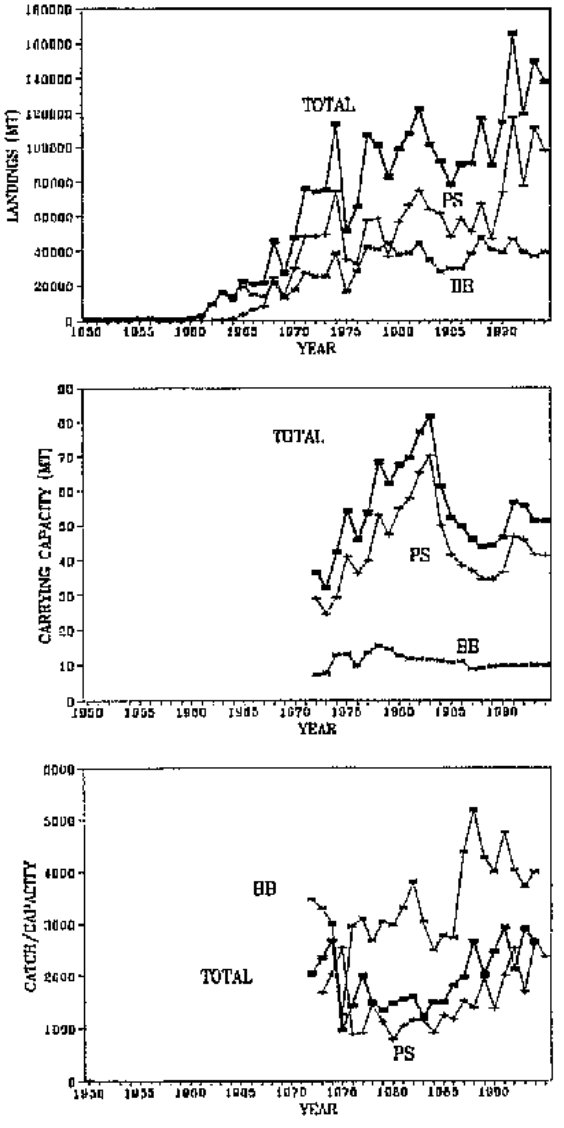
* Provisional

** Ghana (1982-87), Mexico (1983), Congo (1980-81), Gran Cayman (1982-83), Portugal (1979-81), Venezuela (1983), and for recent years Morocco, Norway, Malta, Panama, Vanuatu.

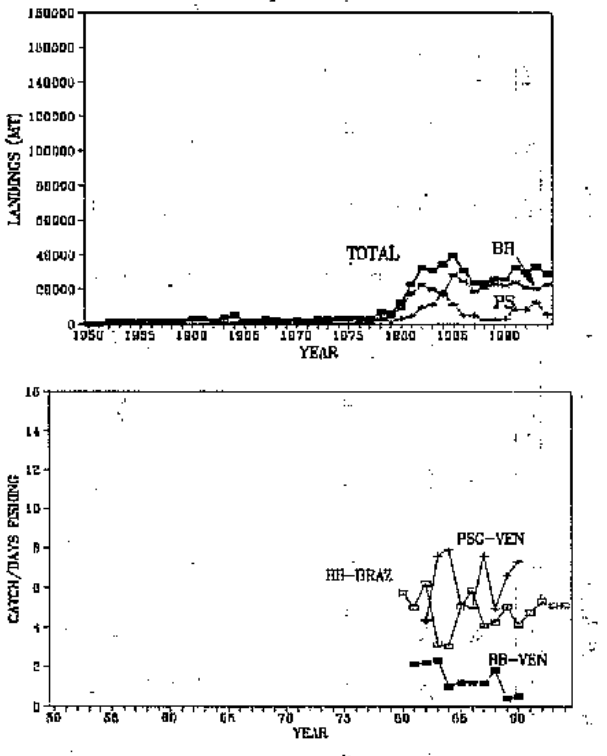


SKJ-Fig. 1. Distribution of skipjack fisheries in the Atlantic. In each circle, the white part is proportional to the purse seine catches and shaded part is to baitboats. Average catch for 1983-1993 period.

(A) East Atlantic skipjack



(B) West Atlantic skipjack



SKJ-Fig. 2. (A) Landings, carrying capacity and catch per carrying capacity for the east Atlantic skipjack. (B) Landings and example of nominal CPUE series for the west Atlantic skipjack.

ALB - ALBACORE

ALB-1. Biology

Albacore is a temperate tuna widely distributed throughout the Atlantic Ocean and Mediterranean Sea. The currently-accepted stock structure hypothesis for this species assumes the existence of three stocks: northern and southern Atlantic stocks (separated at 5°N) and a Mediterranean stock (**ALB-Figure 1**).

Albacore spawning areas in the Atlantic are found in sub-tropical western areas of both hemispheres and throughout the Mediterranean Sea. Maturity is considered to occur at about 90 cm in the Atlantic, and somewhat smaller in the Mediterranean. There are also differences in morphometrics and growth rate between Atlantic and Mediterranean albacore.

Young albacore reach maturity at about age 5. 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.

ALB-2. Description of fisheries

The northern stock is exploited by surface and longline fisheries. Traditional surface fisheries include Spanish troll, used mainly in the Bay of Biscay and adjacent waters, Spanish and Portuguese baitboats in the same area and near the Azores. New surface fishing gears, driftnets and pelagic paired trawls, were introduced in 1987 in the Bay of Biscay and adjacent waters by France, Ireland and the United Kingdom. These surface fisheries mainly target juveniles and pre-adults (50 cm to 90 cm FL). A minor Taiwanese longline fishery targets pre-adult and adult albacore (> 80 cm) in the central and western north Atlantic.

Total albacore catches by gear and country are shown in **ALB-Table 1**, and **ALB-Figure 2** shows catches from the three albacore stocks from 1950 to 1994. The total catch in the north Atlantic has shown a downward trend since 1970, largely due to the reduction in fishing effort by the traditional surface and longline fisheries. In contrast, effort and catch in the new surface fisheries have increased markedly since 1987.

The southern stock is exploited by a South African surface baitboat fishery off the South Africa west coast. Effort in this fishery has remained relatively stable in recent years. Catches by a Portuguese baitboat fleet fishing off South Africa since 1984 were reported to Portugal for the first time, although these catches have been partially reported to South Africa in the past. These data will be reviewed during 1996 in order to avoid possible double reporting. Taiwanese longliners target albacore at a fairly high level of effort. Japanese and Brazilian longliners make a minor contribution to the total southern albacore catch.

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

ALB-3. State of the stocks

Assessments of north and south Atlantic albacore were not revised by the Committee in 1995, nor was any attempt made to analyze the status of the Mediterranean stock, due to insufficient information.

North Atlantic

The 1994 SCRS noted that methods based on equilibrium assumptions should not be applied to the albacore stocks. They also noted that age-aggregated, non-equilibrium production models cannot fully capture the dynamics of the north stock because the abundance indices available represent two separate fisheries acting on two separate age groups and because some of the trends in the individual indices conflict. An application of the standard age-structured production model gave very imprecise estimates of MSY, but more precisely indicated a decline in the age 5+ biomass since 1975.

The 1994 SCRS also analyzed the state of the northern stock using tuned Virtual Population Analyses (VPA). The results of the base case conducted in 1994 are shown in **ALB-Figure 3**. The estimated decline in recruitment was less

dramatic than in previous assessments. However, it should be noted that the recruitment for the most recent years is not well-estimated by tuned VPA's. Both the juvenile (ages 2-3) and adult (ages 5+) stocks appear to have declined in abundance by about 25%-30% since the 1970s. Fishing mortality on young albacore (ages 1 and 2-3) appears to have decreased in recent years after an increase in the late 1980s. The fishing mortality on adults is estimated to have declined sharply after a peak in 1986, but appears to be increasing again in recent years.

Analyses were conducted to determine the sensitivity of the VPA to excluding various indices of abundance, using partial selectivities to track all ages of longline indices, and using alternative catch-at-age data. Based on these sensitivity analyses, the 1994 SCRS concluded that the base case VPA was generally robust to changes in the assumptions. The 1994 SCRS noted the conflicting trends indicated by the Taiwanese and Japanese longline indices, but retained both in the base case because they had no objective means of deciding which index possessed more desirable characteristics for VPA calibration. Document SCRS/95/92, however, demonstrated that the VPA results were, in fact, very sensitive to the assumptions made about the selectivity of the plus group (8+) relative to the next younger age group. Nevertheless, the Committee felt that the base case was still valid because there were no apparent biological reasons for the selectivity of age 8+ and age 7 to differ.

Equilibrium yield-per-recruit computations made by the 1994 SCRS, and spawning stock biomass-per-recruit computations made by the Committee, indicated that, under the present selectivity pattern, the northern stock is near full exploitation (**ALB-Figure 4**). The current level of spawning biomass is approximately 22% of the unexploited level.

South Atlantic

In 1994, an age-structured production model was used to produce base case assessments of albacore abundance, using abundance indices for the main fleets exploiting this stock. Sensitivity analyses were conducted to investigate the effect of production model selection, standardization and choice of abundance indices, relative weight of abundance indices and input parameters (eg. growth model, mortality estimates and stock-recruit function).

It was found that the results of the age-structured production model assessment, although sensitive to the choice of abundance indices, were similar to assessments presented in previous years. There was also close agreement between the base case and the results obtained with non-equilibrium production models, although estimates of current absolute abundance differed. Agreement between equilibrium and non-equilibrium production improved if biomass in the initial year was constrained to be equal to the unexploited equilibrium biomass.

Quantitatively, the results of the various analyses were similar. The resource was estimated to be markedly depleted, to probably slightly less than 20% of the pre-exploitation biomass and to have an MSY of slightly less than 25,000 MT per year (**ALB-Figure 5**). The 1993 fishing mortality rate was estimated to be 127% of that corresponding to MSY.

ALB-4. Outlook

North Atlantic

The northern albacore stock has mainly been exploited by surface fisheries since the longline fisheries shifted their target species to bigeye tuna. An important recent development in this fishery has been the introduction of driftnets and pelagic trawls, which achieve higher catch rates than trolling gear. Recent VPA assessments indicate that the northern stock is at, or near, full exploitation. Attention therefore needs to be given to implementing effective controls to limit fishing effort at current levels.

South Atlantic

Production model assessments conducted during the past few years consistently indicate that the southern albacore resource has been exploited beyond MSY since the mid-1980s, and that recent catch levels of about 31,000 MT are not sustainable. Current fishing effort also substantially exceeds that corresponding to MSY. Risk analyses for a number of possible future catch scenarios indicate that catches need to be reduced to not more than 25,000 MT per year if further declines in this resource are to be prevented.

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 2.5 km was introduced in 1992, and became effective for the French fleet from July 27, 1994.

South Atlantic

During the 1994 meeting, in response to continued indications of over-exploitation, ICCAT adopted a recommendation 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 did not become effective until October, 1995. In 1994, the total reported catches increased slightly to 32,157 MT; South African catches declined slightly, but still exceeded the recommended target level, while Taiwanese catches increased slightly over those in 1993.

Efforts to implement the ICCAT-recommended southern albacore catch limit by South Africa has been hampered by poor reporting of past catches by her fleet. As a first step towards implementing the recommended catch limit, South Africa has therefore limited the off-loading of albacore by her fleet to a limited number of ports, revised tuna permit conditions to improve reporting of catches, and increased the inspection and monitoring of albacore landings by the South African baitboat fleet.

The Taiwan Fishing Authority has also initiated efforts to reduce targeting on southern albacore in 1995 and onwards, in order to reduce Taiwan's annual southern albacore catch from 1995 onwards to not more than 90% of their average annual catch from 1989 to 1993.

ALB-6. Management recommendations

North Atlantic

The 1994 assessment indicated that the northern albacore stock is probably not over-exploited, but appears to be at or near full exploitation. The Committee recommended that fishing mortality on northern albacore not be increased above its 1993 level.

South Atlantic

In 1994, ICCAT adopted a recommendation that catches of southern albacore be limited to not more than 90% of the average catches from 1989 to 1993. The Committee recommended that those countries involved in the southern albacore fishery make a concerted effort to effectively implement this catch limitation.

Mediterranean

There are no management recommendations for the Mediterranean stock.

ATLANTIC AND MEDITERRANEAN ALBACORE SUMMARY

	North Atlantic	*South Atlantic*	*Mediterranean*
Maximum Sustainable Yield (MSY)	poorly estimated[1]	24,700 MT[1] (21,000-27,500 MT)[2]	not estimated
Current (1994) Yield	33,148 MT	33,486 MT	782 MT
Current (1994) Replacement Yield	poorly estimated[1]	25,600 MT[1]	not estimated
Relative Biomass:			
B_{1993}/B_{MSY}	poorly estimated[1]	0.87[1] (0.61-1.08)	
$SSB_{1985-1990}/SSB_{1975-1980}$	0.674	—	not estimated
Spawning potential ratio[3]	0.223	—	
$R_{1985-1990}/R_{1975-1980}$[4]	0.782	—	
Relative Fishing Mortality:			
F_{1993}/F_{MSY}	poorly estimated[1]	1.30[1] (0.91-2.28)	not estimated
F_{1993}/F_{MSY}	0.769	--	
Management measures in effect	none	Limit catches to 90% of 1989-1993 levels	none

1 The estimate of MSY obtained with ASPM was very imprecise. Therefore, it is not included in the table.
2 95% confidence limits of the age-structured production model are shown.
3 Estimated as SSB per recruit in 1990-1993 divided by SSB per recruit under non fishing mortality (virgin SSB).
4 Recruitment level during 1985-1990 compared to 1975-1980.

ALB-Table 1. Reported total annual landings (MT) of albacore in the Atlantic and Mediterranean, by region, gear and country.

REV 3 (as of October 5, 1995 - 12:45:00)

	1965	1966	1967	1968	1969	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
TOTAL	90732	75030	74950	71863	76479	70308	82941	83330	75686	72489	59555	77346	76099	73806	74826	62134	59651	72942	67320	56924	75119	88065	82364	66921	63010	70367	56979	69529	77557	72797
NORTH ATLANTI	60387	47234	58567	45675	47286	46155	57556	49450	46973	52286	41448	57326	53821	50047	51365	38704	34111	41998	50893	39454	40427	47465	38085	33694	32076	36587	25969	31275	38536	33148
-SURFACE	45656	39548	49018	37929	32492	30094	39706	34713	28845	37636	28738	34320	32952	35889	39158	29253	24292	28788	34268	19944	23334	26243	30796	30701	29851	33903	22634	27600	30904	27547
BAITBOAT	20112	16757	18349	13936	14569	14388	15677	8196	10133	16678	19247	20402	15559	11958	15764	16170	13410	15857	21108	8305	12589	15202	18756	16752	15374	18625	8985	12449	15646	11967
FRANCE	4183	3454	3893	2209	1710	1707	1483	475	1074	550	707	1115	633	600	220	355	392	160	199	10	100	130	130	0	290	0	0	0	0	0
PORTUGAL	830	340	740	110	500	200	300	434	887	1229	911	610	62	85	146	72	440	305	1778	762	632	450	430	171	166	3182	700	1622	3369	926
ESPANA	15099	12963	13716	11617	12359	12481	13894	7287	8172	14899	17629	18677	14864	11273	15398	15743	12578	15342	18958	7405	11777	14620	18196	16581	14918	15442	8267	10815	12277	11041
OTHERS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	173	128	80	2	0	0	0	1	18	12	0	0
TROLLING	25544	22791	30669	23993	17923	15706	24029	26517	18712	20958	9491	13918	17391	23931	23332	13059	10778	12831	12788	11029	10654	10837	11466	11350	10554	10350	8959	7348	6109	5955
FRANCE	11365	9959	11640	11030	7675	4456	7727	8683	5785	7875	4959	5685	7100	9800	9100	3600	2537	2695	2192	2787	1760	1070	1441	359	70	0	0	0	0	0
ESPANA	14179	12832	19029	12963	10248	11250	16302	17834	12927	13083	4532	8233	10291	14131	14232	9459	8241	10136	10596	8242	8894	9767	10010	10966	10479	10342	8955	7347	6094	5952
OTHERS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	25	5	8	4	1	15	3
OTHER SURFA	0	0	0	0	0	0	0	0	0	0	0	0	2	0	62	24	104	100	372	610	91	204	574	2599	3923	4928	4690	7803	9149	9625
CHITAIW	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	1354	0	0	0	0
FRANCE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	350	2446	3690	3300	4123	6924	6293	5934
IRELAND	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	40	60	451	1946	2489
OTHERS	0	0	0	0	0	0	0	0	0	0	0	0	2	0	62	24	104	100	372	610	91	204	224	153	233	234	507	428	910	1202
-LONGLINE	14731	7686	9549	7746	14794	16061	17850	14727	18128	14637	12710	23006	20869	14157	12207	9447	9819	13190	16592	19510	17093	21222	7289	2993	2225	2683	3335	3674	7632	5601
CHITAIW	114	204	761	1907	2352	4675	2871	4410	9501	9538	8130	14837	13723	9324	6973	7090	6584	10500	14254	14923	14899	19646	6636	2117	1294	1651	2352	2758	6300	4967
JAPAN	14325	5860	4771	3306	4717	5875	6472	1319	1467	2059	1331	1345	825	531	1219	1036	1740	781	1156	576	844	470	494	723	764	737	691	466	485	384
KOREA	174	1471	3926	1588	6844	5011	7707	7922	4794	2823	2843	5379	5579	3048	2997	797	938	1326	478	967	390	373	18	16	53	34	1	0	8	0
PANAMA	0	0	0	0	0	0	0	240	2366	217	226	1227	557	768	425	193	177	494	357	2551	601	525	44	0	0	0	0	0	0	0
OTHERS	118	151	91	945	881	500	800	836	0	0	180	218	185	486	593	331	380	89	347	493	359	208	97	137	114	261	291	450	839	250
-UNCL + TRAWL	0	0	0	0	0	0	0	10	0	13	0	0	0	1	0	4	0	20	33	0	0	0	0	0	0	1	0	1	0	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	0	0	0	0	0	0	0
OTHERS	0	0	0	0	0	0	0	10	0	13	0	0	0	1	0	4	0	20	33	0	0	0	0	0	0	1	0	1	0	0
SOUTH ATLANTI	29845	27296	15883	25688	28493	23653	24885	33179	28213	19703	17607	19459	21665	23169	22628	22930	24040	29672	14924	13862	30245	36888	40286	29164	26864	28628	25378	32798	32941	33486
-SURFACE	0	0	0	38	0	0	0	100	100	150	151	197	471	363	785	2259	3614	4410	2928	3819	7416	6713	8849	6990	7095	6896	3943	9145	9053	8100
PORTUGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	741	1357	1029	899	1153	557	732	81	184	483	1185
ESPANA	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	389	1691	849	725
SAFRICA*	0	0	0	0	0	0	0	100	97	150	150	150	150	150	466	1500	1784	3060	2169	2492	5797	5430	6927	5625	6535	5194	3410	6193	4535	3752
NEI_1	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	4	40	1048	1000	0
OTHERS	0	0	0	38	0	0	0	0	3	0	1	47	321	213	319	759	1830	1350	759	586	262	254	1023	212	3	966	23	29	13	920
SAF-NAM	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	0	2173	1518

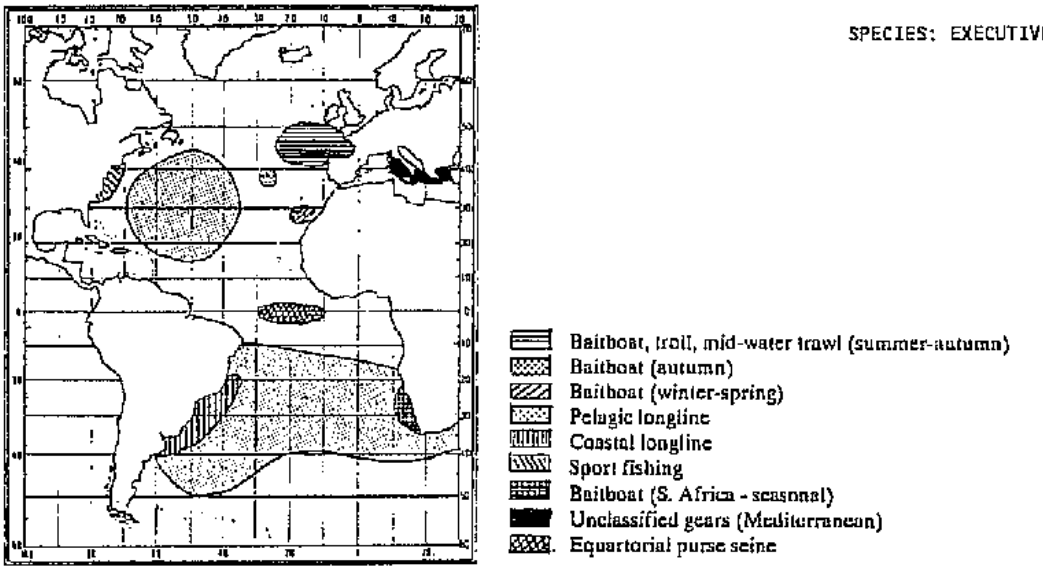
ALB-Table 1. Reported total annual landings (MT) of albacore in the Atlantic and Mediterranean, by region, gear and country.

REV 3 (as of October 5, 1995 - 12:45:00)

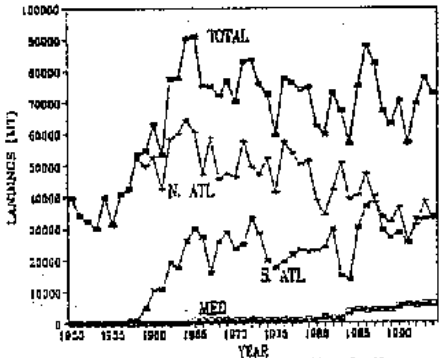
	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
-LONGLINE	29845	27296	15883	25650	28493	23653	24885	33079	28113	19553	17456	19262	21194	22806	21843	20671	20426	25255	11941	9834	22676	29819	30968	21830	19415	21581	21358	23342	23885	25386
ARGENTIN	1100	800	710	1229	400	500	281	100	44	13	97	48	80	8	0	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0
BRASTAI	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	813	2126	3665	597
CHITAIW	0	0	1059	6792	12546	12225	17491	24985	22157	16686	13384	14600	16092	20467	20340	18710	18187	22800	9502	7889	19643	27592	28790	20746	18386	20442	19548	20442	19400	23921
JAPAN	28309	21023	7719	11857	6331	5898	3218	2087	277	109	306	73	105	135	105	333	558	569	162	224	623	739	357	405	450	587	654	583	467	604
KOREA	346	5275	6353	5697	9186	5030	3832	5655	3731	2393	3230	3376	3766	1370	878	690	682	563	599	348	511	321	383	180	54	19	31	5	20	0
PANAMA	0	0	0	0	0	0	0	172	1841	183	256	770	377	354	125	167	129	210	0	0	0	280	924	0	0	0	0	0	0	0
URUGUAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	235	373	526	1531	262	178	100	83	55	34	31	28	16
OTHERS	90	198	42	75	30	0	63	80	63	169	183	395	774	472	395	767	845	878	1305	847	368	625	336	399	442	478	278	155	305	248
-UNCL + TRAWL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	55	209	153	356	469	344	354	151	77	311	3	0
SAFRICA	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	0	0	0
OTHERS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	55	209	153	356	469	344	354	151	77	311	3	0
MEDITERRANEA	500	500	500	500	700	500	500	701	500	500	500	561	613	590	833	500	1500	1272	1235	3414	4129	3712	3993	4063	4060	5150	5632	5456	6078	6003
-SURFACE	0	0	0	0	200	0	0	0	0	0	0	0	0	0	0	0	900	572	535	1663	1166	120	167	141	141	772	1355	1260	1882	1807
ITALY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	191	385	100	107	110	110	567	668	1028	1028	1028
ESPANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	900	572	535	1331	531	0	0	0	0	84	547	221	290	215
OTHERS	0	0	0	0	200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	141	250	20	60	31	31	121	140	11	564	564
-LONGLINE	0	0	0	0	0	0	0	1	0	0	0	41	130	150	0	0	0	0	0	226	375	150	161	168	165	624	523	442	442	442
OTHERS	0	0	0	0	0	0	0	1	0	0	0	41	130	150	0	0	0	0	0	226	375	150	161	168	165	624	523	442	442	442
-UNCL + TRAWL	500	500	500	500	500	500	500	700	500	500	500	520	483	440	833	500	600	700	700	1525	2588	3442	3665	3754	3754	3754	3754	3754	3754	3754
ITALY	500	500	500	500	500	500	500	500	500	500	500	520	483	440	833	500	600	700	700	1525	2588	2958	3165	3254	3254	3254	3254	3254	3254	3254
OTHERS	0	0	0	0	0	0	0	200	0	0	0	0	0	0	0	0	0	0	0	0	0	484	500	500	500	500	500	500	500	500
UNCL REGION	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	268	194	318	0	0	0	10	2	0	0	2	160
-SURFACE	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	0	0	160
OTHERS	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	0	0	160
-LONGLINE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	268	194	318	0	0	0	0	2	0	0	0	0
OTHERS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	268	194	318	0	0	0	0	2	0	0	0	0
-UNCL + TRAWL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	2	0
OTHERS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	2	0

* Figures for South African baitboat landings for 1984 through 1992 are SCRS estimates and differ from Task I reported catches. They may represent uder-estimates. They are being reviewed by South African and Portuguese scientists.

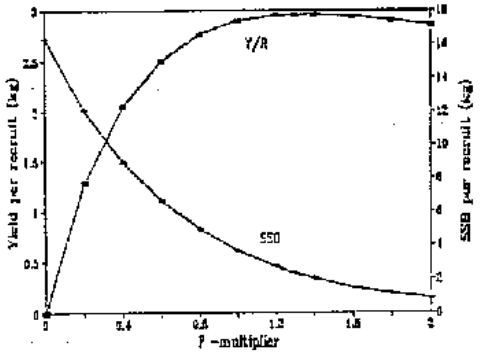
++ Catches less than 0.5 MT



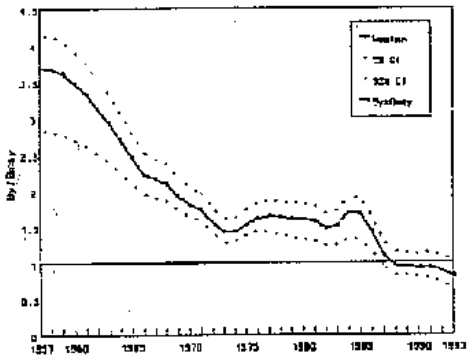
ALB-Fig. 1. General albacore fishing grounds in the Atlantic and Mediterranean, by gears (Source SCRS/94/16).



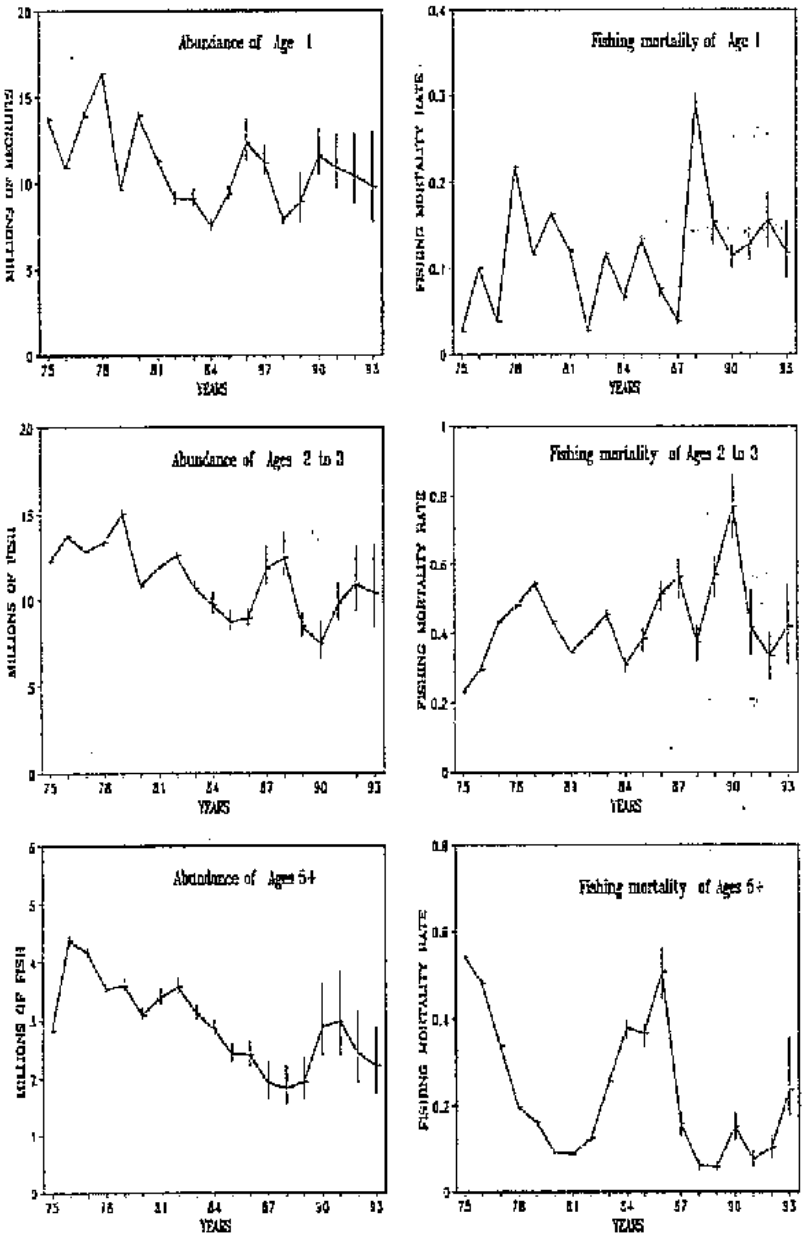
ALB-Fig. 2. Annual landings (MT) of albacore by region.



ALB-Fig. 4. North albacore yield per recruit and SSB per recruit computed from the base case VPA.



ALB-Fig. 5. Trajectory of B/B_{MSY}, 1957-1993, for south Atlantic albacore as estimated by the ASPM base case. (Source: 1994 SCRS Report)



ALB-Fig. 3. Summary results of the base case tuned VPA assessment for north Atlantic albacore, based on 250 bootstraps. Shown are median estimated stock size (in number) on the left column and fishing mortalities in the right column, for age 1 (recruitment), age 2-3 (targeted by the surface gears), and age 5+ (adults). Approximate 80% confidence intervals are also shown. (Source: SCRS Report 1994).

BFT - BLUEFIN TUNA

BLUEFIN TUNA - WEST

BFTW-1. Biology

Atlantic bluefin are distributed from Brazil to Labrador in the west, from roughly the Canary Islands to Norway in the east Atlantic, and throughout the Mediterranean Sea (**BFT-Figure 1**). In 1981** the Commission established a line for separating east and west Atlantic management units. Recent examination of the ICCAT tagging data conducted in 1994 showed that a small number of fish tagged in the east have been recaptured in the west and vice versa

Atlantic bluefin grow to over 300 cm and 650 kg. In the west Atlantic the oldest age considered reliable is 20 years based on an estimated age at tagging of 2 years and about 18 years at liberty, though it is believed that bluefin may live to older ages.

In the west Atlantic bluefin spawn in the Gulf of Mexico and the Florida Straits during mid April through mid June. Juveniles are thought to occur in the summer over the continental shelf primarily from about 34°N to 41°N and offshore of that area in the winter. Distribution expands with age. Bluefin are opportunistic feeders with fish and squid common in their diet.

BFTW-2. Description of fisheries

The Japanese longline fishery in the west Atlantic was considered to be similar to that of recent years. The Canadian 1993 and 1994 fisheries showed increases especially for the traps, harpoon, and rod and reel fisheries compared to earlier years. Decreases in the tended line fisheries were thought to be primarily due to regulatory effects. Most U.S. fisheries in 1994 were similar to previous years, though a new winter-spring fishery developed off the east coast (off Cape Hatteras, North Carolina). Most fish caught in this new fishery were tagged and released. Catch rates were quite high relative to summer-fall catch rates off the northeast U.S.

From 1992 through 1994 west Atlantic catches were 2114, 2309 and 2369 MT, respectively, compared to about 2500 to 3000 in the previous five years (1987-1991). Those catches were made under recommended catch limits of 2660 MT for 1983-1992, and averaged a total of 4788 MT for 1992-1993 combined, and 1995 mt for 1994 (**BFT-Figure 2; BFT-Table 1**).

BFTW-3. State of stocks

The status of western Atlantic bluefin tuna is based upon the assessment conducted at the 1994 SCRS meeting. As agreed in 1994, no new assessment was conducted at the 1995 meeting.

The effect of mixing on the assessment of bluefin tuna in the Atlantic and Mediterranean has not been fully evaluated and the 1994 base case assessment was conducted under the hypothesis of a western stock with no mixing. However, the sensitivity of the results to this assumption was evaluated using one mixing model. The effect of movement between east and west will continued to be explored through joint assessments.

The results of the 1994 assessment generally show similar trends as previous assessments. Recruitment was generally higher from 1970 to 1976 than it has been since, although there is an indication of slightly increasing average recruitment in the 1980's. Ages 2 to 5 abundance reached a low in 1982 but it has increased thereafter (**BFT-Figure 3**), although the 1993 and 1994 values are lower than in previous years. The abundance of ages 6-7 increased steadily since 1983 and has been above the 1970 to 1994 average since 1992. However, the error structure used in 1994 came under additional scrutiny during the 1995 meeting indicating that the trend in abundance of ages 2-5 and 6-7 in the 1980's may not be as indicated (see BFTW-6. Management Recommendations). The abundance of ages 8+ declined steadily until 1993, the lowest level observed, with a slight increase in 1994 (**BFT-Figure 3**). This most recent assessment of western bluefin tuna shows that the 1993 age 8 and older mid-year biomass is about 13% of the 8+ biomass currently estimated for 1975, while the 1994 value was expected to be 16% of the 1975 8+ biomass.

The fishing mortality rate on large fish increased steadily in the 1970's until the implementation of regulations in 1982 (**BFT-Figure 3**) at which time the fishing mortality rate was reduced considerably. However, the fishing mortality began increasing again in the 1980's until it peaked in 1991 at a level higher than occurred in the 1970's. The fishing mortality rate in 1992 and 1993 was somewhat lower. Fishing mortality rates on small fish (ages 2-5) were high in the 1970's and were also reduced with the implementation of the 1982 regulations. The rate increased again in the late 1980's but not up to levels that occurred in the 1970's. Recent (1992 and 1993) fishing mortality rates on small fish appear to be smaller. The 1993 fishing mortality rate for all ages was larger than $F_{0.1}$ and close to F_{max}. It was also larger than F_{med} (the fishing mortality rate corresponding to the median survival ratio for the period 1970-89). While reductions from the 1993 F would not lead to gains in yield-per-recruit, substantial gains in the spawning stock biomass per recruit could accrue.

BFTW-4. Outlook

At the 1994 SCRS, the Committee presented projections based on the base case assessment, assuming a catch of 1995 MT in 1994 and a variety of scenarios encompassing constant catches between zero and 2,660 MT for the years 1995-2003. The central tendency of these projections indicated that spawning biomass could increase by 50% to 200% by the year 1998 relative to 1993, depending on the level of catches. However, the confidence bounds of the stochastic projections showed that 2,660 MT catch levels may not be sustainable beyond the year 2001.

Two import factors influencing the projections were highlighted in 1995 based on new information. First, the reported 1994 landings were 19% higher than assumed for the projections. Second, statistical assumptions made last year to compute standardized indices of relative abundance for the base case assessment may have been inappropriate for some data sets. Due to the lack of an assessment this year, the Committee was unable to evaluate the impact of these issues on the projections. A new assessment with updated data and methods will be made in 1996, which will be used to provide the next outlook for 1997 and beyond.

BFTW-5. Effects of current regulations

The total 1994 catch in the west Atlantic was 2369 MT of which 2278 MT was landed (91 MT discarded dead), which was 14% above the recommended catch of 1995 MT. The combined 1992 and 1993 recommended catch was 4788 MT (average of 2394 MT per year). The total catch *excluding* dead discards was 2070 mt in 1993 and 2278 mt in 1994.

A regulation prohibiting the catching and landing of bluefin less than 6.4 kg in all areas went into effect in 1975 with an exemption of 15% (by number) for incidental catches. 11.6% of the 1994 western Atlantic catch in number of fish was below 6.4 kg. From 1990-1993 the percentages were 4.6, 7.2, 1.3 and 1.7, respectively.

The modified regulation limiting catches of fish less than 30 kg or 115 cm to no more than 8% (by weight) of the catch went into effect in 1992. From 1992-1994 five to six percent of the total catch by weight has been below that size.

BFTW-6. Management recommendations

The most recent assessment of western bluefin showed that the 1993 age 8 and older mid-year biomass was about 13% of the 8+ biomass estimated for 1975, while the 1994 value was 16% of the 1975 8+ biomass. In 1993, the Commission requested that a recovery program aimed at achieving a 50% increase from current levels in the spawning stock biomass by the year 2008 be developed. If the year-classes since 1983 are as abundant as estimated in the 1994 assessment, this target could be achieved by 1995 or 1998, depending on catches in the intervening years. The Committee believed that if would be judicious to take advantage of these year-classes to rebuild the spawning biomass in order to increase the probability of higher recruitment.

Under certain alternative assumptions about the error structure in CPUE standardization, lower estimates from the 1994 assessment of the year-classes since 1983 would result (Ref: Bluefin Tuna Detailed Report). The relative merit of various error structures in CPUE standardization, as well as the implications of mixing are being investigated, and it would therefore be advisable to be cautious while awaiting those results as well as the results of the next assessment. In addition, despite the positive signs estimated in the 1994 assessment, the 8+ biomass remained close to the lowest levels observed while the estimated fishing mortality was higher than $F_{0.1}$ and close to F_{max}.

In 1994, the Committee recognized that it had not been able to fully evaluate the effect of mixing on the assessments of bluefin in the Atlantic and Mediterranean, but it recognized that mixing occurs. Given that recent estimates of East and Mediterranean bluefin had declined substantially, and considering that under some mixing assumptions the decline could even be more pronounced, the Committee strongly reemphasized its 1994 management recommendations for east and Mediterranean bluefin.

BLUEFIN TUNA - EAST

BFTE-1. Biology

Bluefin tuna is a species which lives in the majority of the oceans. In the Atlantic, bluefin tuna are present on both sides of the Ocean, as well as in the Mediterranean. Although exchanges exist for trophic reasons or because of reproduction between the east Atlantic and the west Atlantic, these two stocks have been managed separately with a limit of 45°W longitude in the northern hemisphere and 25°W in the southern hemisphere (**BFT-Figure 1**)

East Atlantic bluefin tuna reproduce primarily in the Mediterranean, in June-July, mainly in the western part, around the Balearic islands and the Tyrrhenian Sea, where the surface temperature of the waters is about 24°C. The bigger the tunas grow, the more they cross the thermal barriers. The movements which they undertake lead them from the cold waters of the north Atlantic, to as far south as Morocco and the southern Mediterranean. Eastern Atlantic bluefin tuna grow rapidly, and attain 150 cm FL (50 kg) by age 5, when they become sexually mature. Their life-span can be long (20+ years), and certain specimens may attain 650 kg. Bluefin tuna feed mainly on small pelagic fish and cephalopods.

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, in particular for the east Atlantic, and even more so for the Mediterranean. Certain fisheries, such as trap, go back to antiquity. Others, such as the Mediterranean purse seine fishery, were fully developed in the middle of the 1970s. The main fishing gears, and their associated share of the 1994 catches by region are; longline (44%), trap (23%) and baitboat (22%) in the east Atlantic; purse seine (76%), longline (15%) and trap (2%) in the Mediterranean.

The total reported preliminary landings for the east Atlantic and the Mediterranean amounted to 34,483 MT, which is about 7,400 MT greater than in 1993 (**BFT-Table 1** and **BFT-Figure 2**). This is the highest level on record since 1955.

The French purse seine catch in the Mediterranean has increased from an average 4,700 MT in the last ten years to 11,800 MT in 1994. It is believed that good climatic conditions, increased effective effort (aided by spotter planes) and new fishing strategies (transshipment vessel) contributed to higher catches of large fish. It should be noted that there is a new domestic longline fleet developing in Sicily. Most of these developments are thought to be influenced by strong market demands.

East Atlantic catches, including the Mediterranean, show a slightly increasing trend since 1987, followed by a decline from 1993 to 1994, from 8,970 MT to 6,370 MT. Spanish baitboat landings in 1994, after a good season in 1993, have returned to the level of previous years (1,140 MT). Since 1994, Japanese longliners have been fishing in a new area in the north Atlantic around 60°N by 20°W, as well as in the traditional areas.

BFTE-3. State of the stocks

The status of the east Atlantic bluefin stock is based on an assessment conducted at the 1994 SCRS meeting. This assessment was conducted under the hypothesis of an eastern stock with no mixing. (see also section BFTW-3 for details).

Following this assessment, the Committee agreed that: In general, the assessment portrays a declining resource, except for the youngest age groups (**BFT-Figure 4**). The number of fish in the age 2 through 4 group seems to be stable or increasing slightly during the period 1970 through 1994. However, the other age groups (4+, 5-9, and 8+)

appear to be declining markedly. In particular, the number of the age 8+ group is estimated to have decreased by about 87% between 1970 and 1993, and about 83% between 1983 and 1993.

Fishing mortality rates are estimated to have increased considerably during the 1970-1993 period. Fishing mortality on the youngest ages (2-4) follows this pattern (**BFT-Figure 5**) and currently is estimated at about 0.7 per year, a very high rate when compared to the assumed rate of natural mortality. The mortality rate on age 8+ group is estimated to have increased sharply in the most recent years, to over 0.6 per year. However, the Committee considered that some of these conclusions are uncertain, as a retrospective pattern appears in estimates of F for the oldest ages. Nonetheless, the F for the 8+ group is estimated to have been over 0.2 in the late 1980s, and if a retrospective adjustment is applied, the current F is estimated at approximately 0.4.

The availability of fish, combined with an increase in effective effort on these fish in 1994, could only have increased the fishing mortality value.

BFTE-4. Outlook

As in the last section, these paragraphs are taken from the SCRS/94 report:

The retrospective-adjusted population estimates for 1993 were projected forward 10 years under three alternative catch scenarios: 20,000, 27,000 and 34,000 MT. The 27,000 MT level was equivalent to the actual catch in 1993, whereas the 34,000 MT correspond to catches taken in 1994. Recruitment was assumed to be constant at the mean levels estimated for 1984 to 1991.

Several results stemmed from these projections: (1) The potential gains in yield per recruit are somewhat lower if the retrospective adjustment is applied. (2) Even with the adjustment, large increases in yield per recruit and total yield from each cohort are to be expected from reducing the overall F or the F on the smallest fish. (3) If future recruitment remains at recent levels, the 1993 yield (27,000 MT or more per year) is probably not sustainable unless the rate of fishing mortality is reduced markedly. Even in that case, a period of lower yields would occur before the expected increase in yield could be taken.

The 1994 analysis estimates that adherence to the size restriction would result in considerable benefits in yield from the eastern stock. Another benefit is also possible, since a certain number of fish from the eastern stock are believed to move to the western stock, restrictions in the east might increase yield in the west as well.

BFTE-5. Effects of current regulations on east Atlantic and Mediterranean bluefin

The Committee noted that in 1974, it was recommended that fishing mortality on bluefin tuna in the entire Atlantic and Mediterranean be limited to recent levels. This recommendation entered into effect in 1975, but has had no effect since it was not adhered to.

There is also a regulation that prohibits the catching and landing of bluefin tuna weighing less than 6.4 kg in the entire Atlantic, with a tolerance level of 15% (in number) for by-catches. The percentage of fish less that 6.4 kg in the catch is still high in the east Atlantic and in the Mediterranean. On average, over the 1972-1993 period, these percentages were about 47% and 36% respectively. While the percentage is variable, there was a notable decline in the east Atlantic in recent years (73% in 1988 to 15% in 1993), whereas the percentage shows strong variations in the Mediterranean, but seems to stabilize at about 30% for the last three years. Catches of age 0 fish are still considerably under-estimated, and the percentage of these under-sized fish could be even more significant than indicated in the official statistics. The market for these small fish is flourishing, as is the case for the large fish, which does not induce the fishermen to limit their catches of this size.

Another recommendation entered into force on June 1, 1994, prohibiting fishing by large pelagic longliners greater than 24 m in length in the Mediterranean during the months of June and July. This regulation is aimed at limiting fishing mortality. Some large longliners have been seen fishing during June-July of 1994 and 1995.

In 1994, the Commission recommended additional regulatory measures for bluefin tuna in the east Atlantic and Mediterranean (Annex 18 to the Proceedings of the Ninth Special Meeting of the Commission, Madrid, November-December, 1994). The recommendation entered into force on October 2, 1995. Thus, the Committee was unable to assess the effect of these regulations during the 1995 SCRS Meeting.

BFTE-6. Management recommendations

The Committee expressed grave concern about the status of east Atlantic bluefin tuna resources in the light of the yield-per-recruitment analysis and the historically highest catch made in 1994. It is apparent that higher long-term yields could be realized if fishing mortality rates were reduced, especially on young fish.

The Committee reiterated the recommendation of 1994 to reduce the level of fishing mortality, as originally recommended in 1974, but which has yet to be implemented in practice. Lack of effective measures to control the level of fishing mortality resulted in a substantial increase in the highest levels observed in the Mediterranean so far.

Given the unexpectedly large increase in catches during 1994, the Committee considers that a 25% reduction in catches over the 1993-1994 levels will not be sufficient to reduce fishing mortality as recommended in 1994. Thus, the Committee recommended that the Commission re-consider the effectiveness of recommendations 2 and 3, as described in Annex 18 of the Commission's Report of its Ninth Special Meeting (Madrid, November-December, 1994).

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 also reiterated the recommendation that measures be taken to avoid catches 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.

ATLANTIC BLUEFIN TUNA SUMMARY

	West Atlantic	*East Atlantic*
Maximum Sustainable Yield (MSY)	not estimated	not estimated
Current (1994) Yield	2,369 MT	34,483 MT
Current (1993) Replacement Yield	not estimated	not estimated
Relative Biomass (B_{1993}/B_{1975})	0.13 (ages 8+)	not estimated
Relative Number (N_{1994}/N_{1975})	0.23 (ages 8+)	0.28 (ages 5+)
Relative Fishing Mortality:		
F_{1993}/F_{MSY}	not estimated	not estimated
$F_{1993}/F_{0.1}$	1.43	5.3
F_{1993}/F_{max}	1.01	4.6
$F_{1993}/F_{Med\ 1970\text{-}1989}$	1.56	not estimated
Management Measures in Effect	--No landing of fish <6.4 kg, with a 15% tolerance. --Limit catches <115 cm (30 kg) to no more than 8% by weight. --Total catch limit of 1,995 MT in 1994 and 2,200 MT in 1995 and 1996.	--No landing of fish <6.4 kg, with a 15% tolerance. --Fishing mortality not to exceed *circa* 1975 level. --No longlining in Med. in June-July by vessels >24m. --1995 catches <1993 or 1994. --A progressive 25% reduction over 3 years starting in 1996 on 1993 or 1994 catches.

BFT-Table. 1. Reported landings and discards of bluefin tuna (MT) in the Atlantic and Mediterranean, by region, gear and country.

REV.7 (As of October 7, 1995 - 12;00)

	1965	1966	1967	1968	1969	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
TOTAL	31002	22706	25207	15738	17385	15924	17461	14634	14607	24516	26249	28168	25468	20409	18478	19904	19617	23820	24202	26716	26836	22828	20668	27280	24874	24890	27051	26992	29371	36852
WEST ATLANTIC	14171	8090	5940	3176	3012	5466	6591	3948	3871	5393	5032	5883	6694	5763	6255	5801	5771	1445	2542	2292	2685	2322	2591	3011	2867	2798	2992	2114	2309	2369
-PURSE SEINE	3331	1006	2082	687	1118	4288	3769	2011	1656	960	2320	1582	1502	1230	1381	758	910	232	384	401	377	360	367	383	385	384	237	300	295	301
CANADA	461	0	0	0	0	1161	935	260	635	103	291	332	298	241	0	0	105	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	0	0	0	0	0	0	0
USA	2870	1006	2082	687	1118	3127	2834	1751	1021	857	2029	1250	1204	989	1381	758	805	232	384	401	377	360	367	383	385	384	237	300	295	301
-ROD & REEL +	1062	3726	343	619	1008	587	1049	1084	519	2913	328	590	630	475	499	535	523	308	476	401	466	328	539	439	557	780	728	354	628	782
CANADA	94	111	56	180	170	151	88	188	239	409	206	342	302	208	214	259	279	0	71	1	1	2	1	7	0	28	32	30	88	71
USA	968	3615	287	439	838	436	961	896	280	2504	122	248	328	267	285	276	244	308	405	400	465	326	538	432	557	752	696	324	540	711
-LONGLINE	9469	3085	3126	1665	593	268	1390	339	1127	946	1522	3066	3752	3217	3691	3972	3879	363	829	835	1245	764	1134	1373	678	739	895	674	696	538
ARGENTIN	100	100	60	21	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BRASIL	0	0	0	0	0	0	0	0	0	0	0	0	0	14	10	2	3	1	1	++	1	0	2	++	2	1	++	0	0	++
CANADA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	33	104	53	4	6	9	25	5
CHITAIW	0	0	0	12	7	2	13	7	2	20	1	0	1	1	49	15	7	11	2	3	3	3	0	0	0	0	0	0	0	0
CUBA	139	465	2352	1351	468	200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
JAPAN	9147	2471	694	272	116	66	1375	321	1097	905	1513	2902	3658	3144	3621	3936	3771	292	711	696	1092	584	960	1109	468	550	688	512	581	427
KOREA	0	0	0	0	0	0	0	11	23	20	8	7	1	0	1	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	0	0	0	0	0	0	4
NORWAY	4	10	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	0
PANAMA	0	0	0	0	0	0	0	0	2	0	0	157	92	58	10	9	14	12	0	0	0	0	0	0	0	0	0	0	0	0
TRINIDAD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	++	++	0	0	0	0	0
URUGUAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0	9	16	6	0	2	0	0	1	++	1	++
USA	79	39	20	9	2	0	++	0	1	1	0	0	0	0	0	10	83	30	114	127	132	139	139	158	125	160	177	136	89	102
NEI_1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	1	0	0	0	0	0	30	24	23	17	0	0
-OTHER & UNCL	309	273	389	205	293	323	383	514	569	574	862	645	810	841	684	536	459	542	853	655	597	356	359	601	999	762	933	742	659	657
ARGENTIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	2	0	1	2	0	0	0	0
CANADA	81	87	174	101	193	130	59	29	144	256	144	172	372	221	31	65	41	291	362	263	141	39	49	282	580	406	447	404	346	316
MEXICO	0	0	0	0	0	0	0	23	29	39	24	37	14	28	22	10	20	14	0	0	0	0	0	0	0	0	0	0	0	0
POLAND	0	0	0	0	0	0	0	0	0	3	0	3	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	0	0	0	0	0	++	3	2	14	14	14	0	43
USA	228	186	215	104	100	193	324	462	396	276	694	433	424	592	631	461	398	237	491	392	450	317	308	316	416	340	472	324	313	298
-LONGLINE DIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	514	192	215	248	133	199	44	31	80
USA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	514	192	215	248	133	199	44	31	80
-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	0	0	0	0	0	0	11
USA	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	0	0	11

BFT-Table. 1. Reported landings and discards of bluefin tuna (MT) in the Atlantic and Mediterranean, by region, gear and country.

REV. 7 (As of October 7, 1995 - 12:00)

	1965	1966	1967	1968	1969	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
EAST ATLANTIC	10834	9290	10523	4629	5683	5764	4675	4732	4685	6067	9976	5212	6977	5800	4767	4064	3331	6669	8010	7392	4759	4491	4432	6950	5323	5935	6735	7373	8967	6371
-BAITBOAT	1820	3347	1805	1474	1826	3017	3055	3032	3142	2348	2991	1803	2881	3904	2128	1874	1553	957	3032	2948	2366	2253	2128	2682	2683	1993	1648	1466	4000	1422
CAP VERT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	1	0	0	0	0	0	0	0	0	0	0
FRANCE	621	1624	860	390	534	732	680	740	540	522	692	267	592	723	275	260	153	150	400	566	380	272	533	479	306	367	448	372	164	66
JAPAN	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	0	0	0
PORTUGAL	0	0	0	0	0	0	0	0	0	191	303	24	14	56	10	17	16	30	53	15	3	28	58	29	1	12	0	++	2	220
ESPANA	1199	1723	945	1084	1292	2285	2375	2292	2602	1635	1996	1512	2275	3125	1843	1597	1384	777	2569	2366	1983	1953	1537	2174	2376	1614	1200	1094	3834	1136
-PURSE SEINE	3378	2737	4022	1149	1435	669	598	961	932	1455	3612	860	1426	257	266	437	266	655	262	414	86	288	0	0	0	8	4	66	0	0
MAROC	906	1778	2048	453	678	406	30	531	512	590	2624	331	662	36	206	155	105	600	187	127	86	122	0	0	0	8	4	66	0	0
NORWAY	2472	959	1974	696	757	263	568	430	420	865	988	529	764	221	60	282	161	50	1	243	0	31	0	0	0	0	0	++	0	0
PORTUGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	74	3	0	123	0	0	0	++	0	0	++	++
SAFRICA	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	0	0	0
ESPANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	41	0	12	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	0	5	0	0	0	0	0	0	0	0	0	0	0	0
-TRAP	5172	3123	4540	1790	2220	1786	663	372	505	20	448	490	561	450	600	706	859	2309	1956	2271	1630	1057	1040	2624	1478	2139	1799	1355	1498	1475
MAROC	1882	1601	1331	635	59	286	63	122	1	7	0	0	222	0	0	6	72	393	94	0	0	166	101	235	304	228	759	84	254	339
PORTUGAL	90	122	209	55	261	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
ESPANA	3200	1400	3000	1100	1900	1500	600	250	504	13	448	490	339	450	600	700	787	1916	1862	2271	1630	891	939	2389	1174	1911	1040	1271	1244	1136
-LONGLINE	434	81	141	208	201	274	254	261	91	2243	2923	2048	1806	733	748	1002	575	2705	2626	1538	535	770	904	1169	853	1504	3114	3689	2493	2772
CHITAIW	0	0	0	138	114	46	12	2	1	12	5	3	2	0	3	5	6	16	2	0	0	0	0	0	0	0	0	0	5	5
FRANCE	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	7	0	0
JAPAN	404	50	100	13	2	21	157	240	44	2195	2900	1973	1594	577	630	880	515	2573	2609	1514	420	739	900	1169	838	1464	2981	3350	2484	2075
KOREA	0	0	0	0	0	0	0	19	43	36	15	3	2	0	1	0	0	0	3	0	77	0	0	0	0	0	0	0	0	684
LIBYA	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	312	0	0
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	0	8	2	16	0	0
NORWAY	30	31	41	57	85	207	85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PANAMA	0	0	0	0	0	0	0	0	3	0	0	69	208	156	14	117	48	12	0	17	22	11	4	**	**	**	**	**	0	0
PORTUGAL	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	99	4	4	8
ESPANA	0	0	0	0	0	0	0	0	0	0	3	0	0	0	100	0	6	104	12	7	16	20	0	0	15	32	32	0	0	0
-OTHER & UNCL	30	2	15	8	1	18	105	106	15	1	2	11	303	456	1025	45	78	43	134	221	142	123	360	475	309	291	170	797	976	702
DENMARK	30	2	15	8	1	++	1	++	2	1	++	3	1	3	1	0	4	++	++	0	2	1	++	0	0	++	++	++	0	0
FRANCE	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	36	110	76	0	245	154	143	117	515	935	269
GERFR	++	++	0	++	++	14	1	6	2	0	0	0	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
GREECE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	++	5	0	0	0	0	0	0	0	0	0	0	0	0
MAROC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	84	44	0	0	255	202	147	59	30	246	22	163
NETHERLA	0	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	0	0	0	0	0	0
POLAND	0	0	0	0	0	0	100	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PORTUGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	7	1	11	47	16	26	42	105	19	2	15	18	34	19	12
ESPANA	0	0	0	0	0	0	0	0	0	0	0	0	300	450	998	38	70	27	2	119	1	0	0	4	0	0	0	2	0	0
SWEDEN	++	++	++	++	0	4	3	0	0	0	2	8	2	2	++	++	1	++	1	++	0	0	0	++	++	0	1	++	0	0
NEI_1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	3	4	0	5	6	74	4	0	0	258 ***

BFT-Table. 1. Reported landings and discards of bluefin tuna (MT) in the Atlantic and Mediterranean, by region, gear and country.

REV. 7 (As of October 7, 1995 - 12:00)

	1965	1966	1967	1968	1969	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	
MEDITERRANE	5997	5326	8744	7933	8690	4694	6195	5954	6051	13056	11241	17073	11797	8846	7456	10039	10515	15706	13650	17032	19392	16015	13645	17319	16684	16157	17324	17505	18095	28112	
-PURSE SEINE	435	1876	2919	3341	3629	2393	3904	4084	4324	8119	8065	13970	9563	7299	6103	8541	8529	12131	10484	9888	13408	10788	8755	11365	10512	11148	12255	13189	12317	20872	
CROATIA	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	538	347	176	389	
FRANCE	0	1000	1500	2500	1500	1100	2200	1100	1400	1800	1600	3800	3182	1566	1527	1701	2300	4818	3600	3570	5400	3460	4300	5750	4404	4663	4570	5970	4730	11803	
ITALY	301	630	1088	691	1828	1203	1336	2783	2700	6000	6270	9607	5431	4663	3705	6120	5704	6442	5552	5382	4522	4789	2579	2229	2345	2531	2660	3530	3294	4366	
LIBYA	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	109	122	273	546	450	
MAROC	0	0	0	0	0	0	42	1	0	2	40	1	7	0	2	++	2	++	0	0	0	0	0	0	0	0	0	0	1	0	
ESPANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	277	0	79	45	110	170	160	300	635	807	1366	1431	1725	
TUNISIE	0	0	0	0	0	0	0	0	0	0	0	0	11	21	113	147	97	108	110	102	127	109	148	153	94	114	1073	975	984	984	
TURKEY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2230	1524	910	1550	2809	2137	2436	679	1155	1155	*
YUGOSLAV	134	246	331	150	301	90	326	200	224	317	155	562	932	1049	756	573	376	486	1222	755	1084	796	648	1523	560	940	0	0	0	0	
NEI_2	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	19	49	49	0	0	
-TRAP	3872	2250	3337	3082	3768	1394	1548	1465	1041	2362	1579	1518	1156	1008	750	545	587	1364	1318	2236	760	683	913	1034	1311	1615	581	706	206	670	
ALGERIE	++	150	150	150	150	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	
ITALY	1264	945	1949	1739	1324	961	1044	835	367	739	713	650	698	210	195	152	209	155	284	327	295	293	310	301	301	290	263	368	115	107	
LIBYA	600	700	800	1000	2000	0	208	449	475	1469	780	799	336	677	424	339	255	130	270	274	0	0	0	0	0	26	29	65	0	150	
MAROC	172	11	27	5	0	0	37	36	1	7	0	0	0	0	0	0	0	0	0	0	0	38	110	96	286	580	22	82	4	332	
ESPANA	1235	151	104	4	217	280	53	88	146	11	3	3	2	1	0	0	3	66	37	621	302	168	219	228	231	470	24	16	6	0	
TUNISIE	601	293	307	184	77	153	206	57	52	136	83	66	120	120	131	54	120	188	170	145	163	184	274	409	493	249	243	175	81	81	*
TURKEY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	825	557	869	0	0	0	0	0	0	0	0	0	0	
-LONGLINE	400	500	300	600	400	69	129	236	520	2387	1363	1218	592	153	199	229	310	1510	949	1175	1207	637	726	1166	1055	839	2458	1983	3686	4159	
CHITAIW	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	0	328	329	
CYPRUS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	*
ITALY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	41	62	1	65	63	63	59	82	59	44	44	*
JAPAN	0	0	0	0	0	0	0	112	246	2195	1260	968	520	61	99	119	100	961	677	1036	1006	341	280	258	127	172	85	123	793	536	
LIBYA	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	123	139	0	0	732	
MALTA	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	63	94	151	344	
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	0	1	0	0	0	0	
PANAMA	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PORTUGAL	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	278	320	183	428	
ESPANA	400	500	300	600	400	69	129	124	274	192	103	250	68	92	100	100	200	538	233	69	129	117	116	135	98	59	51	28	40	178	
NEI_1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	19	0	168	255	700	757	415	1750	1349	2137	1558	***

BFT-Table. 1. Reported landings and discards of bluefin tuna (MT) in the Atlantic and Mediterranean, by region, gear and country.

REV. 7 (As of October 7, 1995 - 12:00)

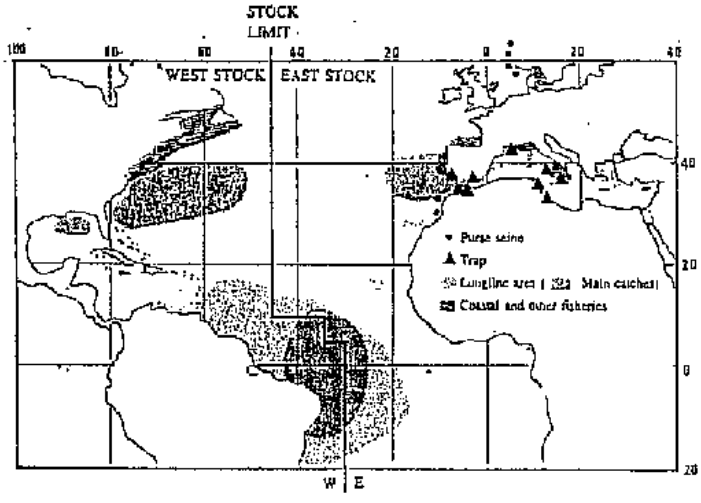
	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	
-OTHER & UNCL	1290	700	2188	910	893	838	614	169	166	188	234	367	486	386	404	724	1089	701	899	3733	4017	3907	3251	3754	3806	2555	2030	1627	1886	2411	
ALGERIE	0	0	0	0	0	100	100	1	++	33	66	49	40	20	150	190	220	250	252	254	260	566	420	677	820	782	800	304	800	800	*
CYPRUS	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	0	4	0	
FRANCE	390	0	0	0	0	0	0	0	0	0	0	0	0	31	51	0	50	60	60	30	30	30	30	30	30	50	50	30	30	30	*
GREECE	700	500	600	500	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	131	99	102	131	155	123	92	92	362	***
ITALY	0	0	0	0	0	100	100	100	100	100	100	112	134	110	120	0	104	61	0	1390	2320	2493	1653	1608	1608	794	490	399	373	373	*
LIBYA	0	0	0	0	0	500	392	0	0	0	0	0	0	0	0	59	16	180	0	0	300	300	300	300	84	0	0	0	0	0	
MALTA	100	100	100	100	++	++	++	++	++	21	37	25	47	26	23	24	32	40	31	21	21	41	36	26	34	66	0	0	0	0	
MAROC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	12	18	6	44	9	7	7	2	1	6	
ESPANA	0	0	0	0	0	0	0	0	0	0	14	0	88	72	15	33	101	108	542	1974	984	306	673	905	1016	658	510	755	541	795	
TUNISIE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	27	1	2	13	60	79	22	34	62	74	43	50	45	45	45	*
TURKEY	100	100	1488	310	393	138	22	68	66	34	17	181	177	127	27	391	565	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

++ CATCH: < 0.5 MT

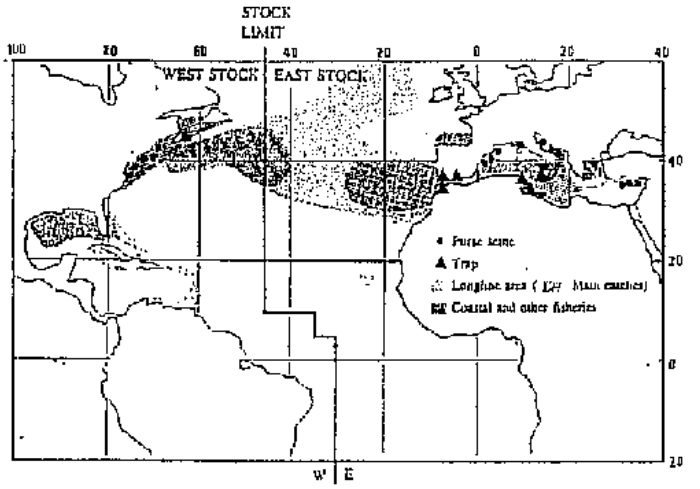
** CATCH: UNKNOWN

* Figures carried over from the previous years

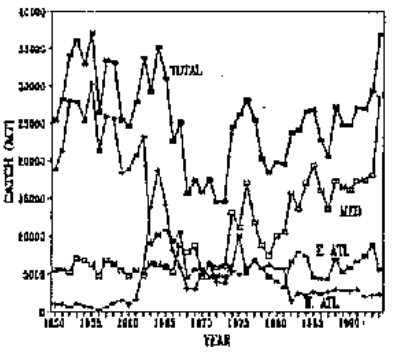
*** Estimated based on Japanese imports.



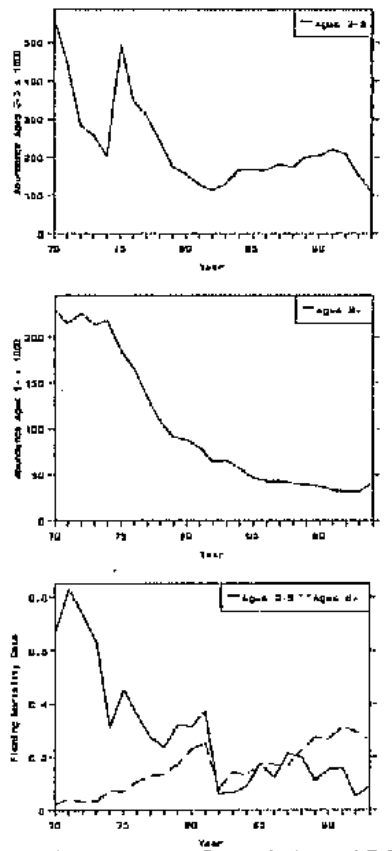
BFT-Fig. 1a. Historical main fisheries (up to 1970) in Atlantic Ocean and Mediterranean Sea.



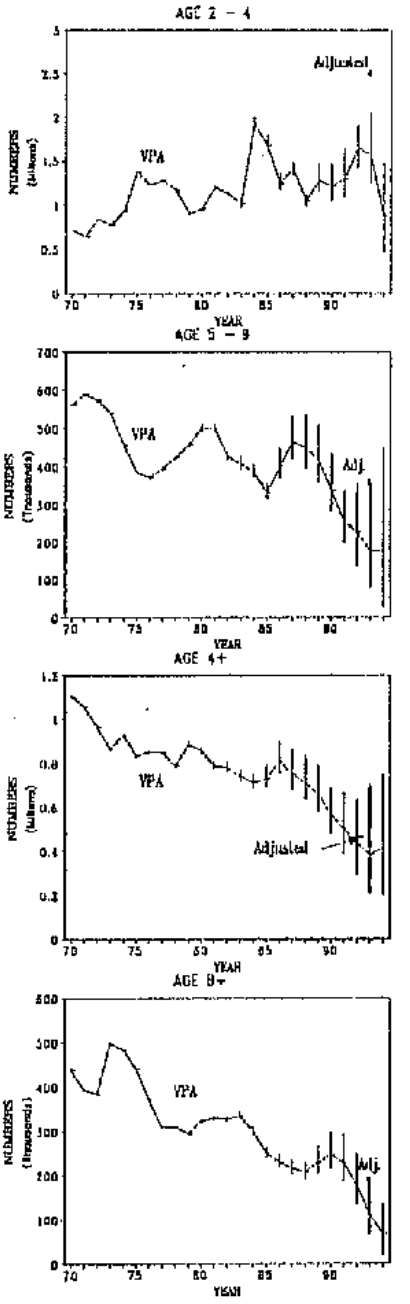
BFT-Fig. 1b. Actual fisheries (1970-1994) in the Atlantic Ocean and Mediterranean Sea.



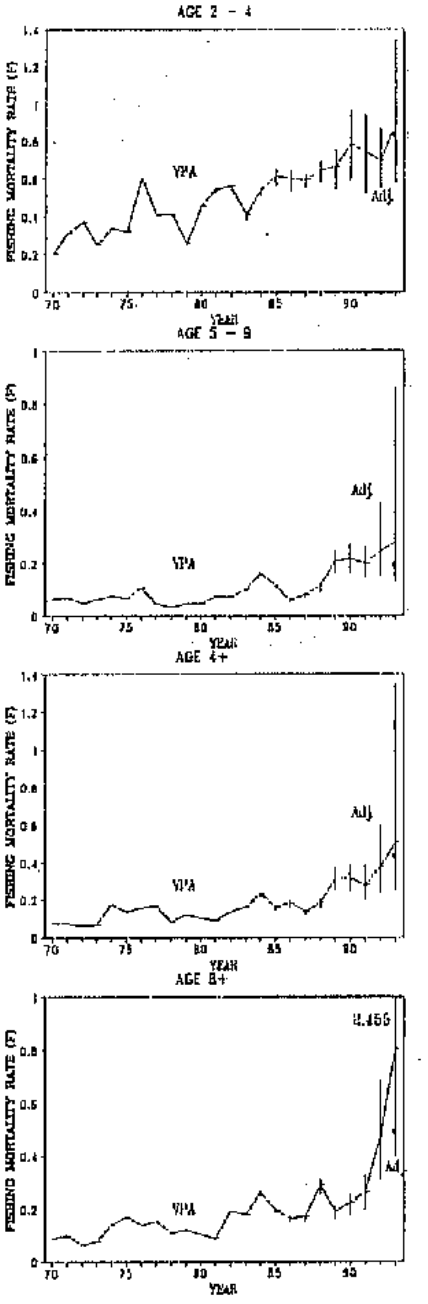
BFT-Fig. 2. Total Atlantic bluefin catches (MT) by regions. (Including discards).



BFT-Fig.3. West bluefin stock size and fishing mortality rate estimated by age groups from base-case assessment.



BFT-Fig. 4. East bluefin stock size (with 95% confidence intervals) estimated by age group from base-case assessment.



BFT-Fig. 5. Fishing mortality rate estimates by age group from the basic-case assessment for east bluefin stock.

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. They 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. The stock hypotheses for assessment purposes are a north Atlantic and south Atlantic stock (divided at 5°N), and a total Atlantic stock. Because about 10% of the tag returns represent trans-Atlantic and trans-Equatorial movements, SCRS now recognizes increased importance of the total Atlantic hypothesis for blue marlin.

Blue marlin feed on a wide variety of fish and squid, but show a dietary preference for scombrids. They are found predominately in the upper reaches of the water column and are typically caught most frequently as a by-catch on surface longline fisheries which target tropical or temperate tunas.

Blue marlin spawn in tropical and subtropical waters in the summer and fall. They 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 larger maximum size than males. Blue marlin are considered sexually mature by ages 2-4.

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 of various countries which target tuna and swordfish, including Brazil, Cuba, Japan, Korea, and Taiwan (and others). Other major fisheries are the directed recreational fisheries of the United States, Venezuela, Bahamas, Brazil, and many other countries 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 over the next few years to 2,000 to 3000 MT, and have fluctuated at relatively stable levels (about 2,000 to 3,000 MT) thereafter (**BUM-Figure 2**). Landings for the north and south 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. The Committee has often acknowledged missing or possible under-reported landings from various Atlantic fisheries.

BUM-3. State of stocks

The most current assessments for blue marlin were submitted to the SCRS in 1992 and these analyses included data through 1990. The general results from these analyses (**BUM-Figures 3 and 4**) using a non-equilibrium production model indicated that biomass had been below B_{MSY} for more than a decade (for all hypotheses) and the Committee considered these stocks to be over-exploited. Maximum sustainable yield was estimated from production model analyses for the total Atlantic, north Atlantic, and south Atlantic to be about 3,600, 1,700 and 1,300 MT, whereas current landings for 1994 are 3,351, 1334, and 1896 MT for the total, north, and south Atlantic, respectively. Biomass in 1990 was estimated to be about 42, 83, and 34% (for total, north, and south Atlantic, respectively) of the biomass needed to produce MSY.

BUM-4. Outlook

For the total and south Atlantic hypotheses, reported landings over the last few years were considerably larger than the estimated equilibrium replacement yields (about 2,500 and 700 MT, respectively in 1990) and these levels of landings are expected to have resulted in a continued decline in stock biomass. However, the reported landings for

the north Atlantic are lower over the last few years than the estimated equilibrium replace yield (about 1,600 MT in 1990) and are therefore expected to have resulted in some improvement in stock status since 1990. It should be reiterated that the SCRS recognizes increased importance of the total Atlantic hypothesis (based on tag return data) for Atlantic blue marlin. The Committee remains concerned about the quality of the landings data used in these assessments, particularly possible under reporting by various countries. Although the Committee recognizes the increase in stock biomass for the north Atlantic production model results (since about 1988) as a sign of recovery, the outlook for the total Atlantic hypothesis is less optimistic, as are the results of the south Atlantic hypothesis. Therefore, the Committee continues to be concerned about the persistent high level of fishing mortality which has depressed stock biomass to levels below that which could produce MSY in most stock hypotheses examined here. However, this needs verification with an updated assessment.

BUM-5. Effect of current regulations

No ICCAT regulations are currently in effect for Atlantic blue marlin.

Two ICCAT contracting parties (the U.S. and Venezuela) and two non-contracting parties (Mexico and St. Lucia) have established domestic regulations for commercial and recreational fisheries involving blue marlin to reduce mortality. 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

Recent 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 at this time. 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.

ATLANTIC BLUE MARLIN SUMMARY

	Total Atlantic	*North Atlantic*	*South Atlantic*
Maximum Sustainable Yield (MSY)	~ 3,600 MT	~ 1,700 MT	~ 1,300 MT
Current (1994) Yield	~ 3,351 MT	~ 1,334 MT	~ 1,896 MT
Current (1990) Replacement Yield	~ 2,500 MT	~ 1,600 MT	~ 700 MT
Relative Biomass (B_{1990}/B_{MSY})	~ 0.42	~ 0.83	~ 0.34
Relative Fishing Mortality:			
F_{1989}/F_{MSY}	~ 2.5	~ 1.1	~ 6.8
F_{1989}/F_{max}	not estimated	not estimated	not estimated
$F_{1989}/F_{0.1}$	not estimated	not estimated	not estimated
Management Measures in Effect	none	none	none

~ = approximate value.

Bum-Table 1. Reported blue marlin landings (MT) in the Atlantic, by region, gear and country.

Rev 3 (As of Oct 8, 1995 - 10:30)

	1965	1966	1967	1968	1969	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
TOTAL	6155	3859	2240	2434	3091	2864	3194	2366	3177	3016	3185	2310	2047	1506	1384	1617	1920	2750	1801	2227	2694	1954	1871	2357	3529	3293	3096	3110	3071	3351
NORTH ATLANT	3682	2040	1173	1344	1601	1845	2115	1315	1616	1916	2076	1366	1255	976	880	1064	1248	1615	1149	1204	1305	1058	662	800	1300	1230	1199	1189	1283	1334
-LONGLINE	3517	1884	970	1170	1388	1635	1932	1122	1406	1497	1683	978	876	553	480	639	780	1154	766	813	1065	743	385	482	1058	1061	925	902	1020	1006
CANADA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	++	0	0	0	0
CHITAIW	2	34	131	337	348	369	158	300	155	183	105	169	64	81	51	160	98	100	106	74	86	117	52	20	8	391	388	336	281	182
CUBA	144	91	223	167	122	108	149	67	223	516	594	250	220	97	156	162	178	318	273	214	246	103	68	94	74	112	50	50	50	50
JAPAN	3330	1677	485	474	658	758	1223	335	229	267	551	260	118	54	68	193	332	637	192	351	409	174	78	206	593	250	145	193	207	368
KOREA	4	46	66	93	214	368	221	215	457	385	304	174	307	185	67	45	70	18	25	57	83	49	15	8	99	78	108	108	5	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	0	0	0	0	0	3	13
NEI_1	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	0	57	100
PANAMA	0	0	0	0	0	**	**	10	208	62	44	47	87	42	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESPANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	4	1	0	0	23	2	4	4	0	0
TRINIDAD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	7	3	17	1	++	27	3	4	3	226	150
USA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	61	92	140	214	205	187	127	144	43
USSR	1	1	3	3	3	2	3	7	10	1	3	0	1	1	**	0	0	0	0	0	0	7	23	0	0	0	0	0	0	0
VENEZUEL	36	35	62	96	43	30	178	188	124	83	82	78	79	93	132	79	102	81	167	107	214	214	55	14	20	20	39	81	47	100
-ROD & REEL	165	156	203	174	213	210	183	193	210	236	243	268	298	301	299	301	300	299	199	206	168	213	180	186	142	48	55	81	108	116
BERMUDA	0	0	0	0	0	0	0	0	0	0	1	2	2	5	2	4	1	2	7	8	9	11	6	8	15	17	18	19	11	20
PORTUGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	11	7	2	0	0	0	0	10	0
TRINIDAD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	++	1	++	++	1	++	1	1	2	1	++	0
USA	163	149	197	168	207	204	179	191	209	234	241	265	295	295	295	295	295	295	187	187	147	187	161	173	121	25	30	49	77	86
VENEZUEL	2	7	6	6	6	6	4	2	1	2	1	1	1	1	2	2	4	2	5	10	5	4	5	3	5	5	5	12	10	10
-OTHER & UNCL	0	0	0	0	0	0	0	0	0	183	150	120	81	122	101	124	168	162	184	185	72	102	97	132	100	121	219	206	155	212
BARBADOS	0	0	0	0	0	**	**	**	**	183	150	120	81	72	51	73	117	99	126	126	10	14	13	46	7	17	14	22	12	20
CUBA	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	77	85	38	50
GRENADA	0	0	0	0	0	**	**	**	**	**	**	**	**	**	**	1	1	12	6	8	11	36	33	34	40	52	64	52	58	52
NLDANT	0	0	0	0	0	0	0	0	0	0	0	0	0	50	50	50	50	50	50	50	50	50	50	50	50	50	40	40	40	50
PORTUGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	1	1	1	++	1	1	4	2	5	6
SENEGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	5	0	0	5
ESPANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	4	0	0
USA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	++	1	++	++	0	0	0	0	0	0
VENEZUEL	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	0	0	27
UKRAINE	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	15	0	0	0
STVINCE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	++	++	1	2	2

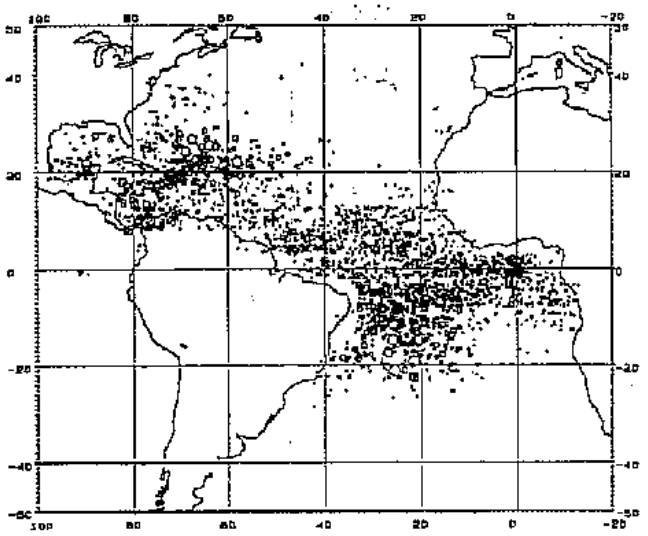
Bum-Table 1. Reported blue marlin landings (MT) in the Atlantic, by region, gear and country.

Rev 3 (As of Oct 8, 1995 - 10:30)

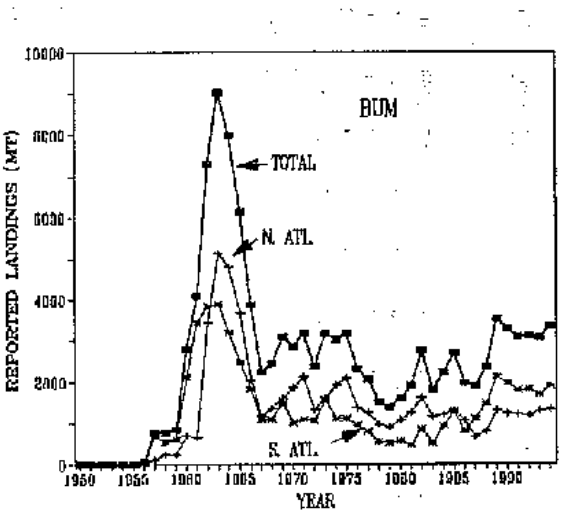
	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
SOUTH ATLANTI	2473	1819	1067	1090	1490	1019	1079	1051	1561	1100	1109	944	792	530	504	553	459	854	507	923	1289	796	1109	1457	2129	1963	1797	1821	1676	1896
-LONGLINE	2473	1819	1067	1090	1489	1018	1079	1051	1561	1100	1109	933	739	526	490	544	431	824	504	812	1171	684	993	1346	1633	1559	1524	1562	1399	1604
BRASIL	12	12	6	15	17	38	14	17	4	15	15	30	47	45	20	21	26	28	27	30	32	41	39	63	66	50	40	17	27	38
BRAS-HON	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	++	6
BRASTAI	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	28	49	107	32
CHITAIW	2	35	160	385	1016	560	604	628	537	369	422	240	107	177	139	129	104	150	39	50	95	98	265	204	335	320	517	488	404	262
CUBA	32	27	221	113	43	41	17	22	75	170	195	159	100	113	180	187	108	118	123	159	205	111	137	191	77	90	0	0	0	0
JAPAN	2421	1693	588	472	302	247	172	85	117	17	57	4	17	15	66	115	136	495	248	482	691	335	362	617	962	967	755	824	719	1116
KOREA	3	47	79	93	98	120	258	251	532	449	354	392	356	140	78	92	56	33	67	91	141	83	168	239	188	132	184	184	25	50
NEI_1	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	0	117	100
PANAMA	0	0	0	0	0	**	**	12	244	72	51	107	103	32	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
USSR	3	5	13	12	13	12	14	36	52	8	15	1	9	4	**	0	1	0	0	0	7	16	22	32	5	0	0	0	0	0
-OTHER & UNCL	0	0	0	0	1	1	0	0	0	0	0	11	53	4	14	9	28	30	3	111	118	112	116	111	496	404	273	259	277	292
BENIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	8	0	9	10	7	4	12	0	6	6	6	6	0
BRASIL	0	0	0	0	1	1	0	0	0	0	0	11	53	4	14	9	22	22	3	2	8	5	12	11	1	2	1	++	1	2
CIVOIRE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	100	100	100	88	65	72	78	58	110	140
CUBA	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	62	69	60	50
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	430	324	126	126	100	100
UNCL REGION	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	213	281	145	100	100	100	100	100	100	100	100	112	121
-LONGLINE	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	0	0	11
USA	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	0	0	11
ESPANA																			**	**	**	**	**	**	**	**	**	**	**	**
-PURSE SEINE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	213	281	145	100	100	100	100	100	100	100	100	100	100	100
FIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	150	180	100	100	100	100	100	100	100	100	100	100	100	100
ESPANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	63	101	45	0	0	0	0	0	0	0	0	0	0	0
-OTHER & UNCL	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	0	12	10
BERMUDA	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	0	11	10
GABON	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	0	1	0

"++ CATCH: < 0.5 MT

"** CATCH: UNKNOWN

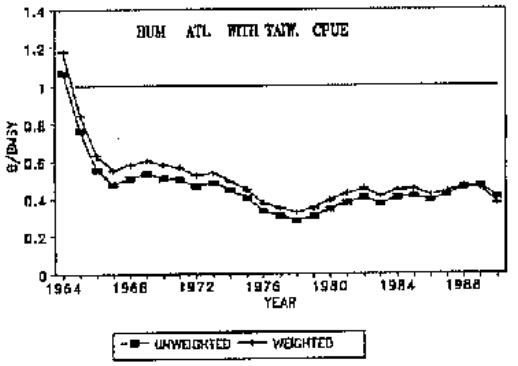


BUM-Fig. 1. Distribution of by-catches of blue marlin by Japanese longline fishery in the Atlantic.

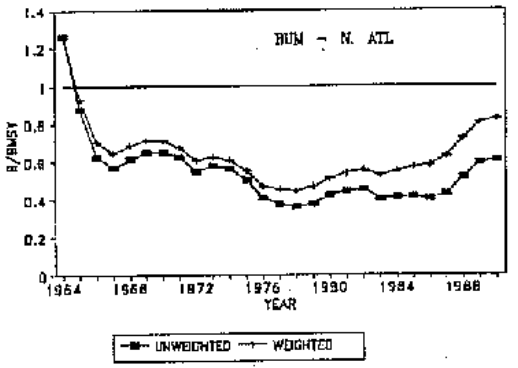


BUM-Fig. 2. Nominal landings (MT) of blue marlin for total, north and south Atlantic.

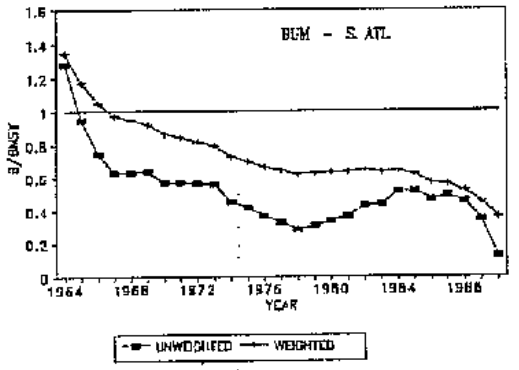
(a)



(b)

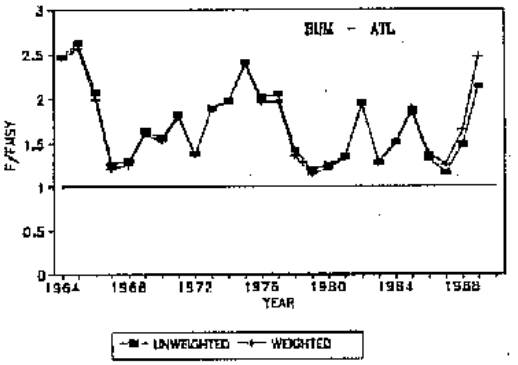


(c)

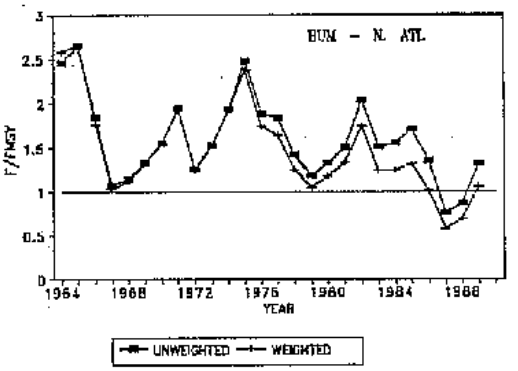


BUM-Fig. 3. Blue marlin estimated trajectory of B/B_{MSY} for the (a) total Atlantic, (b) north Atlantic and (c) south Atlantic. The values for the first three years of the time series have been omitted, as estimates are less precise. Iterative re-weighting methods and results are given in Billfish Workshop Report (1992).

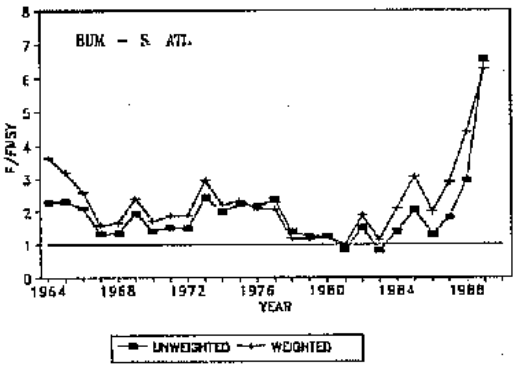
(a)



(b)



(c)



BUM-Fig. 4. Blue marlin estimated trajectory of F/F_{MSY} for the (a) total Atlantic, (b) north Atlantic and (c) south Atlantic. Iterative re-weighting methods and results are given in Billfish Workshop Report (1992).

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. White marlin have an extensive geographical range within the Atlantic and occasionally have migratory patterns that include trans-Atlantic movements. 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. The stock hypotheses for assessment purposes are a north Atlantic and south Atlantic stock (divided at 5°N), and a total Atlantic stock. The SCRS has no basis for distinguishing between these hypotheses at this time.

White marlin are generally considered piscivorous, but also have been know to consume squid. They are found predominately in 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.

White marlin spawn in tropical and subtropical waters in mid- to late spring. They 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 growth faster and reach a larger maximum size than males. This sexual dimorphism is not as extreme as it is with blue marlin.

WHM-2. Description of fisheries

See the section on Description of Fisheries in the 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 1963, declined over the next few years to 900 MT, and have fluctuated between about 1,000 to 2,000 thereafter (**WHM-Figure 2**). Landings for the north and south 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.

WHM-3. State of stocks

The most current assessments for white marlin were submitted to the SCRS in 1992 and these analyses included data through 1990. The general results from these analyses using a non-equilibrium production model indicated that biomass had been below B_{MSY} for almost two decades (for all hypotheses) and the Committee considered these stocks to be over-exploited (**WHM-Figures 3 and 4**). Maximum sustainable yield was estimated from production model analyses for the total Atlantic, north Atlantic, and south Atlantic to be about 1,650, 600, and 1200 MT, whereas current landings for 1994 are 1,647, 644, and 981 MT for the total, north, and south Atlantic, respectively. Biomass in 1990 was estimated to be about 25, 56, and 15% (for total, north, and south Atlantic, respectively) of the biomass needed to produce MSY.

WHM-4. Outlook

For the total and south Atlantic hypotheses, reported landings over the last few years were considerably larger than the estimated equilibrium replacement yields (about 325 and 875 MT, respectively in 1990) and these levels of landings are expected to have resulted in a decline in stock biomass. In the north Atlantic, the reported landings were somewhat lower over the last few years than the estimated equilibrium replacement yield (about 500 MT in 1990) and are therefore expected to have allowed for some improvement in stock status since 1990. The Committee has concerns about the possible under-reporting of landings statistics but remains pessimistic about the over-exploited status of white marlin stocks, particularly in the total and south Atlantic. Therefore, the Committee regards the continuing high level of fishing mortality, which has depressed stock biomass to levels well below that which could produce MSY, as inconsistent with the management objective of MSY. In the north Atlantic, the outlook appears more optimistic, with indications of some improvement in stock status since 1990 because reported catches have been below estimated

replacement yield during some years (but not in other years). However, the expected gains in biomass in the north are likely small and current biomass is still likely below MSY, although this needs verification with an updated assessment.

WHM-5. Effect of current regulations

No ICCAT regulations are currently in effect for Atlantic white marlin.

See Section 5 of the Blue Marlin Executive Summary report.

WHM-6. Management recommendations

Recent stock assessments for Atlantic white marlin indicate that this species is over-exploited and warrants consideration for development of methods to reduce fishing mortality rates. See Section 6 of the Blue Marlin Executive Summary Report.

ATLANTIC WHITE MARLIN SUMMARY

	Total Atlantic	*North Atlantic*	*South Atlantic*
Maximum Sustainable Yield (MSY)	~ 1,650 MT	~ 600 MT	~ 1,200 MT
Current (1994) Yield	~ 1,647 MT	~ 644 MT	~ 981 MT
Current (1990) Replacement Yield	~ 875 MT	~ 500 MT	~ 325 MT
Relative Biomass (B_{1990}/B_{MSY})	~ 0.25	~ 0.56	~ 0.15
Relative Fishing Mortality:			
F_{1989}/F_{MSY}	~ 2.3	~ 0.8	~ 8.0
F_{1989}/F_{max}	not estimated	not estimated	not estimated
$F_{1989}/F_{0.1}$	not estimated	not estimated	not estimated
Management Measures in Effect	none	none	none

~ = approximate value.

WHM-Table 1. Reported white marlin landings (MT) in the Atlantic, by region, gear and country.

REV. 2. (AS OF OCT. 8, 1995)

	1965	1966	1967	1968	1969	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
TOTAL	4906	3512	1426	2047	2254	2097	2260	2280	1792	1750	1577	1819	1125	949	1015	955	1121	1091	1694	1089	1531	1630	1466	1250	1636	1035	1765	1471	1366	1646
NORTH ATLANTIC	2127	1798	588	692	1212	1048	1547	1208	995	1218	1088	1052	501	428	481	508	780	653	1382	702	842	928	583	386	258	295	291	513	400	663
-LONGLINE	2048	1711	497	594	1114	932	1440	1099	886	1103	977	938	390	317	370	396	669	543	1236	549	693	893	484	169	209	236	260	458	355	407
CANADA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2
CHITAIW	2	32	47	58	132	97	178	244	120	248	84	142	44	79	62	105	174	130	203	52	100	319	153	++	4	31	12	66	123	172
CUBA	69	118	127	103	58	61	45	34	112	256	294	68	67	43	68	70	189	205	728	241	296	225	30	13	21	14	20	20	20	20
JAPAN	1913	1417	174	273	451	419	915	339	328	381	404	540	80	27	42	99	118	84	27	52	45	56	60	68	73	34	45	180	33	40
KOREA	1	51	44	52	204	340	219	213	106	90	71	64	71	33	16	12	48	12	28	8	79	42	3	1	24	75	104	104	1	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	0	0	0	0	0	2	8
NEI_1	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	0	46	50
PANAMA	0	0	0	0	0	**	**	10	48	14	10	17	20	8	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESPANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	14	0	0	0	13	4	2	2	0	0
USA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	39	11	103	89	49	36	40	39	22	23	15
USSR	0	0	1	1	1	0	1	1	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VENEZUEL	63	93	104	107	268	15	82	258	170	114	113	107	108	127	181	110	140	112	230	148	148	148	148	38	38	38	38	64	107	100
-ROD & REEL	79	87	91	98	98	116	107	109	109	115	111	114	111	111	111	112	111	110	146	151	148	35	98	76	22	23	11	18	24	12
BERMUDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	++	++	++	1	1	++	1	1	1	1	1	1	1	1	1
USA	76	76	81	87	76	104	95	99	104	108	107	109	109	109	109	109	109	109	141	143	141	31	91	72	16	17	5	8	13	11
VENEZUEL	3	11	10	11	22	12	12	10	5	7	4	5	2	2	2	3	2	1	4	7	7	3	6	3	5	5	5	9	10	0
-OTHER & UNCL GEA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	1	141	27	36	20	37	21	244
BARBADOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	117	27	36	20	29	21	20
CANADA	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	0	0
ESPANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	0	0	0	8	0	19
USA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	**	1	++	0	0	0	0	0	0
VENEZUEL	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	0	0	205

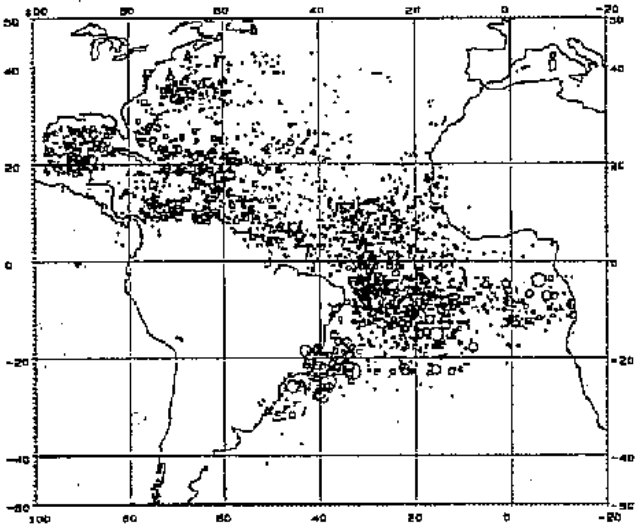
WHM-Table 1. Reported white marlin landings (MT) in the Atlantic, by region, gear and country.

REV. 2. (AS OF OCT. 8, 1995)

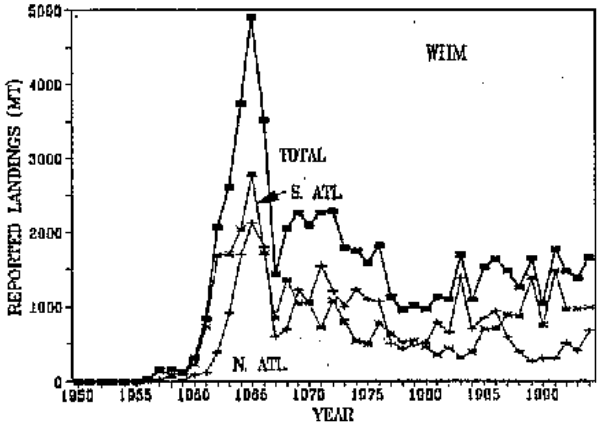
	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
SOUTH ATLANTIC	2779	1714	838	1355	1042	1049	713	1072	797	532	489	767	624	521	534	447	341	438	312	387	689	702	883	864	1378	740	1474	958	965	981
-LONGLINE	2779	1714	838	1355	1042	1049	713	1072	797	532	489	742	621	519	530	444	341	438	312	387	684	676	874	775	1301	696	1296	786	865	881
ARGENTIN	0	0	3	14	0	**	20	100	57	++	2	2	2	**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BRASIL	17	17	9	21	24	54	17	33	18	32	32	43	272	173	129	55	25	76	70	61	88	143	90	148	206	193	294	117	86	79
BRAS-HON	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	1	0	6	6
BRASTAI	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	67	79	161	6
CHITAIW	2	29	134	327	436	469	260	469	412	279	255	377	119	197	155	145	136	220	87	66	134	196	613	514	979	292	700	363	493	680
CUBA	33	23	67	15	7	8	4	6	21	48	55	38	57	127	205	212	116	45	112	153	216	192	62	24	22	6	0	0	0	0
JAPAN	2718	1585	494	815	392	284	65	101	27	9	14	3	26	14	15	7	25	27	17	24	81	73	74	76	73	92	77	68	49	58
JP-SH-OB	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	0	0	2
KOREA	7	58	125	157	177	230	341	332	165	139	109	220	111	5	24	25	37	60	13	18	121	56	29	12	20	112	156	156	2	0
NEI_1	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	0	68	50
PANAMA	0	0	0	0	0	**	**	16	75	22	16	59	31	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
URUGUAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	10	13	65	44	16	6	1	1	1	1	3	0	0
USSR	2	2	6	6	6	4	6	15	22	3	6	0	3	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
-OTHER & UNCL GEA	0	0	0	0	0	0	0	0	0	0	0	25	3	2	4	3	0	0	0	0	5	26	9	89	77	44	178	172	100	100
ARGENTIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	0	0	8	9	6	0	0	0
BRASIL	0	0	0	0	++	++	0	0	0	0	0	25	3	2	4	3	++	++	++	++	1	++	3	1	1	4	++	++	++	++
GABON	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	0	++	0
GHANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	6	88	68	31	172	172	100	100
UNCL REGION	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	0	1	2
-LONGLINE	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	0	0	2
ESPANA	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	0	0	++
USA	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	0	0	2
-OTHER & UNCL GEA	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	0	1	0
ESPANA	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	++	0	0
STVINCE	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	++	1	++

++ CATCH: < 0.5 MT

**CATCH: UNKNOWN

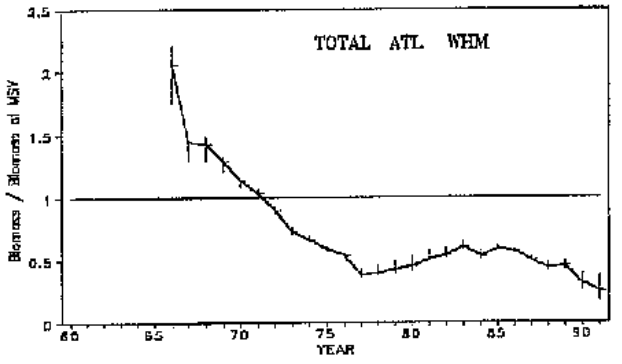


WHM-Fig. 1. Distribution of by-catch of white marlin by Japanese longline fishery in the Atlantic.

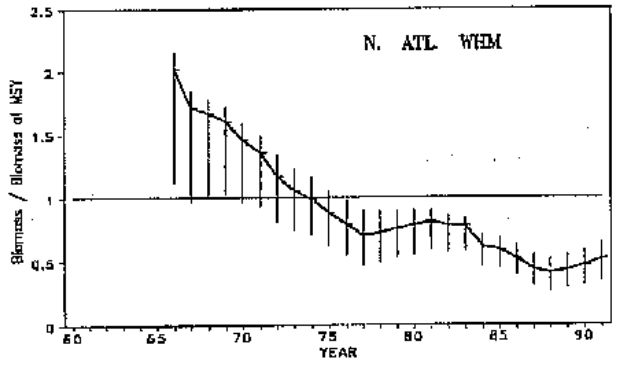


WHM-Fig. 2. Nominal landings (MT) of white marlin for total, north and south Atlantic.

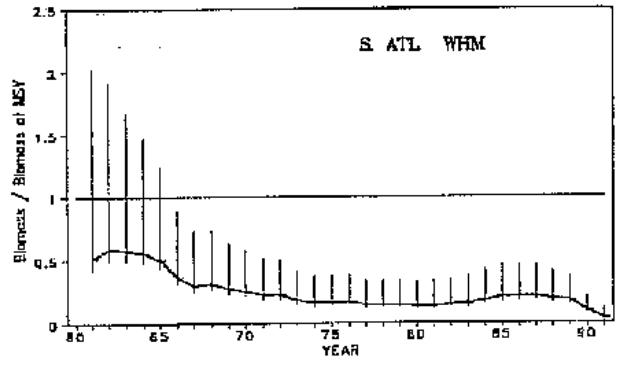
(a)



(b)

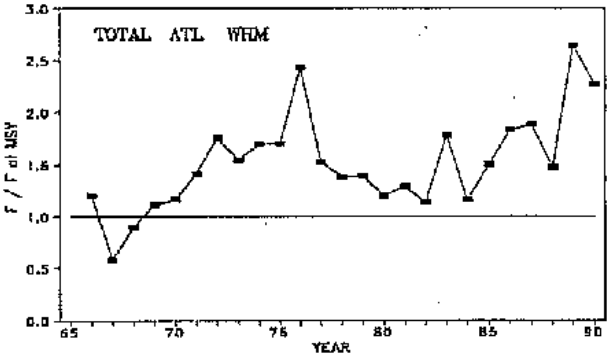


(c)

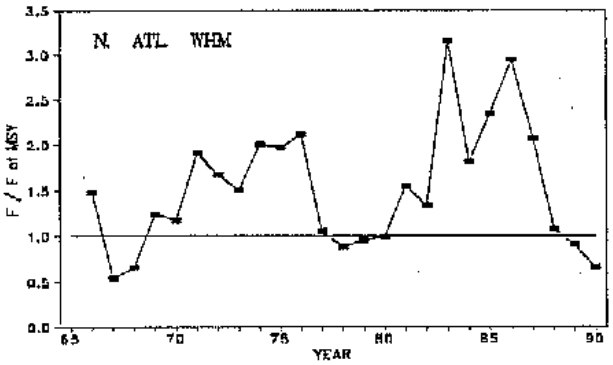


WHM_Fig. 3. Bootstrapped median biomass trajectories with approximate non-parametric 80% intervals for white marlin fisheries from the (a) total Atlantic, (b) north Atlantic and (c) south Atlantic. Results are imprecise for the first 3 to 5 years of the time series.

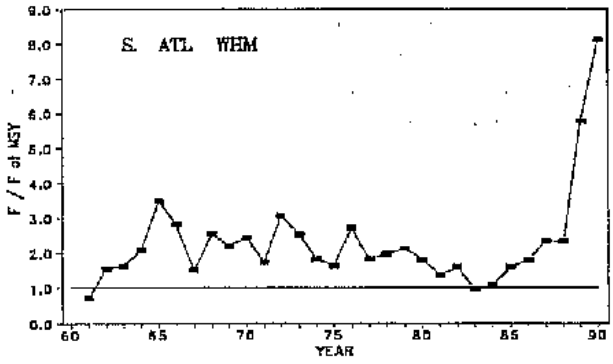
(a)



(b)



(c)



WHM-Fig. 4. Relative fishing mortality trajectories for white marline from the (a) total Atlantic, (b) north Atlantic, and (c) south Atlantic.

SAI - SAILFISH / SPEARFISH

SAI-1. Biology

Since longline catches of sailfish and spearfish have been reported together in ICCAT landing statistics (except for Japan in 1994), these species will be summarized together for the purposes of this report. Sailfish and spearfish have a circumtropical distribution. (**SAI-Figure 1**). Although sailfish have high concentrations in coastal waters (more than any of the istiophorids), 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 30°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 by-catch 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, with an average size of about 15-25 kg and 10-20 kg, respectively, are probably the slowest growing Atlantic istiophorids. Female sailfish grow faster and reach a larger maximum size than males. This sexually dimorphism is not as extreme as it is with blue marlin.

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 but are quite different from one another. For example, the major landings of sailfish/spearfish in the western Atlantic are incidental to the large longline fisheries of various countries which target tunas and swordfish (Brazil, Cuba, Japan, Korea, and Taiwan). Other major fisheries in the western Atlantic are the directed recreational fisheries of the United States, Venezuela, Bahamas, Brazil, Dominican Republic, Mexico and many other countries in the Caribbean Sea. Directed fisheries in the west also include the many artisanal fisheries in the Caribbean Sea. In the eastern Atlantic, the major landings of sailfish are from the artisanal fisheries off west Africa (Ghana, Senegal, Cote d'Ivoire, and others). Directed recreational fisheries for sailfish also exist in Senegal. Landings of sailfish/spearfish in the east Atlantic occur in the offshore longline fisheries of Japan, Korea, Cuba, and Taiwan. Development and geographical expansion of other longline fisheries in the west (by the U.S.) and east (by Spain) also include a by-catch of sailfish/spearfish, which are often discarded. Purse seine fisheries also have an incidental catch of sailfish.

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 1,200 MT by 1975, and then fluctuated (1,200 to 3,000 MT) through 1983. Landings then increased to almost 3,800 MT in 1983 (**SAI-Figure 2**) and then declined and fluctuated around 2,500 MT through 1994. Landings for the east Atlantic generally parallelled the total Atlantic increasing trend whereas the landings in the west were steady for the past two decades. It should be noted that a significant segment of the landings between 1965 and 1983 are listed as unclassified region. A working document submitted to the 1995 SCRS (SCRS/95/105) partitioned these landings into east and west but because of uncertainties, these have not yet been adopted into the landings table at this time. The overall trend in Atlantic landings are very much governed by the large landings from artisanal fisheries off of west Africa, primarily Ghana and Senegal.

SAI-3. State of stocks

West Atlantic sailfish/spearfish assessments were 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 current landings for 1994 are about 753 MT. Biomass in 1992 was estimated to be about 62 % of the biomass needed to produce MSY.

During the 1995 SCRS, an exploratory assessment for east Atlantic sailfish/spearfish was submitted using a non-equilibrium production model and included data through 1992. Due to major uncertainties of meeting model assumptions and specifically the lack of standardized CPUE indices from the major inshore artisanal fishery (i.e. Ghana), the results of this exploratory assessment were considered too preliminary to present here. However, this exploratory assessment did provide an opportunity to analyze the available database and clarified the short-comings in these data so a more definitive assessment could be done in the future.

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 possibly over-exploited levels. The reported landings for west Atlantic sailfish since 1992 were higher than replacement yield and therefore the stock biomass are expected to have continued to decline. However, this needs verification with an updated assessment. Given the inconclusive results of the non-equilibrium production model submitted to the 1995 SCRS for eastern Atlantic sailfish, insight into east Atlantic sailfish stock status remains uncertain, as does the quality of sailfish data used in assessments. The past equilibrium production model submitted to the 1988 SCRS for eastern Atlantic sailfish indicated that this stock had not yet been fully exploited. The Committee is encouraged by the increase in information on eastern Atlantic sailfish, even though current assessment results were not considered creditable at this time.

SAI-5. Effect of current regulations

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

See section 5 of the Blue Marlin Executive Summary report.

SAI-6. Management recommendations

Recent stock assessments for western Atlantic sailfish 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. See section 6 of the Blue Marlin Executive Summary report.

ATLANTIC SAILFISH SUMMARY

	West Atlantic[1]	*East Atlantic*
Maximum Sustainable Yield (MSY)	~ 700 MT	not estimated
Current (1994) Yield	~ 753 MT	not estimated
Current (1992) Replacement Yield	~ 600 MT	not estimated
Relative Biomass (B_{1992}/B_{MSY})	~ 0.62	not estimated
Relative Fishing Mortality:		
F_{1991}/F_{MSY}	~ 1.4	not estimated
F_{1991}/F_{max}	not estimated	not estimated
$F_{1991}/F_{0.1}$	not estimated	not estimated
Management Measures in Effect	none	none

[1] Model D, as described in the Billfish Detailed Report.
~ = approximate value.

SAI-Table 1. Reported sailfish landings (MT) in the Atlantic, by region, gear and country.

REV.2 (AS OF OCT. 8 - 11:00)

	1965	1966	1967	1968	1969	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
TOTAL	2919	2420	1900	2596	2112	2778	2805	2420	1638	1347	1182	1553	1950	2661	3339	2510	2064	1947	3780	3121	2925	2763	3187	2455	1991	2501	2130	2539	3296	2584
EAST ATLANTIC	1334	1242	571	1145	739	580	860	1035	717	311	227	363	894	1775	2391	1549	1070	845	2918	2105	1951	1700	2153	1621	1247	1720	1290	1567	2181	1829
-LONGLINE *	1334	1242	495	1069	658	493	748	913	571	196	83	149	96	58	38	33	87	209	247	191	135	138	93	90	169	151	35	61	393	164
CAP VERT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
CHITAIW	0	0	77	508	414	387	609	785	491	168	38	144	59	42	19	0	0	0	0	9	9	0	0	0	0	13	0	0	322	100
CUBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	158	200	115	19	55	50	22	53	61	0	0	0	0
JAPAN	1331	1237	404	548	230	95	125	89	66	19	38	4	24	11	19	33	50	38	47	63	84	71	37	57	57	63	16	42	58	49
KOREA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	1	1	7	8	14	19	19	2	0
NEI_1	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	0	11	15
ESPANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	4	7	9	0	0	47	++	++	++	0	0
USSR	3	5	14	13	14	11	14	39	14	9	7	1	13	5	**	0	37	0	0	0	0	2	5	4	4	0	0	0	0	0
-ROD & REEL	0	0	2	5	7	13	38	48	70	33	61	76	93	79	77	62	88	69	49	41	25	45	73	46	37	51	47	45	60	50
SENEGAL	0	0	2	5	7	13	38	48	70	33	61	76	93	79	77	62	88	69	49	41	25	45	73	46	37	51	47	45	60	50
-TROLLING	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	4	2	1	1	12	50	108	74	40	179	172	150
SENEGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	4	2	1	1	12	50	108	74	40	179	172	150
-OTHER & UNCL G	0	0	74	71	74	74	74	74	76	82	83	138	705	1638	2276	1454	894	563	2618	1871	1790	1516	1975	1435	933	1444	1168	1282	1556	1465
BENIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36	48	0	53	50	25	32	40	8	20	21	20	21	20
CIVOIRE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	40	40	40	67	55	62	40	71	44	44
CUBA	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	184	200	128	100
GHANA	0	0	0	0	0	0	0	0	2	8	22	11	638	1574	2246	1191	449	16	2161	1658	1485	925	1392	837	462	395	463	297	693	700
KOREA	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PORTUGAL	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	1	2	1
SENEGAL	0	0	74	71	74	74	74	74	74	74	61	113	67	64	30	263	409	499	457	120	215	526	511	491	408	967	460	693	668	600
WEST ATLANTIC	1470	920	727	862	759	1319	1127	575	581	646	568	813	758	727	731	691	630	914	747	1016	974	1063	1034	834	739	781	840	972	1115	753
-LONGLINE *	1279	715	516	644	523	1059	860	304	308	353	272	437	221	211	206	154	152	430	289	494	473	535	615	598	378	413	323	382	759	398
BRASIL	46	46	23	57	27	21	43	64	37	78	76	124	139	128	77	77	38	58	60	80	139	232	133	100	117	94	57	42	46	40
BRAS-HON	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	0	8	2
BRASTAI	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	8	205	233	23
CHITAIW	0	0	106	86	179	111	170	17	107	80	28	126	5	10	18	0	0	0	0	42	39	49	19	300	126	83	73	33	183	95
CUBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	181	28	169	130	50	171	78	55	126	0	0	0	0
JAPAN	1140	608	274	422	228	499	321	132	78	118	112	133	23	9	20	22	44	135	22	34	38	28	6	22	22	25	73	1	2	2
KOREA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37	39	21	24	5	7	38	53	53	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	0	0	0	0	0	2	19
NEI_1	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	0	31	0
TRINIDAD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	64	58	14	78	110	34	16	7	3	2	117	100
USA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	78	40	16	21	37	10	18	17
VENEZUEL	93	61	113	79	89	428	326	91	86	77	56	54	54	64	91	55	70	56	115	74	74	74	74	19	19	19	19	36	119	100

SAI-Table 1. Reported sailfish landings (MT) in the Atlantic, by region, gear and country.

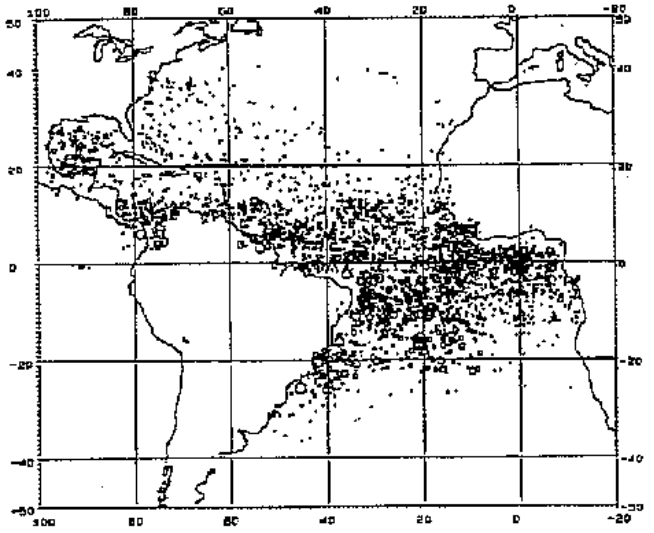
REV.2 (AS OF OCT. 8 - 11:00)

	1965	1966	1967	1968	1969	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
-ROD & REEL	191	205	211	218	236	232	239	243	245	255	258	266	339	338	350	368	336	331	312	352	228	234	237	38	31	26	32	49	41	149
BRASIL	0	0	0	0	0	0	0	0	0	0	0	0	29	28	40	57	26	22	0	37	26	35	36	27	23	19	25	33	21	28
TRINIDAD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	++	++	++	1	++	++	1	1	++	++	0	0
USA	188	194	201	207	214	220	227	233	240	248	254	261	308	308	308	308	308	308	308	308	195	195	195	8	2	1	2	6	10	121
VENEZUEL	3	11	10	11	22	12	12	10	5	7	4	5	2	2	2	3	2	1	4	7	7	3	6	3	5	5	5	10	10	0
-OTHER & UNCL G	0	0	0	0	0	28	28	28	28	38	38	110	198	178	175	169	142	153	146	170	273	294	182	198	330	342	485	541	315	206
ARUBA	0	0	0	0	0	++	++	++	++	10	10	20	20	30	30	30	30	30	30	30	30	30	23	20	16	13	9	5	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	0	161	42	34	42	0	0
BRASIL	0	0	0	0	0	0	0	0	0	0	0	62	119	90	84	87	55	53	8	4	23	25	5	10	0	15	0	0	0	34
CUBA	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	83	70	0	0
DOMINR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	50	49	46	18	40	44	44	40	31	98	50	0
GRENADA	0	0	0	**	**	**	**	**	**	**	**	**	31	37	40	31	36	27	37	66	164	211	104	114	98	218	316	310	246	151
NLDANT	0	0	0	0	0	28	28	28	28	28	28	28	28	21	21	21	21	21	21	21	10	10	10	10	10	10	10	10	15	0
TRINIDAD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	2	0	0
USA	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	0	0
VENEZUEL	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	0	0	17
STVINCE	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	2	1	4	4	4
UNCL REGION	115	258	602	589	614	879	818	810	340	390	387	377	298	159	217	270	364	188	115	0	0	0	0	0	5	0	0	0	0	2
-LONGLINE *	115	258	602	589	614	879	818	810	340	390	387	377	298	159	217	270	364	188	115	0	0	0	0	0	5	0	0	0	0	2
CHITAIW	2	34	0	0	0	0	0	0	0	0	0	0	0	0	0	49	86	140	108	0	0	0	0	0	0	0	0	0	0	0
CUBA	102	75	371	314	71	100	51	30	100	229	262	185	156	120	191	198	213	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	0	0	0	0	0	0	0
KOREA	11	149	231	275	543	779	767	745	165	139	109	151	111	32	24	23	65	48	7	0	0	0	0	0	5	0	0	0	0	0
PANAMA	0	0	0	0	0	**	**	35	75	22	16	41	31	7	2	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	0	0	0	0	0	0	0	0	0	0	0	0	0	2
-OTHER & UNCL. G	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	0	0	0

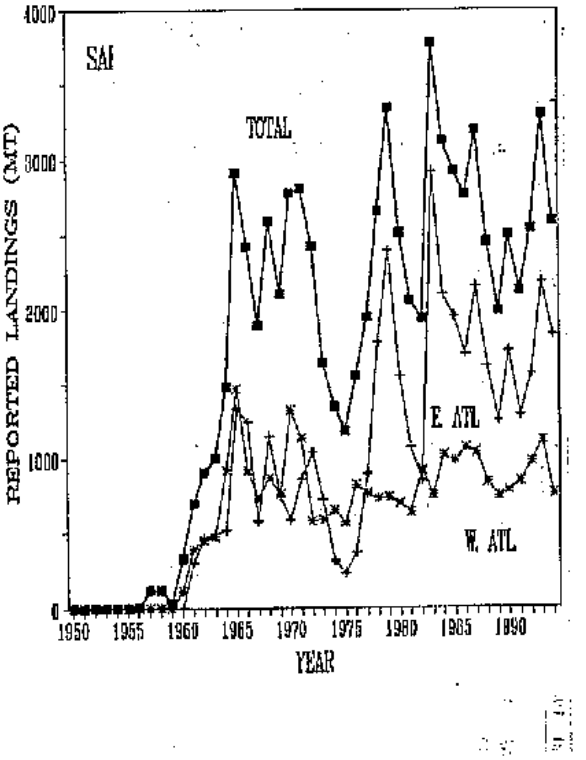
++ CATCH: < 0.5 MT

** CATCH: UNKNOWN

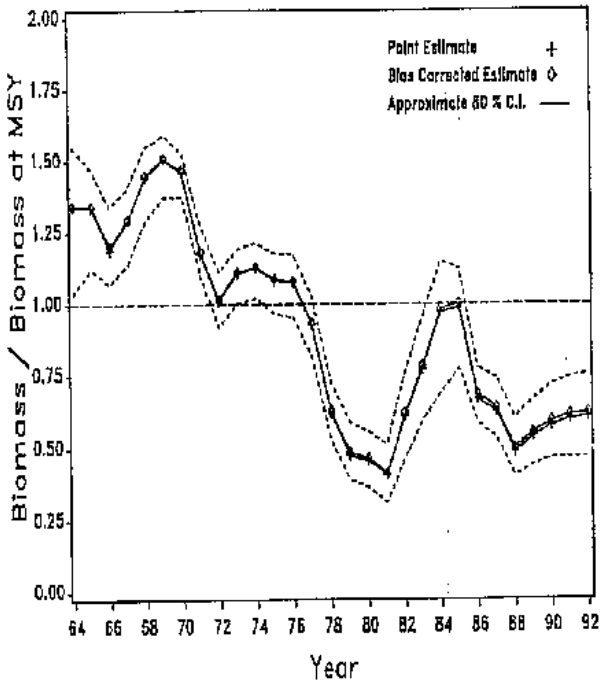
* INCLUDES SPEARFISH (T. PFL



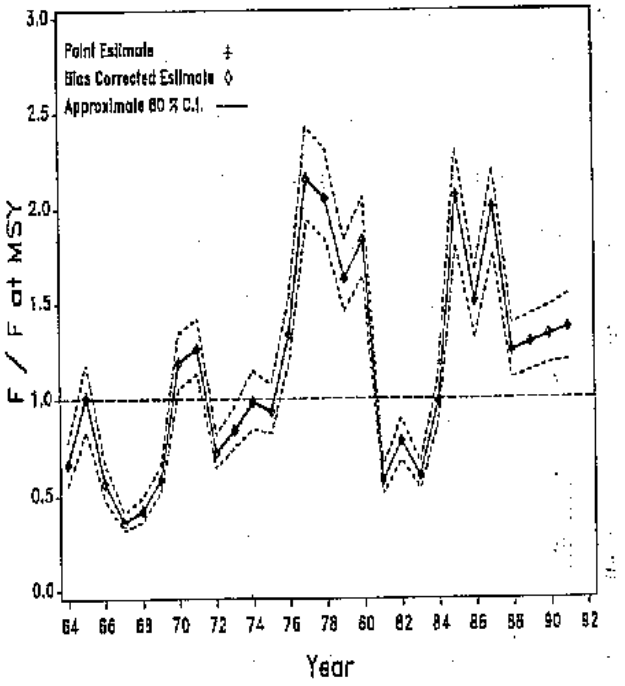
SAI-Fig. 1. Distribution of by-catch of sailfish by Japanese longline fishery in the Atlantic Ocean.



SAI-Fig. 2. Nominal landings of sailfish for total, east and west Atlantic.



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 based on 1000 trials. Annual values for the first two years are omitted due to extreme imprecision. (Model D as described in the Detailed 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 based on 1000 trials. Annual values for the first two years are omitted due to extreme imprecision. (Model D as described in the Detailed Report).

SWO - S W O R D F I S H

SWO-MED - MEDITERRANEAN SWORDFISH

SWO-MED-1. Biology

Swordfish is a cosmopolitan species found in the Atlantic Ocean and the Mediterranean Sea. Recent studies suggest that Mediterranean swordfish form a unique stock which is separated from the Atlantic.

Swordfish feed mainly in the mesopelagic 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. 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 at their third year of life at a length of about 130 cm, while males mature one year earlier.

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 16,500 MT for the past 10 years). The Mediterranean is a much smaller body of water compared to the north Atlantic.

Swordfish fishing has been carried out in the Mediterranean using harpoons 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 **(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 has declined and since 1990, it has fluctuated from about 11,000 to 14,000 MT.

Swordfish fishing is carried out all over the Mediterranean Sea. The biggest producers of swordfish in the Mediterranean Sea are Italy (57%), Greece (18%), and Spain (11%). Also, Algeria, Cyprus, Malta, Morocco, Tunisia, and Turkey have fisheries targeting swordfish in the Mediterranean. Incidental catches of swordfish are taken also 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, but large scale driftnet fisheries are mostly limited to Italy (50% of the total Italian catch). 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

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 and the average size of fish in the catch has declined about 10% since 1985. 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 or the effects of different environmental conditions in the Mediterranean. A preliminary, tuned virtual population analysis (VPA) for Mediterranean swordfish was carried out at the Second Meeting of the *Ad Hoc* GFCM/ICCAT Working Group on Stocks of Large Pelagic Fishes in the Mediterranean Sea in September, 1995. This preliminary assessment was based on estimates of sex-specific catch at age tuned to preliminary, standardized CPUE indices developed at and available to the Working Group. Point estimates from the analysis suggest more or less stable, or even increasing, trends in abundance for the time period considered (1985-1994), and increasing fishing mortalities in the late 1980's followed by a decline into 1994. The results of the analysis were highly uncertain owing to uncertainty in the biological parameters, catch, 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. Application of alternative assessment models might help to reduce this uncertainty if results are consistent between different models.

There is concern about the high catches of juvenile swordfish (those which never spawned) in the Mediterranean, the apparent scarcity of large fish in the population, and high uncertainty in estimates of annual recruitments. Yield-per-recruit analyses and spawning-biomass-per- recruit analyses indicate that at current estimated fishing mortalities (which are highly uncertain), very small gains would be made if fish less than 70 or even 100 cm could be avoided completely. The gain would be more substantial if fish less than 120 cm could be avoided completely.

SWO-MED-4. Outlook

Given the short time series of reliable data and the long history of exploitation of swordfish in the Mediterranean, it is uncertain where the Mediterranean stock is in relation to unexploited stock levels. The warning signals, combined with the results of the preliminary analytical stock assessment, suggest that it is unlikely that the Mediterranean stock of swordfish can sustain continued heavy harvest of juveniles unless there is a continued high recruitment. The odds of continued high recruitment diminish as mature fish are removed from the population.

SWO-MED-5. Effects of current regulations

There are no ICCAT regulations applied to the Mediterranean stock. Greece has been implementing a seasonal closure of longline fishing since 1989 to protect small juveniles. The EU initiated several regulations for Mediterranean swordfish in 1995, such as a minimum size limit of 120 cm LJFL, reduction of driftnet (2.5 km) and longline (60 km) effort. Since no data are yet available for 1995, it is not possible to assess the effect of those regulations on the stock. However, it should be noted that 64% of the Mediterranean catch was <120 cm LJFL in 1994.

SWO-MED-6. Management recommendations

The Committee strongly recommends substantial reduction in catches of juvenile swordfish in the Mediterranean, and no further increase in fishing effort.

MEDITERRANEAN SWORDFISH SUMMARY	
Maximum Sustainable Yield	not estimated
Current (1994) Yield	13,559 MT
Current (1994) 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}/F_{max}	~ 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.

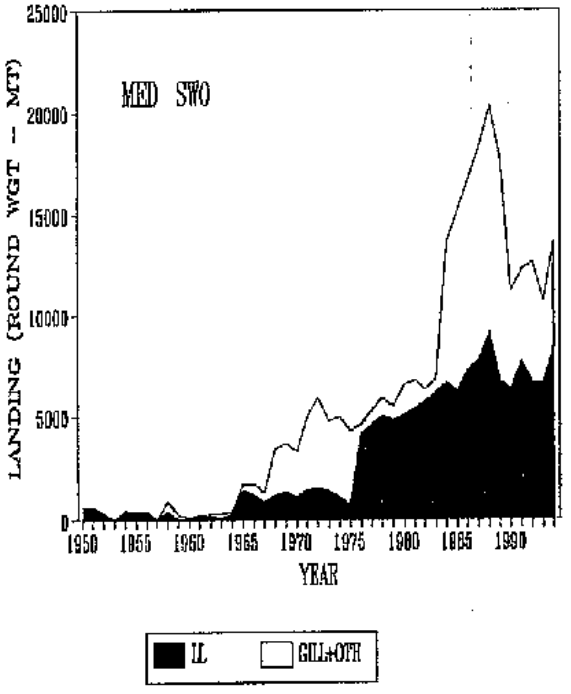
[2] Based on stock size weighted average F's for age 2 and 3 fish in 1993 from VPA analysis. Approximate 80% CI based on estimated CV(F) = .2.

~ = approximate value.

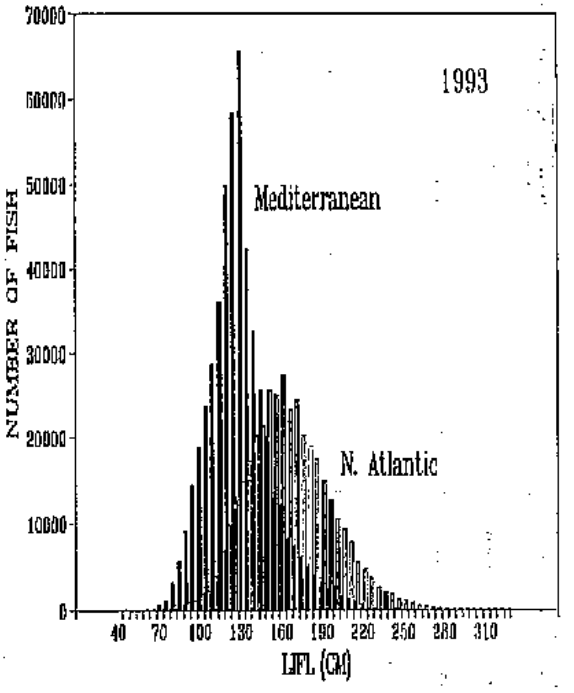
SWO-MED-Table 1. Total landings (MT) of swordfish in the Mediterranean Sea by gear and country (as of Sept. 19, 1995)

	1965	1966	1967	1968	1969	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
TOTAL MED.	1760	1752	1317	3440	3723	3341	4975	5958	4807	5034	4301	4637	5280	5958	5547	6579	6813	6343	6896	13666	15228	16718	18288	20339	17761	11259	12290	12703	10736	13559
LL	1423	1192	869	1196	1350	1114	1426	1529	1388	1089	712	4138	4606	5046	4877	5115	5411	5751	6239	6640	6260	7297	7781	9163	6784	6336	7732	6683	6657	8468
ALGERIE	0	0	0	0	0	**	++	++	100	196	500	368	370	320	521	650	760	870	877	884	890	847	1820	2621	590	173	173	6	173	*185*
CYPRUS	0	0	0	0	0	0	0	++	++	++	5	59	95	82	98	72	78	103	28	63	71	154	84	121	139	173	162	73	116	159
GREECE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	91	773	772	1081	1036	1714	1303	1008	1120	1344	1904	1456	1568	*2520*
ITALY	0	0	0	0	0	0	0	0	0	0	0	3435	3330	3750	3455	3642	3362	2583	2660	2759	2493	2622	2831	2989	2989	*2245*	*3484*	*3518*	*3260*	*3844*
JAPAN	0	0	0	0	0	0	0	0	0	0	0	1	0	2	3	1	0	5	6	19	14	7	3	4	1	2	1	2	4	*3*
MALTA	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	119	71	76	42
MAROC	223	192	169	196	250	214	326	229	183	193	118	186	144	172	0	++	++	0	43	39	38	92	40	62	97	43	24	34	22	85
ESPANA	1200	1000	700	1000	1100	900	1100	1300	1105	700	89	89	667	720	800	750	1120	900	1321	1243	1219	1337	1134	1760	1250	1438	1132	790	1293	1402
TUNISIE																													145	228
NEI_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	517	532	552	499	524	566	598	598	918	733	733	0	
OTH&UNCL	337	560	448	2244	2373	2227	3549	4429	3419	3945	3589	499	674	912	670	1464	1402	592	657	7026	8968	9421	10507	11176	10977	4923	4558	6020	4079	5091
ALGERIE	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	539	389	389	389	*415*
FRANCE	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	++	++	++	
ITALY	**	**	**	1568	2240	2016	3248	4144	3136	3730	3362	312	417	756	475	501	461	356	366	6601	8370	8791	9494	10021	10020	*3070*	*2836*	*4077*	*3070*	*3921*
LIBYA	224	224	336	560	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	
MALTA	++	++	++	++	++	112	224	224	224	192	214	175	223	136	151	222	192	177	59	94	108	97	131	207	121	122	0	0	0	
MAROC	1	0	1	1	0	0	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	246	454	649	414	*648*
ESPANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	8	0	0	2	87	85	39	32	65	101
TUNISIE	0	0	0	0	0	++	++	++	++	5	3	5	0	0	0	0	7	19	15	15	61	64	63	80	159	176	181	178	5	6
TURKEY	112	336	111	115	133	99	76	60	59	15	10	7	34	20	44	13	70	40	216	95	190	226	557	589	209	243	100	136	136	*0*
NEI_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	728	672	0	0	219	231	243	262	277	381	442	559	559	0	

++ CATCH: < 05 MT
** CATCH: UNKNOWN



SWO-MED-Fig. 1. Accumulative catches of swordfish in the Mediterranean Sea by gear.



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

SWO-ATL - ATLANTIC SWORDFISH

SWO-ATL-1. Biology

Swordfish are found throughout the Atlantic and Mediterranean, and range from Canada to Argentina on the western side, and from Norway to South Africa on the eastern side. The stock hypotheses for assessment purposes is a north Atlantic and a south Atlantic stock, divided at 5°N, and a Mediterranean stock (**SWO-Figure 1**).

Swordfish feed on a wide variety of prey including groundfish, pelagics, deep-water fish and invertebrates. They are found throughout the water column but are typically caught on longline at night during their nighttime migration to feed in surface waters.

Swordfish spawn in tropical and subtropical waters throughout the year. They are found in the colder northern waters during summer. Young swordfish grow very rapidly, reaching about 140 cm LJFL (lower jaw-fork length) by age 3, but grow more slowly thereafter. Females grow faster than males and reach a larger maximum size. Swordfish are difficult to age, but 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 1950's or early 1960's, and harpoon fisheries have existed since the late 1800's. The Japanese tuna longline fishery starting in 1956 has operated throughout the Atlantic and catches swordfish as by-catch. There are other directed swordfish fisheries (e.g, Portugal, Venezuela, and Uruguay) and by-catch fisheries which take swordfish (e.g., Taiwan, Korea, Brazil, Trinidad and Tobago).

North Atlantic catch and effort increased continuously after 1978 when USA mercury standards were revised (**SWO-Figure 2**). Since the historical high of 20,224 MT in 1987, the landings declined 23% to 15,642 MT in 1994. These decreases have been partially attributed to various implementations of minimum size and quota regulations, and a shifting of effort south of 5°N or to other oceans. Revisions to the landed catches reported in 1994 by Spain, Portugal, and the USA have resulted in an increase in the historical landed catches reported to ICCAT for 1982-92. Additional revisions to the 1993 reported landings were incorporated in 1995, and resulted in little change.

South Atlantic catches were low until the early 1980's (**SWO-Figure 2**). Since 1988, reported landings have exceeded 10,000 MT, reaching one peak in 1989 (16,610 MT), and a second peak, the historic high, in 1994 (17,174 MT). Since 1988, the Spanish longline fishery has expanded its fishing grounds as far south as 40°S.

SWO-ATL-3. State of stocks

In 1994, 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 and CPUE data through 1993 (SCRS/94/SWO). In 1995, the stock production model (but not VPA) was rerun using revised catch data through 1993 (**SWO-Table 1**). Results presented here are based on the most recent update for each type of assessment. The 1994 base case assessments and 1995 revision all indicate that the North Atlantic swordfish resource has continued to decline despite reductions in total reported landings from peak values in 1987. Catch reductions have not resulted in reductions in the 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 12,500 MT (with estimates ranging from 5,200 to 16,900 MT). North Atlantic swordfish landings have consistently exceeded 12,500 MT since 1981; preliminary estimates of landings in 1994 were about 15,700 MT (**SWO-Figure 3**).

The biomass at the beginning of 1994 was estimated to be 67% (range: 48 to 108%) of the biomass needed to produce MSY (**SWO-Figure 4**). The 1993 fishing mortality rate was estimated to be 1.88 times the fishing mortality rate at MSY (range: 1.04 to 4.83, **SWO-Figure 5**). The surplus production for 1994 was estimated to be about 11,500 MT. Preliminary landings in 1994 and anticipated landings in 1995 and 1996 are all 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 1994 were consistent with the non-equilibrium stock production model results, particularly in terms of the trends in population trajectories. The VPA point estimates for age 1 gradually increased in the early 1980's, shifting to a higher level in 1985 and peaking in 1989. Subsequently, recruitment (age 1) shifted to a lower level between 1990 and 1993. However, estimates of recent recruitment are less precise. The age 2 abundance trend mimics the age 1 trend with the appropriate one year lag. 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 half from 1983 to 1993. The decline from 1978 to 1993 was also one half; however, there is less certainty about the trends from 1978 to 1983. Estimated fishing mortality rates generally declined from 1988 to 1990 but appear to have increased in the most recent years. Current fishing mortality rate estimates 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. Fish stocks are commonly considered at risk of recruitment overfishing when adult biomass per recruit falls below 20 percent of the maximum; the north Atlantic swordfish resource is currently about 6 percent of the maximum.

A quantitative assessment for the south or total Atlantic stock hypotheses could not be conducted, due to data limitations. However, the Committee is seriously concerned about the stock status in the south Atlantic and total Atlantic based on the pattern of high catches and declining CPUE trends in both the north and in several south Atlantic CPUE indices. If a total Atlantic stock was assumed, it is unlikely that the view of the status of the stock would be appreciably improved from that of the north 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 hypotheses.

SWO-ATL-4. Outlook

Projections based upon non-equilibrium production models and VPA's were conducted in order to evaluate the effects of possible management scenarios. Revisions to catch histories considered by 1995 SCRS did not appreciably alter the assessment results or the projections conducted by 1994 SCRS. VPA- and production model-based projections conducted by the 1994 SCRS and production model projections conducted by the 1995 SCRS 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 1994 catch (estimated at 15,690 MT) and anticipated 1995 and 1996 catch levels (15,300 and 13,900 MT, respectively) are not sustainable. Even if future catches were maintained at the MSY level, the stock would be expected to exhibit further decline, since the stock is too low to sustain MSY. Fishing at quota levels agreed to at the 1994 Commission meeting is projected to result in further stock declines since these levels are considerably above projected replacement yield levels. If catches in 1995 were limited to 15,300 MT, the production model projected equilibrium replacement yield for 1996 would be about 10,000 MT. If 1996 catches were limited to 13,900 MT, the production model projected equilibrium replacement yield in 1997 would be even lower.

The Committee noted that total swordfish biomass corresponding to MSY levels 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.

SWO-ATL-5. Effects of current regulations

The regulatory recommendations adopted in 1990 (reduction of fishing mortality in the north Atlantic by 15%, minimum size of 125 cm LJFL, limiting fishing mortality in the total Atlantic) combined with the 1995-1996 country-specific quotas appear not to be sufficient to prevent further stock decline in the north Atlantic.

The Committee emphasized the need for appropriate management measures throughout the Atlantic, to account for the uncertainty associated with the swordfish stock hypotheses. It was noted that although the south Atlantic catches have been limited to 1993 or 1994 levels (whichever is higher), the 1994 catches are the highest on record.

SWO-ATL-6. Management recommendations

The Committee recommends that the Commission, if it desires to rebuild the North Atlantic swordfish stock, must reduce both fishing mortality rates and catch considerably in the immediate future. 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 occurred at the overall level required to allow the stock to increase. The data and analyses show the continued decline of the north Atlantic swordfish stock even under the 1995/96 quota scenarios. It is important to consider that delays in achieving sufficient overall reductions in fishing mortality and catch are likely to result in the need for more severe reductions in the future to achieve recovery.

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 level of harvest should not exceed replacement yield (about 10,000 MT in 1996). In order to allow for increase in stock biomass, the level of harvest needs to be below replacement yield for some time into the future. Projections indicate a range of management strategies that could be implemented to allow stock recovery, all of which indicate the need for substantial reductions in harvest from current levels. More specific recommendations could be provided if the Commission provides the SCRS with more precise statements of its objectives, including the time frame in which they are to be achieved and with what degree of certainty they are to be achieved.

The SCRS noted the uncertainty in assessment of south Atlantic and total Atlantic stock scenarios, but remains concerned with their status. Therefore, the SCRS recommended that effective management measures be implemented throughout the Atlantic and that the catch in the south Atlantic not be allowed to increase beyond the levels referred to as "recent" by Panel 4 in 1992 (the 1992 reported catch was 12,210 MT whereas the 1994 reported catch was 17,174 MT).

ATLANTIC SWORDFISH SUMMARY

	North Atlantic	*South Atlantic*
Maximum Sustainable Yield (MSY)[1]	12,500 MT (5,200-16,900 MT)[3]	not estimated
Current (1994) Yield (preliminary)	15,642 MT	17,174 MT
Current (1994) Replacement Yield[1]	11,500 MT (5,000-16,500 MT)	not estimated
Relative Biomass (B_{1994}/B_{MSY})[1]	0.67 (0.48-1.08)	not estimated[4]
Relative Fishing Mortality:		
F_{1993}/F_{MSY}[1]	1.88 (1.04-4.83)	not estimated[4]
F_{1993}/F_{max}[2]	1.69	not estimated[4]
$F_{1993}/F_{0.1}$[2]	3.09	not estimated[4]
Management Measures in Effect	25 kg minimum size; country-specific quotas	Limit catch to 1993 or 1994 levels

[1] Production model results based on 1995 revisions to catch data through 1993 (Table 1 herein).
[2] VPA results based on catch data through 1993 as reported in 1994 (Table 1 in SCRS/94/SWO).
[3] 80% confidence intervals are shown.
[4] High catches and declining CPUE trends, suggest a situation not unlike the North.

SWO-Table 1. Reported total landings (MT) of swordfish in the Atlantic by region, gear and country.

REV. 5 (As of Oct. 6, 1995 - 9:00)

	1965	1966	1967	1968	1969	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	
TOTAL (incl. Med)	12990	13020	11940	14912	17151	17896	12159	13079	13631	13903	15923	13864	14331	20377	20402	25267	21804	25825	26702	35540	39104	41021	43730	51693	51670	43696	38318	40289	43131	46007	
NORTH ATLANTI	8652	9338	9084	9137	9138	9425	5198	4727	6001	6301	8776	6587	6352	11797	11859	13527	11138	13155	14464	12753	14348	18450	20224	19614	17298	15871	15018	15370	16982	15642	
-LONGLINE	7759	8492	8656	8950	8938	9127	5140	4430	5446	5078	7015	5125	5401	11085	11099	12800	10507	12959	13960	12626	14205	18233	20010	19028	15399	14122	14368	14368	15927	14954	
CANADA	4155	3731	4534	4342	4149	4800	0	0	0	2	21	15	113	2314	2970	1794	542	542	960	465	550	973	876	874	1097	819	953	1487	2206	1654	
CHITAIW	1	37	76	115	218	234	226	129	243	204	209	362	189	126	260	103	140	200	209	126	117	121	40	18	13	207	574	132	108	372	
CUBA	171	175	336	224	97	134	160	75	248	572	280	283	398	281	128	278	227	254	410	206	162	636	910	832	87	47	0	0	0	0	
JAPAN	1025	658	280	262	130	298	914	784	518	1178	2462	1149	793	946	542	1167	1315	1755	537	665	921	807	413	621	1572	1051	992	1064	917	978	
KOREA	2	27	46	24	22	40	159	155	374	152	172	335	541	634	303	284	136	198	53	32	160	68	60	30	320	51	3	3	14	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	0	0	0	0	0	6	14	
MAROC	14	12	11	13	16	14	21	15	10	12	15	12	6	11	208	136	124	91	125	79	137	178	192	195	219	28	27	37	54	39	
NORWAY	++	300	300	200	600	400	200	**	**	**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PANAMA	0	0	0	0	0	**	**	7	171	24	25	91	22	76	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PORTUGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	15	448	984	612	292	463	757	497	1950	1573	
ESPANA	1433	2999	2690	3551	3502	3160	3384	3210	3833	2893	3747	2816	3309	3611	2582	3810	4013	4554	7100	6315	7431	9712	11134	9600	5696	5736	6506	6351	6392	6027	
TRINIDAD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	26	6	45	151	42	79	66	71	562	125	125	*
USA****	945	534	340	180	93	0	0	0	0	0	0	0	0	3020	3888	5015	3986	5271	4510	4666	4642	5143	5164	6020	5855	4967	4399	4124	4044	3761	
USSR	5	8	22	21	11	24	24	28	26	17	32	19	15	20	10	21	0	69	0	16	13	18	0	0	0	0	0	0	0	0	
VENEZUEL	8	11	21	18	100	23	52	27	23	24	52	43	15	46	182	192	24	25	35	23	51	84	86	108	57	158	86	111	111	411	
NEI_1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	76	112	529	**	**	0	0	
-OTHER & UNCL	893	846	428	187	200	298	58	297	555	1223	1761	1462	951	712	760	727	631	196	504	127	143	217	214	586	1899	1749	650	1002	1055	688	
CANADA	519	702	260	51	108	0	0	0	0	0	0	0	0	0	0	91	19	12	128	34	35	86	78	24	150	92	73	60	28	22	
CHITAIW	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	1	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	0	0	0	23	27	16	0	
FRANCE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	4	0	0	1	4	4	0	0	0	75	75	75	95	46	
GRENADA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	56	5	1	2	3	13	13	*
IRELAND	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ITALY	0	0	0	0	0	0	0	0	0	0	0	0	0	8	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	5	38	34	53	++	24	16	30	19	35	3	0	7	0	0	
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	0	0	0	0	0	
MEXICO	++	++	++	++	++	0	0	2	4	3	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MAROC	86	49	23	30	4	3	12	28	8	3	0	0	1	0	0	0	0	0	4	2	0	3	5	1	3	175	165	315	406	296	
POLAND	0	0	0	0	0	0	++	0	100	0	0	0	0	6	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PORTUGAL	6	15	11	12	11	8	11	21	37	92	58	32	38	17	29	15	13	11	9	7	7	20	10	5	8	12	16	45	11	26	
ROUMANIE	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ESPANA	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	1	0	0	0	10	7	1	199	952	650	127	321	206	171	
STLUCIA	0	0	0	0	0	++	++	++	++	++	++	++	++	++	++	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
USA	282	80	134	94	77	287	35	246	406	1125	1700	1429	912	664	731	610	544	139	310	83	63	67	83	151	556	552	126	111	146	113	
USSR	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	4	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	12	0	0	0	0	14	3	131	190	185	43	35	111	0	
STVINCE	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	3	0	3	23	++	

SWO-Table 1. Reported total landings (MT) of swordfish in the Atlantic by region, gear and country.

REV. 5 (As of Oct. 6, 1995 - 9:00)

	1965	1966	1967	1968	1969	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	
SOUTH ATLANTI	2578	1930	1539	2335	4290	5130	1986	2394	2823	2568	2846	2640	2699	2622	2996	5161	3853	6327	5342	9121	9528	5853	5218	11740	16610	16357	12535	12210	15413	17174	
-LONGLINE	2578	1930	1539	2235	4090	5130	1984	2394	2823	2568	2846	2640	2684	2605	2967	5017	3816	6224	5247	8879	8805	4910	4634	11190	16078	15847	11955	11590	14965	16896	
ARGENTIN	400	200	79	259	500	400	63	100	48	10	10	111	132	4	0	++	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BRASIL	125	125	62	100	181	162	154	121	161	465	514	365	384	367	520	1579	654	1018	781	467	569	761	956	1159	989	1499	815	636	675	1084	
BRAS-HON	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	17	0	70	257	
BRASTAI	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	527	1200	1014	217	
CHITAIW	1	73	128	375	637	985	599	621	849	617	719	573	519	481	994	540	406	400	201	153	215	166	260	614	469	689	837	1271	641	2210	***
CUBA	164	122	559	410	170	148	74	66	221	509	248	317	302	319	272	316	147	432	818	1161	1301	95	173	159	830	448	0	0	0	0	
JAPAN	1845	1300	474	859	2143	2877	662	1023	480	191	805	105	514	503	782	2029	2170	3287	1908	4395	4613	2913	1877	3426	4019	6254	3696	2475	5184	4790	
JP-SH-OB	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	0	0	56	
KOREA	4	54	79	77	370	382	256	249	602	563	279	812	699	699	303	399	311	486	409	625	917	369	666	1012	776	50	147	147	146	180	
PANAMA	0	0	0	0	0	**	**	12	274	90	40	219	28	83	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAFRICA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	3	3	0	0	0	0	0	0	0	
ESPANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	66	0	4393	7725	6166	5760	5651	6975	7937	
URUGUAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	92	575	1084	1927	1125	537	699	427	414	302	156	210	260	165	
USSR	39	56	158	155	89	176	176	202	188	123	231	138	106	149	70	154	36	26	46	146	60	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	0	0	0	0	0	0	856	439	0	0	0	0	
-OTHER & UNCL	0	0	0	100	200	0	2	0	0	0	0	0	15	17	29	144	37	103	95	242	723	943	584	550	532	510	580	620	448	278	
ANGOLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26	228	815	84	84	84	++	++	0	0	0	
ARGENTIN	0	0	0	0	0	0	0	0	0	0	0	++	0	0	0	0	0	20	0	0	361	31	351	198	175	230	88	88	14	14	*
BENIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	24	0	86	90	39	13	19	26	28	28	26	28	28	*
BRASIL	0	0	0	0	0	0	0	0	0	0	0	0	12	5	1	3	1	1	0	1	++	1	0	0	0	0	0	0	0	0	
BULGARIA	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHITAIW	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	4	0	0	0	0	
CIVOIRE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	10	10	10	10	10	10	10	7	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	0	0	0	209	246	159	0	
GHANA	**	**	**	100	200	0	0	0	0	0	0	0	0	0	0	110	5	55	5	15	25	13	123	235	235	235	235	235	235	235	*
JAPAN	0	0	0	0	0	0	2	0	0	0	0	0	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	0	0	0	0	0	0	0	0	0	**	**	83	69	0	0	0	0	0	0	0	3	0	0	
PORTUGAL	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	1	0	++	
SAFRICA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	31	9	3	7	23	3	2	2	4	++	0	5	9	4	1	
TOGO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	32	1	++	2	3	5	5	8	0	
USSR	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	4	0	0	12	0	0	0	0	0	0	0	0	0	0	

++ CATCH: < 0.5 MT

* Catch of the previous years carried over.

** CATCH: UNKNOWN

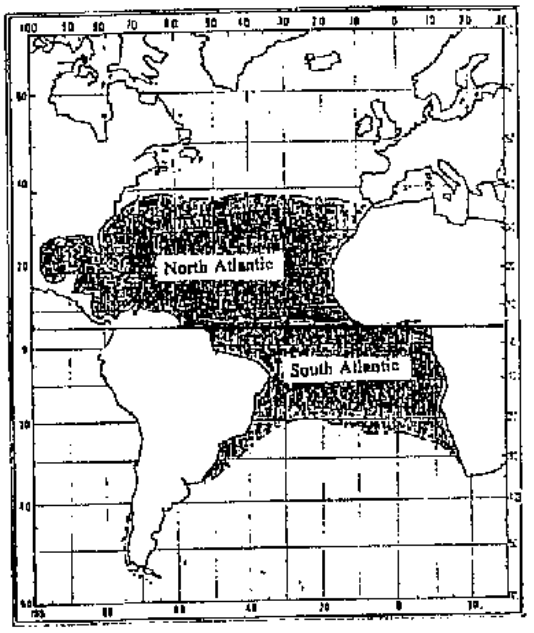
*** 1994 landing may include catches of Indian Ocean.

**** U.S. LL includes longline discards.

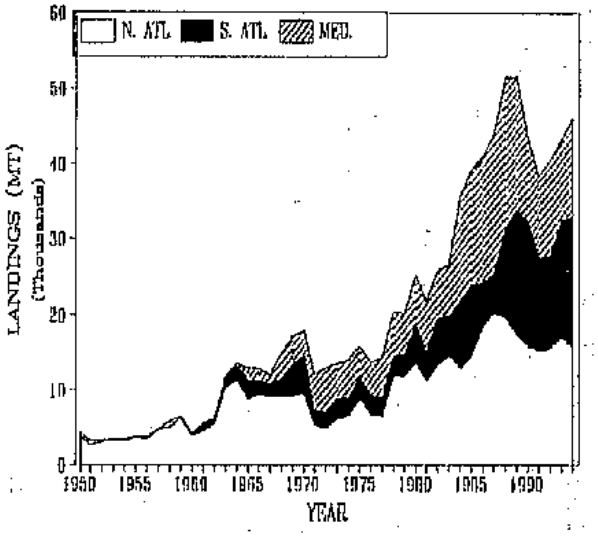
NEI_1: Nowhere else included - 1. Portuguese flag vessels unloaded in Spanish ports.

NEI_2: Nowhere else included - 2. Unreported catches estimated based on U.S. import statistics.

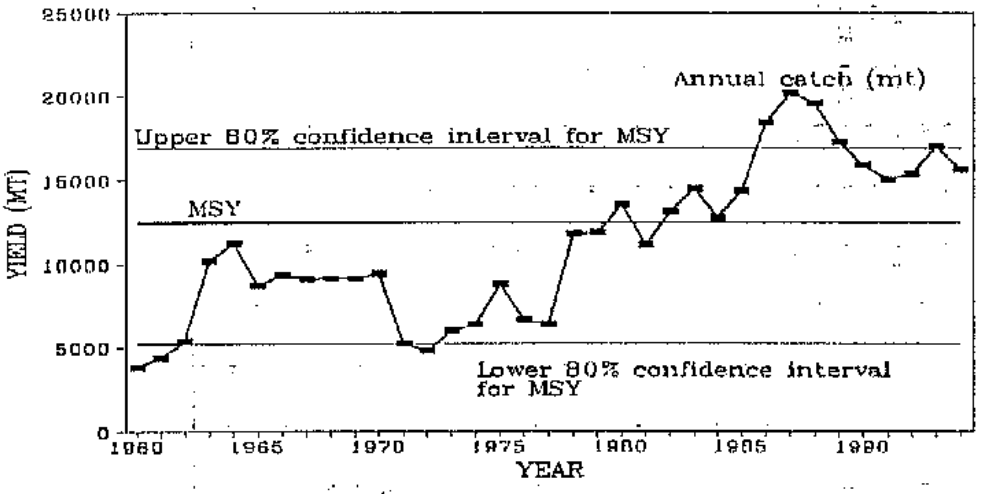
NEI_3: Nowhere else included - 3. Estimated under-reporting in national statistics.



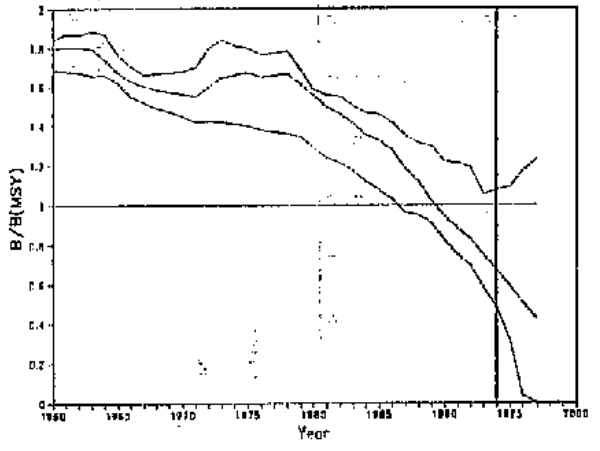
SWO-Fig. 1. Distribution and stock structure of swordfish in the Atlantic.



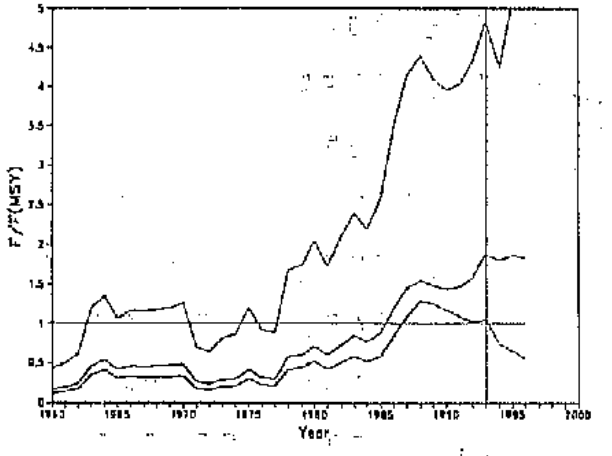
SWO-Fig. 2. Cumulative catches of swordfish (MT) for the Atlantic and Mediterranean, from 1950 to 1994.



SWO-Fig. 3. North Atlantic swordfish yield from 1960-1994, in relation to MSY (±80% confidence intervals).



SWO-Fig. 4. Relative biomass (B/B_{MSY}) estimates, with approximate 80% confidence intervals, from the north Atlantic swordfish base case production model analysis. Reference line is 1.0. Vertical line indicates split between the historical and projected periods.



SWO-Fig. 5. Relative fishing mortality (F/F_{MSY}) estimates, with approximate 80% confidence intervals, from the north Atlantic swordfish base case production model analysis. Reference line is 1.0. Vertical line indicates split between the historical and projected periods.

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 of south of Java, Indonesia and off northwest of Australia. Juveniles migrate southward along the Australian west coast and stay in the coastal waters of southwest, south, and southeast off Australia. As fish grow, they extend their distribution to cover circumpolar area throughout the Pacific, Indian and Atlantic Oceans.

Southern bluefin tuna are considered to 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, the recent analysis revealed that a significant number of fish bigger than 160 cm were older than age 25. The maximum age obtained from otoliths was age 45. This led to an examination of applying age-specific natural mortality, high for young fish and low for old fish, for the stock assessment, although a constant mortality of 0.2 was applied to the previous analyses. The possible existence of a stock not available to the fisheries was suggested as one of the other explanations for the occurrence of a large number of old fish.

Preliminary results from recaptured archival tags suggest that fish move in a much wider range than previously considered. 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 the course of 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 the surface fishery peaked at 21,500 MT in 1982. New Zealand, Taiwan and Indonesia have also exploited southern bluefin tuna and Korea started a fishery since 1993.

The catches of Australia, Japan and New Zealand have been controlled by 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 steadily increased and remained at a level of about 2,200 MT since 1991. The catches by these nations are not regulated or monitored adequately.

The Atlantic catch has varied widely between 400 and 6,200 MT since 1978, reflecting the shifts of longline effort between the Atlantic and Indian Oceans. The fishing grounds in the Atlantic are located off the southern tip of South Africa.

SBF-3. State of stocks

The first Scientific Committee of the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) was held in Shimizu, Japan, from July 10 to 19, 1995, to examine the current stock status of southern bluefin tuna.

The CPUE for the parental stock continued to decline through 1993, while partial data for 1994 showed a slight increase relative to 1993 (**SBF-Figure 2b**). The standardized CPUE for juveniles exhibited a decline through the 1970s to the mid- to late 1980s, depending on the age classes, followed by an increase after that (**SBF-Figure 2a**). The first sign of a substantial increase of CPUE of age 4 fish was observed in the mid-1980s, which could be followed sequentially through older age groups.

The Virtual Population Analysis (VPA) indicated trends similar to stock status as did the CPUE. The parental biomass continued to decline through 1993 and showed a slight increase in 1994-1995 in most cases. The sequential rebuilding of especially young age-classes was clearly notified, but the extent of recovery varied among VPAs. A significant discrepancy in the estimates of recent recruitment trends (1988-1990) was noted according to the VPAs conducted.

In summary, the current parental biomass of southern bluefin tuna remains at a historical low level and is estimated to be 26-50 % of the 1980 level, which is used as a reference level for stock rebuilding. Sequential rebuilding, which started in the mid-1980s in age 4, now reaches to age 6 to age 9 according to the VPAs. However, it is still unclear whether the observed sequential rebuilding is enough to rebuild the parental biomass to the 1980 level in the near future.

SBF-4. Outlook

Future projections were performed to examine the medium to long-term consequences of the current global catch on the parental biomass as well as the probability to recover to the 1980 level, based on the various VPAs conducted. Results showed a wide variety of views ranging from 100% recovery to the 1980 parental biomass level before the year 2010, to 3-15 % of collapse of the stock within the next 10 years, reflecting different interpretation of the extent of the observed recovery and recent recruitment. This discrepancy in interpretations could not be solved and no single view on the outlook of the stock could be proposed.

SBF-5. Effects of current regulations

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

The sequential rebuilding observed in young age-classes was considered to be a combined results of the benefit of the substantial reduction in fishing mortality, especially for small fish since 1988, and relatively good recruitment in the latter half of the 1980s. This sequential rebuilding could reach to age 9 fish in 1994 and could start contributing to the recovery of the parental biomass.

The catch quota and high catch rate realized in recent years caused a substantial contraction of the fishing season and area of the Japanese longline operations. This resulted in an increase in the uncertainties in relation to CPUE interpretations.

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 Commission for the Conservation of Southern Bluefin Tuna (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 to 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 (MSY)	not estimated
Current (1994-1995) Yield	14,450 MT (preliminary)
Relative Biomass	
SSB_{1995}/SSB_{1980}	0.27-0.50 (base case only)
Management Measures in Effect	global quota at 11,450 MT

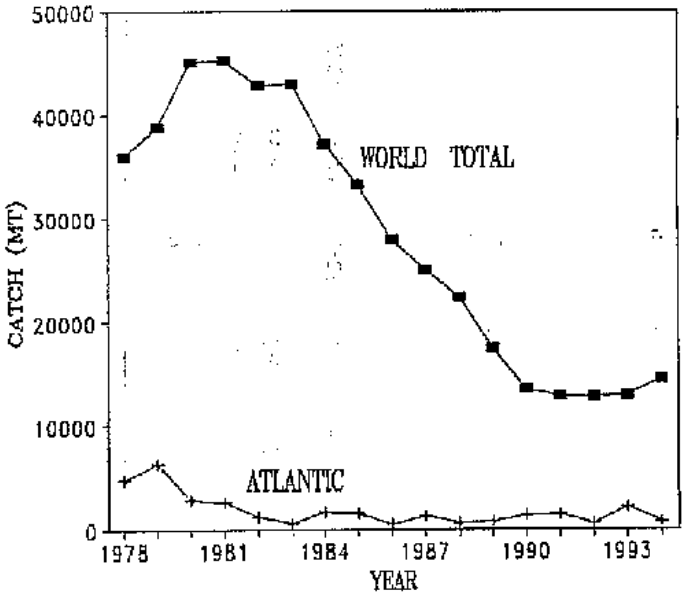
SBF-Table 1. Atlantic and world southern bluefin catch (MT) by gear, area and country.

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994 *
ATLANTIC TOTAL	4677	6203	2823	2569	1138	522	1636	1493	426	1193	613	699	1257	1344	525	2095	740
-CATCH BY GEAR																	
Longline	4677	6203	2810	2563	1138	522	1636	1493	426	1189	610	694	1257	1344	525	2095	740
Baitboat	0	0	13	6	0	0	0	0	0	0	0	1	0	0	0	0	0
Sport	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	4	2	5	0	0	0	0	0
-CATCH BY COUNTRY																	
China-Taiwan	26	11	22	57	3	17	0	25	37	69	62	69	55	13	++	407	238
Japan	4651	6192	2788	2506	1135	505	1636	1468	389	1120	548	625	1202	1331	525	1688	502
South Africa	0	0	13	6	0	0	0	0	0	0	1	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	4	2	5	0	0	0	0	0
World Catches (all oceans)	35848	38673	45054	45191	42764	42838	37089	33199	27875	25033	22402	17368	13483	12833	12736	12851	14450
Japan (Longline)	23632	27828	33653	27981	20789	24881	23328	20396	15182	13964	11422	9222	7056	6774	6937	6965	
Australia (Surface, Longline)	12190	10783	11195	16843	21501	17695	13411	12589	12531	10821	10591	6118	4719	4162	4095	4715	
New Zealand (Longline, etc.)			130	173	305	132	93	94	82	59	93	424	480	129	244	141	
Other (Longline, etc.)	26	62	76	194	169	130	257	120	80	189	296	1604	1228	1768	1460	1030	

* Preliminary

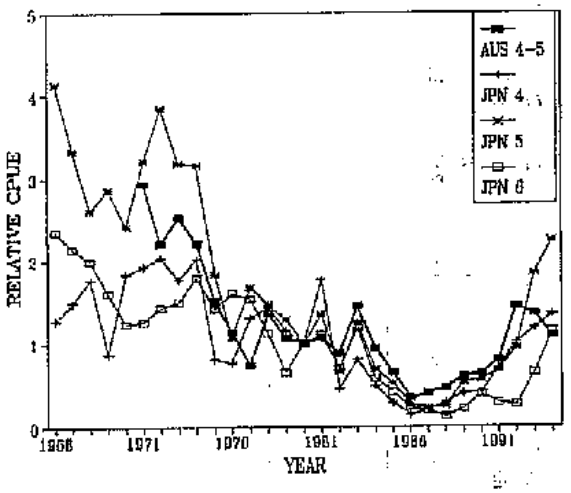
++ Catch < 0.5 MT

Source for "world" section: Report of the Thirteenth Meeting of Australian, Japanese and New Zealand Scientists on Southern Bluefin Tuna (Wellington, New Zealand - April, 1994).

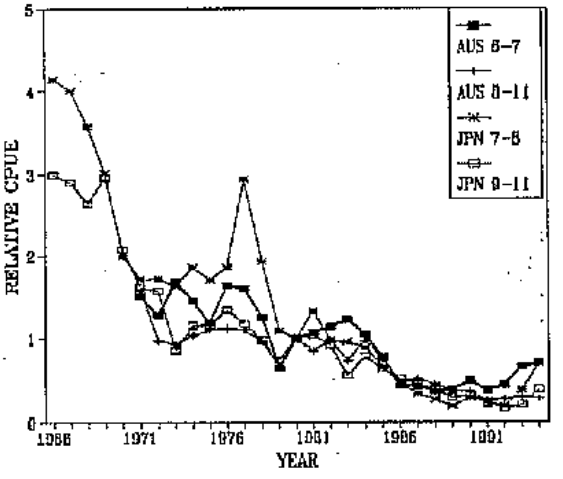


SBF-Fig. 1. Reported landings (MT) of southern bluefin tuna in the Atlantic.

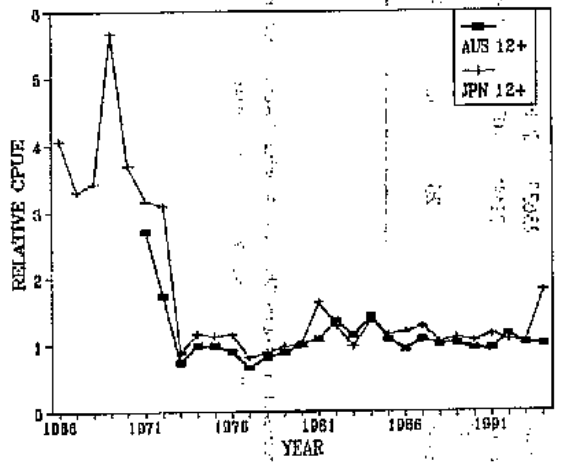
(a) Juvenile fish



(b) Young spawners



(c) Plus age groups



SBF-Fig 2. Standardized CPUE used for base case of Australian and Japanese VPA for a) young fish (ages 4-6), b) young portion of parental stock (ages 6-11), and c) age 12 plus group. All indices were standardized relative to 1980 level.

SMT - SMALL TUNAS

SMT-1. Biology

The biology of small tunas is not well known and scientific studies are rarely undertaken. This is due to the low economic importance generally accorded to many of these species and to difficulties in sampling the landings of artisanal fisheries, the principal fisheries exploiting these species. Some exceptions include some Spanish and king mackerel stocks, such as those found in U.S. and Brazilian waters. The large, industrialized fleets often discard these catches at sea and rarely record in logbooks the amount caught.

These species are widely distributed in tropical and subtropical waters in the Atlantic, Mediterranean and Black Seas. They are often found forming large schools together with other small size tunas or tuna-like species in inshore and offshore waters. They have a very varied diet with a preference for some small pelagics (clupeids, mullets, carangids and ammodytids), crustaceans, mollusks and cephalopods. The reproduction period varies with species and areas and spawning takes place generally near the coast, when waters are warm.

In the eastern tropical Atlantic, the size-at-first maturity is about 42 cm for *E. alletteratus*, 30 cm for *Auxis sp.*, 38 cm for *S. sarda* and 45 cm for *Scomberomorus sp.* The growth rate currently estimated for these species is extremely rapid during the first two or three years, and then growth slows when these species reach size-at-first maturity.

SMT-2. Description of fisheries

Small tunas are exploited mainly by coastal and often by artisanal fisheries, although substantial catches are also made either as target species or as by-catch by purse seiners and mid-water trawlers (i.e., pelagic fisheries in West Africa-Mauritania). Tropical purse seiners operating around artificial flotsam (fish aggregating devices) since 1991, may have led to an increase in fishing mortality on tropical small tuna species.

Over 10 species make up the small tunas category, but only five of these species accounted for about 70% of the total catch weight each year. These five species are: Atlantic bonito *(Sarda sarda)*, Atlantic black skipjack *(Euthynnus alletteratus)*, frigate tuna *(Auxis thazard)*, spotted Spanish mackerel *(Scomberomorus maculatus)*, and king mackerel *(Scomberomorus cavalla)* **(SMT-Figure 2)**.

The historical landings of small tunas are given in **SMT-Figures 1** and **2**. The reported total landings of all species combined increased from about 71,000 MT in 1965 to over 115,000 MT in 1969 **(SMT-Figure 1)**. Reported landings remained stable between 1970 and 1979 at about 85,000 MT, increased to approximately 142,000 MT in 1982, followed by a steady decline to about 98,000 MT in 1986, and a subsequent increase to about 141,000 MT in 1988. Reported landings for the 1989-1991 period have remained relatively stable at about a mean value of 130,000 MT **(SMT-Figure 1)**. The catch then decreased to about 100,000 MT in 1993. A preliminary 1994 estimate of total landings of small tunas amounted to 114,000 MT **(SMT-Table 1)**.

The Committee noted the relative importance of small tuna fisheries in the Mediterranean Sea, which account for about 26% of total reported catches of tuna and tuna-like species for the last five years. However, the Committee also noted that uncertainties remain regarding the accuracy of reported landings in all areas, including the Mediterranean, and the general lack of information on by-catch mortality of these species.

SMT-3. State of the stocks

There is little information to determine the stock structure of many small tuna species. Current available information generally does not allow an evaluation of the stock status assumed for most of these coastal pelagic species. However, most stocks are likely to be localized rather than having an ocean-wide distribution. For this reason, management can be made at a local level for most stocks. The available information submitted in 1994 was reviewed by the Committee and is summarized below.

Annual, age-structured stock evaluations of spotted Spanish and king mackerels are carried out for coastal areas of the southeastern United States and the Gulf of Mexico. Currently, these assessments indicate that the Atlantic

Spanish mackerel and the Gulf of Mexico king mackerel stocks are overexploited. Reductions in fishing mortality rates are considered necessary in order to allow the stocks to recover to levels that can provide high average long-term yields and to provide adequate safeguards against recruitment failure.

SMT-4. Outlook

Catch and effort statistics for small tunas are incomplete for many of the coastal and industrial fishing countries. Also there is a general lack of biological information needed for stock assessment of most of these species stocks. On the other hand, many of these species are of importance to coastal fishermen, especially in various developing countries, from the point of view of economy as well as protein resource. Therefore, studies should be conducted in order to determine the status of those stocks and optimal management scale of those species, probably most often optimally managed at a local sub-regional level.

SMT-5. Effects of current regulations

There are no ICCAT regulations in effect for any of 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 for king and Spanish mackerels through implementation of catch quotas. It is believed that vessel landing limits, geographical quotas, and minimum size restrictions have helped to stabilize harvests and improve overall stock conditions.

SMT-6. Management recommendations

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

SMT-Table 1. Reported landings (MT) of small tunas in the Atlantic and Mediterranean, by region, gear and country.

REV.3 (AS OF OCT. 5, 1995 - 16:30)

	1965	1966	1967	1968	1969	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	
ATLANTIC + MEDITER	71430	66241	91350	74576	115534	86911	96275	84923	62495	84793	76536	73739	90387	82833	87113	122341	124787	141832	133426	111984	98011	98150	118266	141697	124754	134446	132439	114943	100846	114493	
MEDITERRANEAN	30935	26072	46353	30618	60552	25562	33660	21116	11315	13777	10848	12326	15201	16041	20354	27879	35901	41827	44798	25070	27901	25483	31275	36417	23028	36760	35984	22842	30045	31541	
ATLANTIC	40495	40169	44997	43958	54982	61349	62615	63807	51180	71016	65688	61413	75186	66792	66759	94462	88886	100005	88628	86914	70110	72667	86991	105280	101726	97686	96455	92101	70801	82952	
ATLANTIC BONITO (S SARDA)																															
ATLANTIC + MEDITER	31375	29135	49148	31947	61677	28683	43922	24979	12323	21374	15609	15989	20676	17273	19971	31733	40053	44909	42874	22505	25433	21990	30229	40886	26163	28049	33832	21947	29095	30292	
MEDITERRANEAN	27001	22112	41206	26268	55612	20681	28230	16225	6254	7695	6038	6499	8699	9419	13486	19165	29293	31518	35997	15656	18487	16098	22857	24548	12296	22059	26077	15377	25939	26126	
-PURSE SEINE	30	138	56	28	17	10	13	13	4	10	9	23	26	39	29	72	39	1466	2367	2403	14781	12921	19243	19433	7640	17351	22469	11727	22293	22293	
GREECE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1405	1367	1732	1321	1027	1848	1254	2534	2534	2690	2690	2690	2690	/*
ESPANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	969	634	617	430	0	0	0	0	0	0	0	0	
TURKEY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12809	11426	17333	18133	5008	14737	19645	8863	19548	19548	/*
OTHERS	30	138	56	28	17	10	13	13	4	10	9	23	26	39	29	72	39	61	31	37	34	38	62	46	98	80	134	174	55	55	/*
-OTHER SURFACE	636	930	1042	477	458	683	973	542	931	603	604	1170	1272	1035	1383	1182	1759	1921	1215	1299	1365	809	381	1695	2165	2046	1313	870	809	996	
ALGERIE	200	300	200	100	100	0	31	222	343	183	140	143	206	196	515	640	740	860	867	874	880	459	203	625	1528	1307	600	600	570	570	/*
MAROC	30	15	125	23	28	25	54	54	308	130	135	630	456	128	155	62	309	71	92	75	57	51	127	108	28	27	27	11	9	55	
ESPANA	406	615	717	354	338	658	888	266	280	290	329	397	610	711	713	480	710	990	256	350	428	299	51	962	609	712	686	228	200	341	
OTHERS	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	31	30	30	/*
-UNCL+ LL + TRAWL	26335	21044	40108	25763	55137	19988	27244	15670	5319	7082	5425	5306	7401	8345	12074	17911	27495	28131	32415	11954	2341	2368	3233	3420	2491	2662	2295	2780	2837	2837	
BULGARIA	1683	1475	2281	1784	2079	0	100	0	0	0	0	40	44	11	1	13	191	4	24	1	1	0	13	0	0	17	17	20	8	8	/*
EGYPT	0	0	0	0	0	0	0	0	0	10	3	0	1	17	10	3	2	23	14	48	62	68	35	17	358	598	574	518	640	640	/*
GREECE	3200	2300	1800	1700	2000	900	600	600	500	487	658	511	550	610	712	809	1251	0	0	0	0	0	0	0	0	0	0	0	0	0	/*
ITALY	852	969	1413	836	969	914	1064	965	715	760	959	955	1533	1378	1403	1180	1096	1102	1806	2777	1437	1437	2148	2242	1369	1244	1087	1288	1238	1238	/*
TUNISIE	0	0	0	0	0	117	251	200	203	499	429	619	768	791	865	700	381	748	600	600	482	504	500	600	422	488	305	643	643	643	/*
TURKEY	20600	16100	34514	21343	50089	18057	25229	13905	3901	5324	3371	3178	4503	5536	9082	14910	24300	25978	29485	7818	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	295	274	276	452	694	359	359	537	561	342	311	311	311	300	300	/*
OTHERS	0	200	100	100	0	0	0	0	0	2	5	3	2	2	1	1	0	0	34	16	0	0	0	0	0	4	1	0	8	8	/*
ATLANTIC	4374	7023	7942	5679	6065	8002	15692	8754	6069	13679	9571	9490	11977	7854	6485	12568	10760	13391	6877	6849	6946	5892	7372	16338	13867	5990	7755	6570	3156	4166	
-PURSE SEINE	100	526	345	461	2400	4200	3248	2900	1177	2293	205	283	2026	2608	1294	2661	912	43	285	109	511	458	214	221	32	269	239	240	63	3	
ARGENTIN	100	500	345	461	2400	4200	3248	2900	1166	2293	200	283	2026	1746	1288	2600	846	0	0	0	0	0	0	0	0	0	0	0	0	0	
USSR	0	0	0	0	0	0	0	0	0	0	0	0	0	849	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTHERS	0	26	0	0	0	0	0	0	11	0	5	0	0	13	6	61	66	43	285	109	511	458	214	221	32	269	239	240	63	3	
-TROLLING	0	4	3	4	2	0	0	0	0	0	0	0	0	30	4	117	36	0	157	110	0	204	291	150	456	353	175	112	0	0	
OTHERS	0	4	3	4	2	0	0	0	0	0	0	0	0	30	4	117	36	0	157	110	0	204	291	150	456	353	175	112	0	0	
-TRAP	663	1568	1271	520	1023	719	897	458	335	236	48	58	130	98	258	285	487	322	246	275	251	123	74	254	240	168	109	107	123	71	
ANGOLA	314	1181	832	403	647	662	756	369	303	201	22	29	118	52	129	191	103	188	39	112	63	56	0	148	115	127	99	0	47	20	
OTHERS	349	387	439	117	376	57	141	89	32	35	26	29	12	46	129	94	384	134	207	163	188	67	74	106	125	41	10	107	76	51	

SMT-Table 1. Reported landings (MT) of small tunas in the Atlantic and Mediterranean, by region, gear and country.

REV.3 (AS OF OCT. 5, 1995 - 16:30)

	1965	1966	1967	1968	1969	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	
-OTHER SURFACE	3311	4524	5623	4294	1939	2400	10957	4638	3874	8744	6497	7264	4819	3840	2027	8686	8108	10212	4782	3496	4231	3917	4518	3010	3728	2778	3548	3341	2166	3289	
ANGOLA	76	182	87	13	85	208	93	179	196	150	16	802	820	479	122	186	93	65	85	113	57	45	144	32	53	1	3	4	2	0	
BRASIL	1400	1500	3400	2500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37	187	179	523	345	214	273	109	67	83	137	142	
GHANA	0	0	0	0	0	0	0	0	0	33	20	0	9	9	0	77	5	71	13	8	10	0	943	0	0	0	0	0	0	0	
MARTINIQ	0	0	0	0	0	100	200	300	400	476	384	549	510	400	500	500	502	587	545	552	491	431	331	395	427	430	820	770	770	770	/*
MAROC	253	695	343	497	449	210	159	134	133	194	322	303	131	171	196	305	477	535	441	217	0	0	223	587	563	284	488	571	878	411	
SENEGAL	0	0	0	0	0	0	0	0	0	4	40	164	614	523	159	140	1327	1424	497	200	495	345	288	421	474	251	406	285	218	218	/*
ESPANA	1550	2127	1786	767	1001	1582	10005	3525	2045	6975	4793	4350	1966	1873	588	140	249	300	109	82	0	0	0	0	0	0	0	38	0	0	
USSR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6433	4559	6329	2375	1290	2073	1085	1083	0	0	0	0	0	0	0	
VENEZUEL	0	0	0	500	400	300	500	500	700	522	562	756	767	382	443	861	833	864	554	748	774	1401	1020	1153	1783	1514	1514	1443	0	1646	
OTHERS	32	20	7	17	4	0	0	0	400	390	360	340	2	3	19	44	63	37	126	99	152	87	141	208	155	189	250	147	161	102	
-UNCL+ LL + TRAWL	300	401	700	400	701	683	590	758	683	2406	2821	1885	5002	1278	2902	819	1217	2814	1407	2859	1953	1190	2275	12703	9411	2422	3684	2770	804	803	
ARGENTIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1775	310	2058	1399	699	1607	2794	1327	1207	1794	1559	434	434	
MEXICO	0	0	0	0	100	100	200	279	198	437	446	237	81	59	174	271	408	396	567	744	212	241	391	356	338	215	200	657	0	0	
RUSSIA	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	948	29	0	0	
USA	0	1	0	0	1	83	90	24	261	92	117	23	268	224	502	1	164	209	0	1	5	3	18	5	3	7	296	262	3	2	
USSR	0	0	0	100	300	300	100	155	24	1400	1542	1281	4164	753	2125	0	0	0	0	0	0	0	0	8882	7363	706	0	0	0	0	
OTHERS	300	400	700	300	300	200	200	300	200	477	716	344	489	242	101	547	645	434	530	56	337	247	259	666	380	287	446	263	367	367	/*
ATL BLACK SKIPJACK (E ALLETTERATUS)																															
ATLANTIC + MEDITER	4120	3301	4016	3171	3550	8636	5704	3141	2603	5500	9043	10401	8344	17633	14673	19486	15313	14833	20881	19829	11699	13426	14439	22915	24272	25050	20014	16512	6189	8497	
MEDITERRANEAN	42	27	38	168	951	960	866	904	1061	1304	1386	2028	2499	2495	2870	2774	1446	2480	1561	1650	2040	2166	2424	2405	2035	2606	1815	1135	1157	1157	
-SURFACE	36	18	24	156	942	683	529	613	770	774	897	1266	1265	1586	2197	2188	1087	1721	1027	1005	1201	1104	1475	1600	1006	1243	1136	558	580	580	
ESPANA	31	15	12	139	931	590	372	566	716	688	732	1134	1059	1192	993	800	6	705	0	32	12	5	0	5	0	0	0	0	0	0	
TUNISIE	0	0	0	0	0	86	116	32	29	77	82	126	198	394	1198	1388	1020	1004	1026	966	1188	1098	1473	1578	1002	1230	1122	555	550	550	/*
OTHERS	5	3	12	17	11	7	41	15	25	9	83	6	8	0	6	0	61	12	1	7	1	1	2	17	4	13	14	3	30	30	/*
-UNCL+ LL + TRAWL	6	9	14	12	9	277	337	291	291	530	489	762	1234	909	673	586	359	759	534	645	839	1062	949	805	1029	1363	679	577	577	577	
TUNISIE	0	0	0	0	0	163	220	185	185	283	282	353	811	589	397	384	229	326	202	258	253	492	330	330	564	883	221	109	109	109	/*
OTHERS	6	9	14	12	9	114	117	106	106	247	207	409	423	320	276	202	130	433	332	387	586	570	619	475	465	480	458	468	468	468	/*
ATLANTIC	4078	3274	3978	3003	2599	7676	4838	2237	1542	4196	7657	8373	5845	15138	11803	16712	13867	12353	19320	18179	9659	11260	12015	20510	22237	22444	18199	15377	5032	7340	
-BAITBOAT	22	81	675	287	558	1891	1060	577	247	474	493	187	701	396	595	1316	1067	1376	1189	1595	2090	1766	1690	853	1708	3665	967	815	1278	1917	
ANGOLA	22	81	675	287	558	1191	660	257	198	408	363	9	647	325	462	836	732	1114	1179	1267	1255	1129	1267	501	408	99	39	14	11	15	
GHANA	0	0	0	0	0	0	0	0	26	66	130	53	54	68	131	17	19	1	0	256	748	524	318	289	1212	3496	201	309	359	994	
ESPANA	0	0	0	0	0	700	400	320	23	0	0	0	0	0	0	5	0	0	0	0	0	0	0	5	0	0	0	0	0	0	
VENEZUEL	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	621	451	887	887	/*
OTHERS	0	0	0	0	0	0	0	0	0	0	0	125	0	3	2	458	316	261	10	72	87	113	105	58	88	70	106	41	21	21	/*

SMT-Table 1. Reported landings (MT) of small tunas in the Atlantic and Mediterranean, by region, gear and country.

REV.3 (AS OF OCT. 5, 1995 - 16:30)

	1965	1966	1967	1968	1969	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	
-PURSE SEINE	0	7	0	0	0	0	400	0	38	51	73	55	43	5533	8	788	1553	2225	1656	666	1508	455	143	802	780	721	1997	1317	1791	713	
FRANCE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1098	1120	0	0	0	0	0	0	195	0	0	0	0	0	
GHANA	0	0	0	0	0	0	0	0	0	0	8	23	0	0	0	0	368	617	0	284	153	93	34	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	0	0	0	0	0	617	306	265	189	
SENEGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	523	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
USSR	0	0	0	0	0	0	0	0	0	0	0	32	0	5452	0	0	0	444	1613	356	901	271	61	757	543	667	0	0	0	0	
VENEZUEL	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	1342	958	1002	0	
OTHERS	0	7	0	0	0	0	400	0	38	51	65	0	43	81	8	265	87	44	43	26	454	91	48	45	42	54	38	53	524	524	/*
-TROLLING	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	55	1	0	4	0	0	501	398	743	747	582	439	124	17	17	
SENEGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	501	371	737	727	561	407	90	0	0	
OTHERS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	55	1	0	4	0	0	0	27	6	20	21	32	34	17	17	/*
-TRAP	2868	2751	3104	2395	1438	1754	1120	487	640	671	66	1	194	56	183	369	445	604	490	369	201	49	74	632	740	296	334	3	170	95	
ANGOLA	2700	2718	3090	2379	1372	1747	1106	482	639	667	66	1	194	15	183	359	419	604	436	324	142	31	58	629	724	186	267	0	164	90	
OTHERS	168	33	14	16	66	7	14	5	1	4	0	0	0	41	0	10	26	0	54	45	59	18	16	3	16	110	67	3	6	5	
-OTHER SURFACE	1188	428	199	321	603	3873	2253	861	511	1114	6107	7715	4379	9070	10934	13768	10580	6697	14937	14910	5607	8395	9686	16369	18256	17045	14400	12646	1484	4579	
ANGOLA	811	374	198	59	50	3156	642	495	133	212	20	0	485	486	1	133	20	16	17	41	36	7	20	18	93	0	0	0	0	0	
BRASIL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	714	738	402	131	103	72	148	275	163	378	1225	
GHANA	0	0	0	0	0	0	0	0	0	0	4518	5968	1131	5981	5416	4117	2900	1523	5009	5426	0	32	5199	11299	11299	11299	11299	11299	0	0	
MAROC	19	54	0	162	438	319	582	107	6	42	58	31	15	21	289	16	19	26	0	2	0	0	103	48	11	162	35	194	0	30	
SENEGAL	0	0	0	0	0	0	0	0	0	437	1092	705	1540	1446	1697	1921	3052	4011	4290	7612	3370	6528	2614	3424	5101	3889	2471	548	0	0	
ESPANA	358	0	0	0	15	148	679	9	22	0	5	6	33	14	4	480	2	3	0	3	0	0	0	0	0	0	0	0	0	0	
USA	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	7	43	0	24	4	41	55	43	104	94	66	100	102	989	1137	
USSR	0	0	0	0	0	0	0	0	0	0	0	438	690	675	2184	6307	3615	641	4915	257	139	0	0	0	0	0	0	0	0	0	
VENEZUEL	0	0	0	100	100	200	300	200	300	373	357	501	426	390	1270	721	791	311	573	644	1050	1123	1467	1236	1374	1294	0	0	0	2115	
OTHERS	0	0	0	0	0	50	50	50	50	50	57	66	59	57	73	66	138	166	109	207	233	248	109	137	212	187	220	340	117	72	
-UNCL+ LL + TRAWL	0	7	0	0	0	158	5	312	106	1886	918	415	528	83	83	416	221	1451	1044	639	253	94	24	1111	6	135	62	472	292	19	
CIVOIRE	0	0	0	0	0	0	0	0	0	1583	860	400	431	38	57	177	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	0	0	397	543	99	40	10	2	0	2	38	0	0	0	0	
ISRAEL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	227	203	640	282	271	76	0	0	0	0	0	0	0	0	0	
USA	0	7	0	0	0	158	5	212	6	0	2	5	10	32	9	3	6	87	3	3	0	1	2	73	3	52	51	459	273	0	
USSR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	950	0	0	0	0	0	0	
OTHERS	0	0	0	0	0	0	0	100	100	303	56	10	87	13	17	9	12	327	216	266	137	83	20	88	1	45	11	13	19	19	/*

SMT-Table 1. Reported landings (MT) of small tunas in the Atlantic and Mediterranean, by region, gear and country.

REV.3 (AS OF OCT. 5, 1995 - 16:30)

	1965	1966	1967	1968	1969	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	
FRIGATE TUNA (A THAZARD)**																															
ATLANTIC + MEDITER	9479	7209	11533	8578	16202	11551	10304	13625	10190	13937	10530	9747	20020	8343	12575	20912	15913	25240	21944	25903	22876	20303	23431	24696	21429	24817	20591	14354	12761	15548	
MEDITERRANEAN	2591	2732	4561	3078	2786	3366	4095	3445	3549	4355	2644	3290	3409	3567	3707	3952	3678	6043	5820	6337	5240	5057	3740	6126	6387	7514	5822	4042	2581	3890	
-PURSE SEINE	52	47	58	50	56	24	29	21	12	22	16	18	24	23	113	44	22	205	1663	1657	1520	1375	290	299	138	125	146	190	52	52	
ESPANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1629	1605	1392	1297	0	0	0	0	0	0	0	0	
OTHERS	52	47	58	50	56	24	29	21	12	22	16	18	24	23	113	44	22	205	34	52	128	78	290	299	138	125	146	190	52	52	/*
-TRAP	653	694	702	990	574	226	361	400	390	808	120	445	544	343	144	20	100	203	506	655	613	281	658	1342	2219	2315	1489	890	215	246	
MAROC	457	352	380	640	75	99	156	130	147	346	0	227	125	0	0	0	0	0	0	0	0	25	27	0	70	185	118	250	60	91	
ESPANA	196	342	322	350	499	127	205	270	243	462	120	218	419	343	144	20	100	203	506	655	613	256	631	1342	2149	2130	1371	640	155	155	/*
-OTHER SURFACE	1186	1091	2601	838	1056	1853	1885	1139	1762	1935	1269	1547	874	1402	1700	2110	1614	1809	57	93	90	152	151	2138	1539	2063	1442	1185	503	1781	
MAROC	11	11	30	11	5	8	16	65	299	62	0	130	109	69	73	10	14	77	57	52	48	150	151	811	1107	1208	567	605	0	1069	
ESPANA	1175	1080	2571	827	1051	1845	1869	1074	1463	1873	1269	1417	765	1333	1627	2100	1600	1732	0	41	42	2	0	1327	432	855	855	569	493	702	
OTHERS	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	20	11	10	10	
-UNCL+ LL + TRAWL	700	900	1200	1200	1100	1263	1820	1885	1385	1590	1239	1280	1967	1799	1750	1778	1942	3826	3594	3932	3017	3249	2641	2347	2491	3011	2745	1777	1811	1811	
GREECE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	516	2192	1887	2060	1419	1400	1400	1400	1400	1400	1400	1400	1400	1400	/*
ITALY	700	900	1200	1200	1100	1100	1600	1700	1200	1300	939	912	1147	1177	1342	1376	1193	1299	1494	1610	1344	1344	906	609	509	494	432	305	379	379	/*
TUNISIE	0	0	0	0	0	163	220	185	185	283	282	353	811	589	397	384	229	326	202	258	253	492	330	330	564	883	883	31	0	0	
OTHERS	0	0	0	0	0	0	0	0	0	7	18	15	9	33	11	18	4	9	11	4	1	13	5	8	18	234	30	41	32	32	/*
ATLANTIC	6888	4477	6972	5500	13416	8185	6209	10180	6641	9582	7886	6457	16611	4776	8868	16960	12235	19197	16124	19566	17636	15246	19691	18570	15042	17303	14769	10312	10180	11658	
-BAITBOAT	903	414	625	1564	3247	3126	251	247	1674	698	117	39	131	146	280	201	282	459	414	372	308	229	463	219	153	233	411	474	321	191	
JAPAN	902	409	625	1558	3208	3117	0	25	1237	461	17	14	89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTHERS	1	5	0	6	39	9	251	222	437	237	100	25	42	146	280	201	282	459	414	372	308	229	463	219	153	233	411	474	321	191	
-PURSE SEINE	0	0	444	1259	177	687	700	1349	242	25	3	7	0	1205	800	5976	6541	5876	6468	9304	5722	5938	8921	8461	5598	7671	10189	8214	9366	8314	
FIS+ESP*****	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1856	1984	2800	640	416	1904	3392	3392	3008	3872	6656	7136	8000	5520	
JAPAN	0	0	443	1253	177	687	635	1189	216	25	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MAROC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	176	0	1055	520	37	45	292	151	0	0	50	52	30	0	0	
RUSSIA	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	431	350	220	505	
ESPANA	0	0	0	0	0	0	65	0	0	0	0	0	0	600	800	5800	4685	2461	2510	5454	3586	3074	4361	3801	1570	1680	476	194	65	709	
USSR	0	0	0	0	0	0	0	0	0	0	0	7	0	605	0	0	0	376	305	3062	1614	144	182	446	264	739	0	0	0	0	
VENEZUEL****	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34	490	817	440	599	1067	1710	322	881	881	/*
NEI_1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	333	46	0	0	17	381	155	237	862	182	200	699	
OTHERS	0	0	1	6	0	0	0	160	26	0	0	0	0	0	0	0	0	0	0	65	27	34	1	1	2	26	2	0	0	0	

SMT-Table 1. Reported landings (MT) of small tunas in the Atlantic and Mediterranean, by region, gear and country.

REV.3 (AS OF OCT. 5, 1995 - 16:30)

	1965	1966	1967	1968	1969	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	
-TRAP	2756	2121	1555	841	1089	874	605	930	975	832	336	268	277	339	394	146	185	314	246	123	139	98	188	140	438	823	500	203	137	107	
ANGOLA	1596	1379	1104	465	714	336	448	378	483	683	178	2	77	122	66	40	65	97	60	61	26	0	0	3	37	27	0	0	4	6	
MAROC	792	278	245	149	47	401	26	282	124	51	0	0	3	0	0	86	10	0	5	0	0	10	11	3	113	238	347	91	76	58	
ESPANA	368	464	206	214	324	137	131	270	368	98	158	266	197	217	328	20	110	217	181	62	113	88	177	134	288	558	153	112	57	43	
OTHERS	0	0	0	13	4	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	
-OTHER & UNCL GEARS	3229	1942	4348	1836	8903	3498	4653	7654	3750	8027	7430	6143	16203	3086	7394	10637	5227	12548	8996	9767	11467	8981	10119	9750	8853	8576	3669	1421	356	3046	
ANGOLA	121	91	101	166	24	176	472	1686	199	616	257	0	78	89	11	25	4	31	3	38	0	7	14	0	28	0	0	0	0	0	
BRASIL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	368	382	727	929	1702	572	359	247	82	148	329	
CAPE VERDE																								86	105	75	135	82	82	82	
GHANA	0	0	2200	900	8200	2000	1800	5127	1563	6295	6001	4311	13914	1047	4286	7566	2048	6062	5632	4530	4500	3256	4689	0	0	0	0	0	0	0	
MAROC	516	65	541	102	112	495	58	17	1049	65	48	272	685	770	694	706	1257	71	746	161	379	0	303	191	486	447	464	121	109	38	
RUSSIA	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	2818	1091	0	0	
ESPANA	792	386	406	268	167	127	1823	224	239	148	131	152	377	432	83	430	500	450	0	230	3	1	0	3	0	0	0	45	0	0	
USSR	0	0	0	0	0	0	0	0	0	0	0	155	242	198	450	694	407	5247	1350	2841	4441	3321	2723	5549	5513	5634	0	0	0	0	
VENEZUEL	1800	1400	1100	400	400	700	500	600	700	903	993	1253	907	550	1845	1176	944	509	1171	1478	1712	1614	1441	2212	2062	1969	0	0	0	2597	
OTHERS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	40	67	178	94	121	50	55	20	7	87	92	5	0	17	0	

SPOTTED SPANISH MACK (S MACULATUS)

ATLANTIC	11917	13516	12783	12812	12480	13984	12713	13956	15593	14685	15433	14296	14420	13490	13430	16736	13539	15310	11695	13232	13587	15655	16002	14455	15933	16960	17924	18390	20999	20942	
-LONGLINE	0	0	0	0	0	0	0	0	0	0	600	500	400	100	0	116	219	63	273	110	60	82	490	212	201	127	0	0	0	0	
CUBA	0	0	0	0	0	0	0	0	0	0	600	500	400	100	0	116	219	63	273	110	60	82	490	212	201	127	0	0	0	0	
-TROLLING	89	140	92	82	61	0	0	0	0	0	0	0	0	500	400	467	1264	413	130	55	44	53	444	75	82	538	538	611	391	391	
CUBA	0	0	0	0	0	0	0	0	0	0	0	0	0	500	400	462	438	413	124	55	44	53	444	75	82	538	538	611	391	391	/*
USA	89	140	92	82	61	0	0	0	0	0	0	0	0	0	0	5	826	0	6	0	0	0	0	0	0	0	0	0	0	0	
-OTHER SURFACE	8321	9072	7776	7011	7178	2600	2700	2700	3500	3383	2668	2242	2376	2279	2946	8682	4798	2061	5345	7157	7413	9014	8238	8527	8041	7768	8709	8287	10249	10249	
CUBA	1583	1320	1107	770	829	900	500	500	700	600	0	0	0	0	0	0	0	0	292	379	339	486	672	516	463	0	0	0	0	0	
DOMINR	0	100	200	200	200	200	200	200	300	324	292	253	174	317	415	479	503	384	168	1058	1267	1271	1321	1415	1401	1290	728	735	739	739	/*
USA	3538	4152	3469	5241	4849	0	0	0	0	0	1	0	0	0	0	5412	1920	0	2764	3850	3810	5719	4774	4853	4190	4018	5521	5322	4433	4433	
VENEZUEL	3200	3500	3000	800	1300	1500	2000	2000	2500	2459	2375	1989	2202	1962	2531	2791	2375	1677	2121	1870	1997	1538	1471	1743	1987	2460	2460	2230	5077	5077	/*
-UNCL + TRAWL	3507	4304	4915	5719	5241	11384	10013	11256	12093	11302	12165	11554	11644	10611	10084	7471	7258	12773	5947	5910	6070	6506	6830	5641	7609	8527	8677	9492	10359	10302	
COLOMBIA	0	0	0	0	0	300	600	100	200	310	393	245	283	228	199	213	408	8	10	77	101	81	72	151	112	76	37	95	58	0	
MEXICO	3500	4300	4900	5700	5200	4778	3500	5293	6656	5236	4794	3380	4414	5138	5751	5908	5908	7799	5922	5777	5789	6170	6461	5246	7242	8194	8360	9181	10066	10066	/*
TRINIDAD	0	0	0	0	0	800	1200	1000	800	766	1691	1544	1484	1933	1208	1337	939	1218	0	0	0	0	0	0	0	0	0	0	0	0	
USA	7	4	15	19	41	5506	4713	4863	4437	4990	5287	6385	5453	3310	2926	12	2	3747	14	55	176	238	297	244	254	254	280	216	234	234	
OTHERS	0	0	0	0	0	0	0	0	0	0	0	0	10	2	0	1	1	1	1	1	4	17	0	0	1	3	0	0	1	2	

SERRA SPANISH MACKEREL (S. BRASILIENSIS)

ATLANTIC	0	0	0	0	0	1868	1154	2810	4446	6291	2664	283	986	1522	1191	2826	3466	4342	4511	6259	1504	5011	4741	5063	5927	2977	1437	1116	803	1149	
-OTHER SURFACE	0	0	0	0	0	1868	1154	2810	4446	6291	2664	283	986	1522	1191	2826	3466	4342	4511	6259	1504	5011	4741	5063	5927	2977	1437	1116	803	1149	
BRASIL	0	0	0	0	0	1868	1154	2810	4446	6291	2664	283	986	1522	1191	2826	3466	4342	4511	6259	1504	5011	4741	5063	5927	2977	1437	1116	803	1149	

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REV.3 (AS OF OCT. 5, 1995 - 16:30)

	1965	1966	1967	1968	1969	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	
KING MACKEREL (S CAVALLA)																															
ATLANTIC	3183	2950	3871	5322	5414	6489	6420	7365	9717	13644	9048	8293	8732	6769	11450	15656	18513	18149	14607	13182	9964	12187	11890	13041	10841	10178	10497	11121	12256	15292	
ARGENTIN	0	0	4	9	0	0	3	0	0	0	0	466	988	379	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BRASIL	0	0	0	0	0	1532	946	2532	3318	5162	2185	546	790	845	848	1598	1612	1929	2695	2588	806	2890	2173	2029	2108	18	6	46	0	1352	
MEXICO	1000	900	1000	700	1100	907	1300	1520	2189	1531	1354	1497	1331	1535	2249	1946	2740	4409	2874	2164	2303	2643	3067	3100	2300	2689	2147	3014	3289	3289	/*
TRINIDAD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	43	11	38	82	752	541	432	657	0	1192	1192	/*
USA	2083	2050	2767	2813	2814	3050	2571	2213	2710	4747	3095	4053	3837	2507	6292	10726	12565	9863	7068	7444	6011	5683	5628	5810	4363	5937	6425	6707	6922	6922	
VENEZUEL	100	0	100	1800	1500	1000	1600	1100	1500	2204	2388	1731	1624	1328	1988	1361	1566	1905	1910	924	833	933	940	1330	1500	1069	1228	1307	800	2484	
OTHERS	0	0	0	0	0	0	0	0	0	0	26	0	162	175	73	25	30	43	40	19	0	0	0	20	29	33	34	47	53	53	/*
WEST AFRICAN SPAN MACK (S. TRITOR)											TRITOR)																				
ATLANTIC	0	0	0	1800	2700	200	1300	2100	1600	4713	1140	1901	2572	6716	4167	4921	3156	5312	4716	4498	3989	3292	1799	3772	2684	4248	3581	1433	1788	1788	
GERMANY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	851	537	33	1	0	0	0	0	0	0	0	0	0	
GHANA	0	0	0	1800	2500	0	700	1500	1000	3513	598	555	720	771	1569	4412	1983	2982	2225	3022	3000	1453	0	1457	1457	1500	2778	899	466	466	/*
SENEGAL	0	0	0	0	0	0	0	0	0	52	314	1270	1188	1054	1112	404	1045	671	754	1174	732	1516	1754	2159	698	1297	589	332	1089	1089	/*
USSR	0	0	0	0	200	200	600	600	600	800	228	76	644	4810	1439	0	0	602	1170	223	206	219	28	143	195	1240	0	0	0	0	
OTHERS	0	0	0	0	0	0	0	0	0	348	0	0	20	81	47	105	128	206	30	46	50	104	17	13	334	211	214	202	233	233	/*
BLACKFIN TUNA (T ATLANTICUS)																															
ATLANTIC	712	662	896	683	753	1952	1875	1895	936	1062	815	1026	1251	1341	1205	1175	1973	1941	1738	1908	1403	2821	3461	3321	2832	3734	4157	4365	4177	3977	
CUBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	721	622	558	487	157	486	634	332	318	487	318	196	125	125	/*
DOMINR	0	0	0	100	100	100	100	100	200	136	86	90	68	78	105	125	124	144	144	106	90	123	199	5	568	539	546	124	148	148	/*
GUADELOU	0	0	0	0	0	1100	1100	1100	240	240	220	190	530	530	470	440	460	490	482	490	460	470	470	450	460	470	460	470	1000	1000	/*
MARTINIQ	600	600	800	500	600	600	500	300	100	420	270	580	300	400	300	300	301	352	327	331	295	259	199	366	395	395	750	700	700	700	/*
USA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	139	41	7	0	11	32	44	154	87	80	111	126	508	492	
VENEZUEL ****	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	946	1447	1239	650	1250	1598	2148	1221	1221	/*
OTHERS	112	62	96	83	53	152	175	395	396	266	239	166	353	333	330	310	228	292	220	494	390	505	468	775	354	513	374	601	475	291	
WAHOO (A SOLANDRI)																															
ATLANTIC	0	0	0	100	0	378	381	381	280	391	326	379	393	452	760	610	2920	2280	2366	2159	920	1150	1235	1612	1542	1470	1651	1953	2485	1606	
CAP VERT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	2307	1464	1588	1365	142	205	306	340	631	458	351	547	415	416	
USA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	12	57	128	110	82	134	203	827	391	
VENEZUEL	0	0	0	100	0	100	100	100	0	104	27	67	71	54	100	57	77	175	66	125	147	113	106	141	101	159	302	331	513	538	
OTHERS	0	0	0	0	0	278	281	281	280	287	299	312	322	398	660	529	536	641	712	669	618	820	766	1003	700	771	864	872	730	261	

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REV.3 (AS OF OCT. 5, 1995 - 16:30)

	1965	1966	1967	1968	1969	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	
CERO (S REGALIS)																															
ATLANTIC	0	0	0	100	100	500	800	800	780	619	620	565	629	698	586	604	628	687	677	680	574	500	392	219	234	225	375	390	360	360	
MARTINIQ	0	0	0	0	0	200	500	500	400	240	260	220	510	600	500	500	522	611	567	574	511	448	344	162	175	175	330	310	310	310	/*
OTHERS	0	0	0	100	100	300	300	300	380	379	360	345	119	98	86	104	106	76	110	106	63	52	48	57	59	50	45	80	50	50	/*
SCOMBEROMORUS UNCLASSIFIED (S. SPP)											.SPP.)																				
ATLANTIC	1800	1900	2100	2100	3400	500	400	300	500	508	838	502	471	424	197	214	339	283	20	485	22	11	102	159	37	80	176	305	265	265	
BRASIL	1100	1300	1500	1600	3000	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	
COLOMBIA	0	0	0	0	0	300	200	100	200	251	412	133	108	92	54	73	160	80	20	485	22	11	102	159	37	25	7	12	21	21	/*
MEXICO	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	0	0	0	
OTHERS	700	600	600	500	400	200	200	200	300	257	426	369	363	332	143	141	179	203	0	0	0	0	0	0	0	55	169	293	244	244	/*
PLAIN BONITO (O UNICOLOR)																															
ATLANTIC + MEDITER	217	340	732	232	1344	809	690	316	105	150	84	212	456	970	492	698	1448	584	38	49	133	87	564	1482	1116	335	408	363	344	525	
MEDITERRANEAN	1	1	48	4	3	3	7	6	3	7	0	0	135	153	28	0	0	0	0	0	9	1	26	8	7	21	9	40	40	40	
OTHERS	1	1	48	4	3	3	7	6	3	7	0	0	135	153	28	0	0	0	0	0	9	1	26	8	7	21	9	40	40	40	/*
ATLANTIC	216	339	684	228	1341	806	683	310	102	143	84	212	321	817	464	698	1448	584	38	49	124	86	538	1474	1109	314	399	323	304	485	
MAURITAN	0	0	0	0	0	0	50	100	100	100	80	80	90	90	90	101	478	99	37	40	40	50	50	50	50	50	50	50	50	50	/*
MAROC	216	339	684	228	1341	806	633	210	2	43	4	132	231	727	373	596	968	483	0	0	83	33	487	1422	1058	263	348	272	253	434	
OTHERS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2	1	9	1	3	1	2	1	1	1	1	1	1	/*
MIXED OR UNKNOWN TUNA-LIKE SPECIES											ECIES																				
ATLANTIC + MEDITER	8627	7228	6271	7731	7914	13229	11766	16065	7868	8210	13050	10428	12423	8724	7607	9596	10992	12304	11870	7554	7411	6728	14722	15139	17671	19300	19233	23810	10127	15401	
MEDITERRANEAN	1300	1200	500	1100	1200	552	462	536	448	416	780	509	459	407	263	1988	1484	1786	1420	1427	2125	2161	2228	3330	2303	4560	2261	2248	328	328	/*
GREECE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	195	135	40	128	79	129	103	485	485	515	510	0	0	
ISRAEL	200	300	0	300	200	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	
LEBANON	500	300	200	300	800	200	200	200	200	260	200	140	130	140	140	140	130	120	110	100	120	130	150	150	150	130	150	150	0	0	
ESPANA	600	600	300	500	200	300	0	0	0	0	337	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUNISIE	0	0	0	0	0	52	262	336	148	142	204	360	299	265	112	1826	1344	1450	1164	1273	1791	1872	1858	2991	1659	3941	1588	1588	318	318	/*
OTHERS	0	0	0	0	0	0	0	0	100	14	39	9	30	2	11	22	10	21	11	14	86	80	91	86	9	4	8	0	10	10	/*

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	1965	1966	1967	1968	1969	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	
ATLANTIC	7327	6028	5771	6631	6714	12677	11304	15529	7420	7794	12270	9919	11964	8317	7344	7608	9508	10518	10450	6127	5286	4567	12494	11809	15368	14740	16972	21562	9799	15073	
BRASIL	0	0	0	0	0	0	0	0	0	0	0	33	338	679	415	647	48	714	400	31	3	10	335	53	8	11	74	2	174	1149	
CHITAIW	17	16	183	408	1117	844	708	941	1008	932	398	1007	3	489	1272	775	825	1100	770	13	45	127	270	124	1075	223	2023	0	0	0	
COLOMBIA	0	0	0	0	0	0	0	0	0	28	54	7	15	34	7	21	40	316	16	335	971	677	917	802	1221	341	61	3926	5009	5009	/*
CIVOIRE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2900	3100	4400	1000	650	20	5300	5300	4700	6950	10100	11150	0	0	
CUBA	0	0	19	16	0	0	400	600	1100	300	1000	400	100	100	100	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EGUINEA	0	0	0	0	0	300	300	300	300	300	300	300	300	300	300	200	200	160	190	400	400	500	400	400	400	390	350	360	390	390	/*
GHANA	0	0	0	0	0	1000	900	0	0	882	451	671	1037	414	70	200	242	616	147	423	0	0	0	0	0	0	0	0	0	0	
GUADELOU	1000	800	1000	1000	1100	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	
ISRAEL	500	100	0	0	300	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	
JAPAN	5155	4836	3339	1493	1060	1573	1477	980	514	580	398	1048	757	952	1629	1276	814	663	114	342	468	378	341	366	390	539	443	265	261	261	/*
KOREA	0	0	0	2384	989	6980	5676	3116	2386	3489	5798	2880	4163	2495	1661	2134	2020	1876	1224	960	970	669	357	0	521	170	9	2	5	27	
LIBERIA	0	0	0	0	0	200	200	200	200	200	200	200	200	218	515	182	441	395	396	284	235	233	265	229	246	237	237	237	0	0	
PANAMA	0	0	0	0	0	0	0	956	994	0	762	1395	2602	757	228	659	1117	648	690	0	415	430	436	0	0	0	0	0	0	0	
PORTUGAL	361	123	120	279	509	327	501	206	21	42	178	262	285	503	199	227	218	68	0	0	17	367	0	14	0	0	0	0	0	25	
SILEONE	0	0	0	0	0	0	0	0	0	0	0	16	0	539	492	92	90	79	76	78	80	80	80	80	270	80	35	53	601	601	/*
ESPANA	0	0	1000	800	700	100	0	6648	0	0	1345	0	0	0	0	0	0	0	0	0	0	0	0	0	50	13	13	13	0	0	
TOGO	0	0	0	0	0	400	500	500	600	564	792	660	533	533	43	433	332	418	322	128	0	0	0	0	0	0	0	0	0	0	
TRINIDAD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	150	21	25	0	3056	3933	5974	6009	2851	4428	2477	2477	/*
USA	114	3	10	2	1	0	50	0	0	1	19	30	71	31	11	512	61	209	426	883	223	289	287	127	138	229	122	216	181	181	/*
USSR	180	150	0	49	238	253	292	181	196	295	380	37	1262	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VENEZUEL	0	0	0	100	300	200	200	800	0	0	22	729	0	54	40	0	0	0	878	891	404	406	13	0	0	0	188	111	0	4744	
OTHERS	0	0	100	100	400	500	100	101	101	181	173	244	298	219	362	211	160	156	251	338	380	381	437	381	375	448	466	799	701	209	

* INCLUDES FRIGATE TUNA FOR COTE D'IVOIRE

** INCLUDES BULLET TUNA (A. ROCHEI)

& INCLUDES ATL. BLACK SKIPJACK FOR ATLANTIC PS ESPANA BEGINNING IN 1978

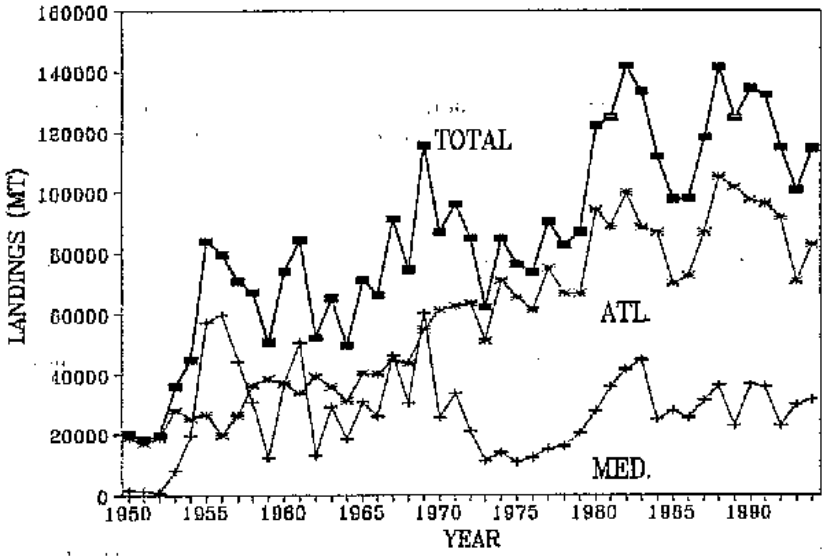
*** INCLUDES SERRA SPANISH MACKEREL (S. BRASILIENSIS)

**** Figures for 1986-1993 were corrected, using a new statistical procedures shown in Doc. SCRS/95/39.

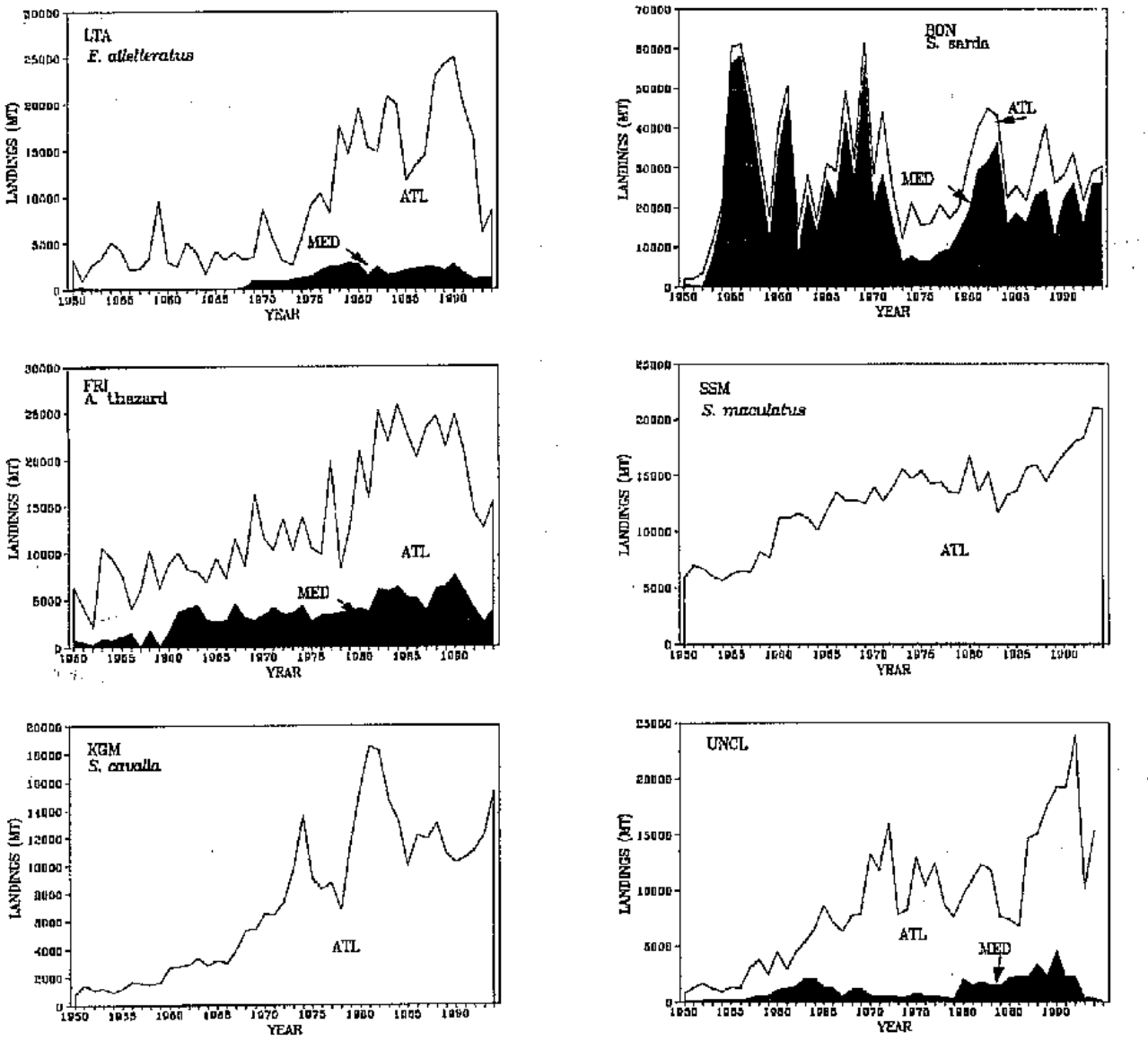
***** Estimated small tuna catches (SMT) made by FIS and Spanish fleets and unloaded at Abidjan.

/* CARRIED OVER FROM PREVIOUS YEARS

FOR EACH SPECIES-AREA-GEAR GROUP, COUNTRIES WITH < 450 MT ANNUAL CATCH DURING THE ENTIRE PERIOD COVERED ARE INCLUDED IN OTHERS.



SMT-Fig. 1. Reported landings (MT) of small tunas (all combined) in the Atlantic and Mediterranean Sea.



SMT-Fig. 2. Reported landings (MT) of major species of small tunas in the Atlantic and the Mediterranean Sea.

11. Report of Sub-Committee on Environment

11.1 The Report of the Sub-Committee on Environment was presented by the Convener, Mr. J. Pereira (Portugal). The SCRS reviewed the Report and adopted it together with all the recommendations contained therein. The Report is attached as **Appendix 8.**

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

12.1 The Report of the Sub-Committee on Statistics was presented by the Convener, Dr. S. Turner (U.S.A.). He called the SCRS' attention to the recommendations made by the Sub-Committee, particularly those concerning improvements to the Secretariat's computer/software facilities, which require funding. After thoroughly reviewing the Report, it was adopted and forwarded to the Commission, together with all the recommendations. The Report is attached as **Appendix 9.**

13. Report of the *Ad Hoc* Working Group on By-catches. Future plans for the collection of by-catch statistics

13.1 The Report of the *Ad Hoc* Working Group on By-catches, which met during the 1995 SCRS meeting, was presented by the Convener, Dr. G. Scott (U.S.A.).

13.2 The Report was adopted and all the recommendations were forwarded to the Commission (attached as **Appendix 10**). The Committee noted that the Group has reviewed the progress of some preliminary studies relative to by-catches (**Addendum 2 to Appendix 10**).

13.3 In view of the increasing importance of investigations of by-catches, particularly shark by-catches in tuna fisheries, the Committee reiterated the Group's recommendation to create a "Sub-Committee on By-catches" and to form a "Working Group on Sharks" within this Sub-Committee.

13.4 The SCRS also took due note that an intercessional meeting was proposed by this Group for early 1996. It decided to discuss the details of the meeting schedule under Agenda Item 17, after reviewing all the requests to hold meetings from other groups.

14. Report of the Steering Committee on the ICCAT Tuna Symposium. Progress on the organization of the Symposium and consideration of funding requirements

14.1 The Steering Committee's Report (SCRS/95/20) was presented under Agenda Item 7. The SCRS reviewed the Symposium Agenda, Moderators, tentative time schedule, organization and procedures for the meeting and the subsequent publication of the Symposium Report. The Committee was noted the invitation received from the Regional Autonomous Government of the Azores to hold this meeting in Ponta Delgada, San Miguel Island from June 10 to 18, 1996. With the understanding that this invitation includes assuming all the costs of the conference as well trips of the Secretariat staff, the Steering Committee drafted a budget, which includes inviting one scientist from each developing Contracting Party as well as other guest scientists. The proposed budget is attached as **Appendix 11.**

14.2 The Committee expressed its appreciation to the Autonomous Government of the Azores for their generous invitation, and requested the Commission to finalize the arrangements.

14.3 A Symposium logo, which was developed by the Steering Committee and modified by the Secretariat, was presented to the Committee. Further modifications were suggested and it was agreed that the Secretariat, in consultation with the members of the Steering Committee, finalize the logo, taking such suggestions into account.

14.4 A proposed new design for the Commission's letterhead to commemorate ICCAT's 25th Anniversary, and to be used for all correspondence concerning the Symposium, was also presented by the Secretariat. The Committee suggested some minor modifications and then approved the design.

14.5 The Committee strongly recommended the Commission to make a final decision on holding the Symposium and provide the necessary funding for the Symposium, although the scientists should also seek outside funding for this important event of the Commission.

15. Review of ICCAT publications

15.1 The Committee noted that this subject has been adequately covered by the Sub-Committee on Statistics and concurred with the recommendations made by the Sub-Committee, particularly the proposal that a copy of both the *Biennial Report* and the *Collective Volume of Scientific Papers* be sent, via air mail, to the Head Delegates and/or Chief Scientist of each Contracting Party that attended the meetings.

15.2 The Committee found the progress in the preparation of the special publication of the Albacore Research Program to be satisfactory and looked forward to receiving this enhanced publication.

16. Review of future SCRS activities

16.1 BYP Program Plan

According to the discussions under Agenda Item 9, Dr Tsuji, the Program Coordinator for western Atlantic Bluefin, presented the Modified BYP Program Plan (2nd Generation), which was drafted by the east and west bluefin coordinators. Dr. Tsuji explained that the Modified Plan is based on the recommendations made at the Planning Meeting (Genoa, March, 1995). The Committee thanked the Coordinators for their rapid and efficient work and adopted the Plan, which is attached as **Appendix 7**.

The SCRS reiterated the proposal for modest BYP Program funding by the Commission and urged the Commission to give serious consideration to this matter.

16.2 Billfish Program Plan for 1996

The Billfish Program Plan for 1996 was presented to the Committee by the west Atlantic Coordinator, Dr. E. Prince (U.S.A). He explained that the Plan was very similar to that of 1995, with only minor changes. The Committee thanked the Program Coordinators, particularly Dr. Prince, for their efforts throughout the year, for obtaining funds from private sources and for carrying out the Program as planned. The 1996 Program Plan was adopted and attached as **Appendix 5**. All the recommendations included in the Plan were also forwarded to the Commission for due consideration.

16.3 Organization of the SCRS sessions (Report of the Chairman's Advisory Committee)

The Report of the Chairman's Advisory Committee was submitted under Agenda Item 2, since its contents had direct bearing on the drafting/reporting procedures to be implemented during this SCRS Session. The Committee evaluated these new procedures from the point of view of the Committee's experience at this meeting.

In general, it was recognized that the new scheme resulted in a very concise product, which will greatly facilitate the Commission's review of the SCRS Report. The new system also considerably reduced the work load of the Secretariat staff during the meeting, and the scientists involved.

The Committee also discussed ways to further improve the new reporting system. A request was made that the "Detailed Reports" be translated before inclusion in the Collective Volume series and this was agreed upon by the SCRS. In view of the numerous intercessional meetings scheduled for 1996, the Secretariat considered that it might be difficult for the staff to carry out this work. The Committee then requested the Commission to establish a $ 5,000 contingency fund for outside contracting of this work. The Committee further decided that since the Detailed Reports contain information on the scientific methodologies applied in the assessments, these reports need not be transmitted to the Commissioners, particularly since it is the responsibility of the national scientists to brief their respective Commissioners.

The Committee thanked the Advisory Group, particularly Dr. J. Porter, for the time and effort devoted to drafting efficient, new drafting and reporting procedures for the SCRS. Appreciation was also expressed to the Group for their work in producing the first definition of technical terms, in response to a request to the SCRS by the Commission. It was agreed that this list would be improved and expanded in the future for inclusion later in one of the Commission's basic publications, such as the "Field Manual". The Definition of Technical Terms is attached as **Appendix 12**.

The Committee agreed that even if stock assessments are not carried out for a particular species, a projection of stock conditions should be made using the latest stock assessment results and the newest data base, and that the results should be included in the "Executive Summary".

Some scientists felt that the figures attached to the Executive Summary should be expanded to include some of the stock assessment results. However, the Committee agreed that this year's system should be well implemented, i.e. that figures should only occupy one page. The use of better quality paper, as recommended by the Sub-Committee on Statistics, was recommended as a means to improve the legibility of these reduced size figures.

The SCRS Chairman was asked to seek the opinions of the Commissioners on this new reporting system.

The Committee, cognizant that the frequent changes of Task I data during and throughout the meeting of the species groups caused unnecessary delays in the work of scientists and the Secretariat, decided that no changes must be admitted after the first day of meeting of these groups.

17. Recommendations

17.1 Management recommendations

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

17.2 General recommendations which have financial implications for the Commission

Numerous recommendations by the SCRS to the Commission are noted under various Agenda items and in the Reports of the various Sub-Committees and Working Groups. Among these recommendations, several require Commission funding and/or have some financial repercussion for the Commission. These are listed below, for the convenience of the Commission:

a) The Bluefin Year Program Plan **(Appendix 7)** includes a request for funding for several research items (See also Item 9 of this Report).

b) The Report of the Sub-Committee on Statistics Report **(Appendix 9)** contains several recommendations, such as the updating of Secretariat computer facilities **(Addendum 2 to Appendix 9)**, and reiterates those concerning the hiring of a biostatistician, the mailing of some of the Commission publications by air-mail, consideration of using better quality paper for copying meeting documents.

c) The proposal made by the Sub-Committee on Environment **(Appendix 8)** to put observers on fishing vessels was considered too costly for Commission financing. However, the SCRS reiterated the importance of this research item and the urged the national offices to give due consideration to this recommendation.

d) The budget proposed by the Symposium Steering Committee to hold the ICCAT Symposium is discussed under Item 14 of this Report and is attached as **Appendix 11.**

The following recommendations for research on each species also requires some funding from the Commission and/or large-scale funding by the Contracting Party Governments. The Committee considers that carrying out all these recommendations is the responsibility of tuna fishing nations, to comply with the request for responsible fishing.

17.3 Recommendations relative to research of various tuna species

TROPICAL TUNAS: *(i)* The development of tropical tuna fishing using artificial floating objects has been a continuous cause for concern to the Committee since 1991. The effects derived from the increased use of this fishing method are reflected in the species composition of the catches of the three main species, especially young bigeye tuna, as well as in the by-catch of non-targeted species. For this reason, the Committee recommended that pilot studies developed up to now be extended on a time-area basis and include the different types of association linked to the purse

seine fishery. On the basis of the results obtained, the development of an improved sampling strategy and an optimal correction procedure of species composition be developed, as well as raising the sizes to the catch.

(ii) The important technical devices with which purse seiners have been progressively equipped over the last 10 years, together with new fishing methods (fishing using artificial objects, possible use of sonar for locating bigeye, etc.) have resulted in a continuous increase in purse seine fishing power which has not yet been evaluated. Thus, it was recommended that a structure be established for collecting and preparing information relating to potential factors which may increase fishing potential.

(iii) A large-scale of tagging program for bigeye tuna is highly recommended to improve the current knowledge of stock status. The main objectives are to obtain information regarding (1) stock structure, (2) growth, (3) abundance independent from the fishery statistics, (4) natural mortality. These parameters are necessary not only for the stock assessment but also to evaluate the potential interactions between fisheries catching small bigeye tuna (tropical baitboats and purse seiners) and large bigeye (longliners and baitboats in the islands). This bigeye tagging program is urgently needed, considering the dramatic increase in purse seine and longline catches, as well as the subsequent possible over-fishing of the stock. Such an intensive tagging program would probably be expensive, but considering the high value of bigeye tuna, (at least on the "sashimi" market), this project would be a key and a very good investment to develop in the future a rational management of this stock. This tagging program can easily be conducted in the eastern Atlantic as this species is actively fished at various sizes by various baitboat fleets, which is the ideal gear to carry out tagging. Yellowfin tunas can also be tagged during this program on an opportunistic basis to test the hypothesis that small yellowfin born in the eastern Atlantic migrate massively to the western Atlantic. Since this tagging program needs to be assessed at all levels (scientific, practical and financial), it is recommended that ICCAT conduct a feasibility study in 1996 on a large-scale tagging program for bigeye and yellowfin tunas. This project should be submitted to and discussed by the SCRS in 1996 and then submitted to the 1996 Commission Meeting for approval of the program and to ensure funding sources.

ALBACORE: *(i)* The next albacore meeting will assess the status of northern and southern stocks and should be held in 1996 and, if possible, separate from the SCRS, with a minimum duration of one week.

BLUEFIN TUNA: *(i)* The Committee suggested that ICCAT take a lead role in securing funding for conducting a bluefin archival tagging experiment aimed at acquiring data on their biological attributes and movement patterns. The Committee noted that pilot studies must begin immediately to gain the practical knowledge necessary to implement an archival tagging experiment. These include tag attachment and fish handling techniques, among others. It is also noted that a good understanding of reliability of reporting rates is essential for future planning of research programs as well as for analysis of conventional tagging data. Representatives of member countries should formulate the experimental design, identify priorities, and determine the logistic requirements for the international coordination of this tagging program.

(ii) A meeting of the *Ad Hoc* GFCM/ICCAT Working Group will be needed to develop (1) the 1995 (and perhaps 1994) catch at size and (2) standardized indices of abundance, and (3) to encourage GFCM participation in ICCAT assessments. The Committee noted continued improvements in timely catch reporting but noted that for 1994, size composition was available for only about 20% of those catches at the 1995 meeting. The GFCM/ICCAT meeting should be immediately followed by a preparatory meeting on methodologies to be applied to stock assessments of east and west bluefin tuna. The assessment itself should be carried out nine days before the annual SCRS meeting.

(iii) An inter-sessional meeting of principle investigators working on the 1994 larval surveys in the Gulf of Mexico and Mediterranean Sea was recommended for early 1996.

BILLFISH: *(i)* The Committee recommended that an inter-sessional meeting on billfish be held in Miami, Florida, USA in July 1996 (at the invitation of the U.S. Government), in order to accomplish updated assessments of billfish, as identified in the Executive Summary reports. This would involve development, revision, and/or correction of landing statistics and standardized CPUE series for the major longline fisheries, as well as the relevant recreational and artisanal fisheries. Computations of dead discards for historical longline fisheries, where appropriate, would also be involved.

(ii) It was also recommended that ICCAT rigorously continue to pursue implementation of the ICCAT Billfish Tagging Program, particularly as this applies to release and recapture activities of the offshore longline fleets.

SWORDFISH: *(i)* The Committee recommended that (1) a sex-specific analysis be conducted and (2) that CPUE indices for the south Atlantic be improved in order to conduct a south or total Atlantic assessment. The SCRS recommended that an inter-sessional meeting be held in early 1996 to complete a sex-specific VPA and a south Atlantic assessment using data to the end of 1994. National scientists whose fleets catch swordfish in the south Atlantic were especially encouraged to attend this swordfish inter-sessional meeting. A one-day meeting will be held prior to the SCRS to run projections from the new stock assessment and include the 1995 catches.

17.4 Inter-sessional scientific meetings in 1996

The overall organization of the SCRS inter-sessional scientific meetings for 1996 were discussed. The Committee recognized that several important inter-sessional meetings have been proposed by various groups. A small study group was formed to work on the scheduling of these meetings. The following proposal was presented to the Committee:

- Shark Working Group of the Sub-Committee on By-catches, as proposed by *Ad Hoc* Working Group on By-catches: February, 1996, at the NMFS Southeast Fisheries Science Center in Miami, Florida, at the invitation of the U.S. Government.

- Swordfish Species Group meeting (as recommended in Item 17) (and dependent on the availability of Spanish swordfish data): February-March, 1996, for 6-7 working days, at the NMFS Southeast Fisheries Science Center in Miami, Florida, at the invitation of the U.S. Government (probably held concurrently with the Working Group on Sharks).

- BYP Larval Survey meeting, as proposed by the Bluefin Tuna Species Group: March or April, 1996, possibly in Fano, Italy.

- ICCAT Tuna Symposium, as proposed by the Steering Committee: June 10-18, 1996, in Ponta Delgada, Sao Miguel, Azores, Portugal, by the invitation of the Regional Autonomous Government of Azores.

- Billfish Stock Assessment meeting (3rd Workshop), as proposed by the Billfish Species Group: Late July or August, 1996, at the NMFS Southeast Fisheries Science Center in Miami, Florida, at the invitation of the U.S. Government.

- Third Meeting of *Ad Hoc* GFCM/ICCAT Joint Working Group on Stocks of Large Pelagic Fishes in the Mediterranean Sea, to be held concurrently with the ICCAT Session on Atlantic Bluefin Assessment Methodologies and Data Preparation, as proposed by the Bluefin Species Group: Possibly September 11-17, at a city in Italy (possibly Messina).

- Albacore Stock Assessment Session, as proposed by the Albacore Species Group: October 9-15, 1996, at the ICCAT Headquarters in Madrid, Spain.

- Atlantic Bluefin Tuna Stock Assessment Session, as proposed by the Bluefin Species Group: October 16-25, 1996, at the ICCAT Headquarters in Madrid, Spain.

- Other Species Group Meetings: October 23-25, 1996, at the ICCAT Headquarters in Madrid, Spain.

After a thorough review and discussion of the above meeting schedule, it was agreed upon, in principle, by the Committee. While the schedule is quite full, the Committee considered that all these meetings are an essential part of the Commission's research activities. The Committee recommended some flexibility as regards the dates and places and requested the Secretariat to finalize the dates and venues in consultation with the SCRS Chairman and pertinent scientists.

The Committee also recognized that the Third GFCM/ICCAT joint meeting should be arranged with FAO and hence requested the GFCM Technical Secretary (Dr. P. M. Miyake) in consultation with the GFCM Secretary, to make every effort to assure that this meeting can be arranged and held.

The Committee requested the Executive Secretary to assure that the necessary budgetary provision is made to cover such meeting costs, as well as any necessary Secretariat staff's travel expenses to organize and participate actively in these meetings.

18. Cooperation with non-contracting parties and other fisheries organizations

18.1 The SCRS Chairman noted that this item (particularly concerning cooperation with FAO, CITES, CWP, ICES, IPTP, IATTC, etc.) had been well covered under other Agenda items.

19. Election of SCRS Chairman

19.1 Dr. A. Fonteneau was asked to chair the session for the election of the SCRS Chairman. At the proposal of the U.S., Dr. Z. Suzuki was unanimously re-elected Chairman by acclamation.

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

20.1 The SCRS proposed that the 1996 SCRS meeting be held for a five-day period, starting on Monday, October 28, through Friday, November 1, in principle, in Madrid, Spain. As recommended in the Sub-Committee on Statistics, holding the SCRS meeting earlier than these proposed dates would be detrimental to satisfactory stock assessments, due to the unavailability of adequate statistics at that time.

21. Other matters

21.1 A proposal was made that the Secretariat maintain a bibliographic data base (including ICCAT's own publications) on tuna research, as well as adequate software to access this base. Commercial data bases of this sort are available on CD Rom. Such a system will facilitate the work of the scientists in searching background literature.

21.2 The Committee recommended that the Secretariat look into different options available and obtain the data base, if feasible.

21.3 The Second Consultation on the Technical Aspects of Methodologies Which Account for Individual Growth Variability by Age (Brest, 1994) recommended the Secretariat to simulate a catch-at-size curve, while maintaining the confidentiality of the various input parameters. This assignment was found to require very high technical knowledge and extensive research time. The Chairman of the Consultation (Dr. G. Scott) was asked to look into the matter to find an outside volunteer, including someone from FAO, to carry out this work.

21.4 The Observer from the UK (Dr. L. Kell) commented that his Lowestoff Laboratory was involved in the work of simulating models and may be able to assist us in such a project. However, he requested more details on the requirements before giving a definite answer. The Committee thanked him for this offer and asked the Consultation members to explain further the requirements of this work to Dr. Kell.

22. Adoption of Report

22.1 The 1995 SCRS Report was adopted with some modifications.

23. Adjournment

23.1 At the time of adjournment of the 1995 SCRS, the Chairman, Dr. Suzuki, expressed his appreciation to all the scientists, the Secretariat, and the team of interpreters. He thanked the Committee for its continued support and he hoped to do all he could during his second term as SCRS Chairman to maintain the high level of ICCAT's scientific work, which has earned the respect of the international scientific community.

23.2 Dr. Miyake, on behalf of the ICCAT Secretariat congratulated the SCRS Chairman for his re-election and for the excellent job he did in chairing this year's sessions and in coordinating the Committee's work throughout the year. He also thanked the Committee for its dedicated work and cooperation with the Secretariat throughout the year.

23.3 The 1995 Meeting of the Standing Committee on Research and Statistics was adjourned.

Attachment A

ADDRESS BY DR. RIBEIRO LIMA, COMMISSION CHAIRMAN, AT THE INAUGURAL SESSION OF THE 1995 SCRS

(Hotel Chamartin, Madrid, October 9, 1995)

Mr. SCRS Chairman, friends and colleagues:

It is a great honor for me, as ICCAT Chairman, to address the members of our Standing Committee on Research and Statistics.

As you will recall, this year are celebrating the 25th Anniversary of our Organization, and I wanted to highlight, by my presence at this opening session, the great importance that the Commission gives to the work and results of its scientific Committee.

The SCRS constitutes the basic nucleus that enables the Commission to carry out its functions with the necessary scientific and technical advice, which, while always helpful, becomes absolutely vital in cases where important recommendations must be adopted relative to the conservation and management of the pelagic species under our mandate.

By your contributions, you are adding, year after year, new facts to the store of knowledge which ICCAT has accumulated over time. In reality, you are the principal, and perhaps the only, people in the world on whom rests the noble scientific responsibility of investigating and assessing the current status of the stocks of tunas and related species, whose importance I do not need to recall here.

You are all well aware of the increasing concern in the world for the conservation of ecological balance and biodiversity. Important initiatives have been undertaken on a world-wide scale that have a clear influence on the activities of the SCRS, and which recognize the need to rely on more solid and reliable statistical data and scientific reports. For example, the United Nations Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks has established, in Article 14 of the Agreement recently adopted in New York, the minimum requirements for the collection and dissemination of statistics, and has highlighted the need to reinforce inasmuch as possible the structures for marine biology research in fishing countries. The FAO, for its part, has practically concluded the adoption of the new Code of Conduct for Responsible Fishing, the content of which also affects the improvement of statistics and fisheries research.

In view of comments arguing low returns of fishery research to justify a lack of budgetary allocations for scientific work, it should be recalled here that the proportion between fishery research costs and the sectorial value of the fishing industry is usually considerably less than the proportional costs corresponding to other industries or primary sectors, whereas the fishing industry contributes to socio-economic stability, sustaining an activity that is difficult to reconvert, in terms of employment.

I would like to congratulate the scientists for the enthusiasm with which you have embraced the initiative of Dr. Fonteneau to hold an important Tuna Symposium, coinciding with the 25th Anniversary of ICCAT, and I thank you in advance for your positive participation in the sessions and topics to be discussed. Our responsibility will continue to be the obtaining of the advice necessary to maintain viable fisheries in sustainable ecosystems. Since its beginning, the Commission has relied on eminent scientists of the SCRS, who, year after year, and often without the awareness of the public, have been providing the basis for the assessments of the state of the stocks under our purview. The collection and compilation of statistical and biological data have also been fundamental in this process. However, the extraordinary progress in fishing technology in recent years renders advisable the updating of traditional methods of obtaining, processing and disseminating the data obtained on the fisheries. I am sure that the Symposium that ICCAT will hold in June, 1996, in Ponta Delgada, San Miguel, Azores, will represent a milestone in the progress of all the aspects of our scientific values, making the advice of the SCRS ever more valuable, by progressively eliminating the usual hesitancy with which it is characterized.

In conclusion, I would like to reiterate the great esteem the Commission has for the professional level and dedication of the SCRS scientists, and I hope that the sessions which open today under the chairmanship of Dr. Suzuki will be useful and beneficial to all.

I am also pleased to remind you that, at the close of today's session, we will hold the traditional annual lottery to award the prizes for the ICCAT International Tagging Program, after which I invite you all to share, in harmony and friendship, some refreshments offered by the Secretariat.

Appendix 1

SCRS AGENDA

1. Opening of the meeting
2. Adoption of Agenda and arrangements for the meeting
3. Introduction of Contracting Party delegations
4. Admission of observers
5. Admission of scientific documents
6. Review of national fisheries and research programs
7. Reports of 1995 inter-sessional scientific meetings
8. Review of the progress made by the Program of Enhanced Research for Billfish
9. Review of the progress made by the Bluefin Year Program and proposed modifications to the BYP Program Plan
10. Executive Summaries on species: YFT-Yellowfin, BET-Bigeye, SKJ-Skipjack, ALB-Albacore, BFT-Bluefin, BIL-Billfishes, SWO-Swordfish, SBF-Southern Bluefin, and SMT-Small Tunas
11. Report of Sub-Committee on Environment
12. Report of the Sub-Committee on Statistics and review of Atlantic tuna statistics and data management system
13. Report of the Ad Hoc Working Group on By-catches. Future plans for the collection of by-catch statistics
14. Report of the Steering Committee on the ICCAT Tuna Symposium. Progress on the organization of the Symposium and consideration of funding requirements
15. Review of ICCAT publications
16. Review of future SCRS activities
    - Organization of the SCRS sessions (Report of the Chairman's Advisory Committee)
    - Inter-sessional scientific meetings in 1996
    - Other matters
17. Recommendations
    a) Management recommendations
    b) General recommendations which have financial implications for the Commission
    c) Recommendations relative to research of various tuna species
    d) Inter-sessional scientific meetings in 1996
18. Cooperation with non-Contracting Parties and other fisheries organizations
19. Election of SCRS Chairman
20. Date and place of the next meeting of the SCRS
21. Other matters
22. Adoption of Report
23. Adjournment

Appendix 2

LIST OF SCRS PARTICIPANTS

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SCRS/95/3	Tentative Agenda of the Sub-Committee on Statistics
SCRS/95/4	Tentative Agenda of the Sub-Committee on Environment
SCRS/95/5	Organization of the 1995 Meeting of the SCRS
SCRS/95/6	Guidelines for the presentation of Documents to the 1995 SCRS
SCRS/95/7	Questionnaire on by-catch - ICCAT Secretariat **Annex** to SCRS/95/7: Brazilian data **Annex 2** to SCRS/95/7: Spanish data
SCRS/95/8	Tuna fisheries in eastern Atlantic: some statistical aspects - Cuevas, A., J. de la Horra
SCRS/95/9	Rapport sur la réunion annuelle de l'IATTC (Commission Interaméricaine du Thon Tropical) (San Diego, Californie, USA, 13-15 juin 1995) - Fonteneau, A.
SCRS/95/10	Rapport de la réunion IPTP sur les thons de l'Océan Indien (Colombo, 23-29 septembre 1995) - Fonteneau, A.
SCRS/95/11	Report to the ICCAT SCRS on the participation in the 2nd ICES study group on elasmobranch fishes-Nakano, H., Y. Uozumi **Annex** to SCRS/95/11: Report of the Study Group on Elasmobranch Fishes (ICES Headquarters, Copenhagen, Denmark, 15-18 August 1995) - ICES
SCRS/95/12	Report on Statistics and Coordination of Research in 1995
SCRS/95/13	Report of the Contributions-Expenditures of the ICCAT Enhanced Billfish Research Program in 1995
SCRS/95/14	Report of the ICCAT Planning Session for the Bluefin Year Program (BYP) (Genoa, Italy, March 13-14, 1995)
SCRS/95/15	Report of the Second Meeting of the Ad Hoc GFCM/ICCAT Working Group on Stocks of Large Pelagic Fishes in the Mediterranean Sea (Bari, Italy, September 13-19, 1995)
SCRS/95/16	Report of the Meeting of the ICCAT Working Group on Vessel Monitoring (Seattle, Washington, USA, May 17-18, 1995) **Annex** to SCRS/95/16: Appendices 4-12
SCRS/95/17	United Nations Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks (New York, March 27-April 12 and July 24-August 4, 1995)
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SCRS/95/31	Multi-species and multi-gear tuna fisheries in the Atlantic and possible interactions between gears and species - Miyake, P.M., P. Kebe
SCRS/95/32	Report on FAO Expert Consultation on Interaction of Pacific Tuna Fisheries (Shimizu, Japan, 23-31 January 1995) - Miyake, P.M.
SCRS/95/33	Report on the Workshop on Northern Pacific Bluefin Tuna (Shimizu, Japan, February 1-2, 1995) - Miyake, P.M.
SCRS/95/34	ICCAT BYP Programme - Instituto Español de Oceanografía (IEO)

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SCRS/95/36 Japanese progress report on ICCAT Bluefin Year Program (BYP) - Suzuki, Z., S. Tsuji
SCRS/95/37 Projet de programme de recherche sur le thon rouge proposé dans le cadre du "Programme ICCAT Année Thon Rouge (BYP)" (Maroc)
SCRS/95/38 U.S. bluefin tuna research in support of BYP
SCRS/95/39 El problema de las correcciones multiespecíficas de las capturas atuneras. Aplicación de un modelo log-lineal iterativo a las capturas venezolanas de superficie (1987-93) - Gaertner, D., J. Marcano, H. Salazar, L. Astudillo
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SCRS/95/42 (GFCM-ICCAT/95/2) Status report of the Japanese tuna longline fishery in the Mediterranean Sea with special reference to swordfish - Takeuchi, Y.
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SCRS/95/50 Unusual occurence of ""green tunas in Abidjan landings, 1993-1995 - Bard, F.X., J.B. Amon Kothias, J. Panfili, A. Hervé
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SCRS/95/99 Age validation and growth of swordfish, *Xiphias gladius*, in the Northwest Atlantic - Ehrhardt, N.M., R.J. Robbins, F. Arocha

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SCRS/95/101 U.S. swordfish catch at age by sex - Turner, S.C., F. Arocha, G.P. Scott

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SCRS/95/103 Overview of the SEFSC pelagic observer program in the Northwest Atlantic from 1992-1994 - Lee, D.W., C.J. Brown, T.L. Jordan

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Appendix 4

REPORT OF THE CONTRIBUTIONS/EXPENDITURES OF THE ICCAT ENHANCED BILLFISH RESEARCH PROGRAM IN 1995

The ICCAT Enhanced Research Program for Billfish, which began in 1987, continued in 1995. 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 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 1995.

The General Coordinator of the Program is Dr. B. Brown (USA); the East Atlantic Coordinators are Dr.T. Diouf (Senegal) and Mr. M. Mensah (Ghana), while the West Atlantic Coordinator is Dr. E. Prince (USA).

Table 1 shows the income received at the Secretariat towards the Billfish Program, expenses for 1995, and the balance of Billfish Program funds (as of October 3, 1995). At the start of Fiscal Year 1995, there was a balance of US$ 55,553.86 in the Billfish Program account. Income received in 1995 was limited to the interest earned on a time-deposit account. It should also be noted that the ICCAT Secretariat, with the authorization of the Billfish Program Coordinator, arranged for a portion of the budget to be deposited in a time deposit account. This was done at the beginning of the year in order to earn interest on that portion of the funds intended to be used during the later part of the 1995 sampling season. The interest earned from this effort is reflected as a deposit of US$ 657.71. These funds are intended to support research activities for the 1995 and 1996 sampling seasons. Overall, the Program Plan for 1995 was successfully carried out in a timely manner.

Table 2 shows the Billfish Budget and expenditures as of October 3, 1995. It should be noted that several additional expenditures are expected to be incurred before the end of 1995. Several budgetary items show a zero expenditure. This is due to the fact that authorization of some budgetary expenditures of the 1995 Budget was dependent on the sufficiency of funds, while in other cases no request for funding was submitted to the General Coordinator.

Progress of research carried out during 1995 in the west Atlantic is described in SCRS/95/107. Research carried out in the eastern Atlantic mainly involved documentation of landing statistics and this is described as part of the exploratory stock assessment for eastern Atlantic sailfish (SCRS/95/105). In addition, progress in data compilation and analysis of fisheries for billfish in the eastern Atlantic are described in SCRS 95/51 and in the western Atlantic in SCRS 95/106 and SCRS/95/63.

One of the most important research activities related to the ICCAT Enhanced Research Program for Billfish is at-sea sampling on industrialized longline vessels (summarized in **Table 3**). This activity has been carried out primarily in the western Atlantic on Venezuelan vessels fishing in the Caribbean sea. The historical sampling rate has increased significantly since 1987, with only three trips during the first 3 years and a steady increase to over 30 trips, or over 200 sets, during the last four years (including 1995). Therefore, the volume of information is now large. Observations from at-sea sampling on whether billfish are being brought alongside longline vessels as either dead or alive has been extremely valuable in calculations of dead discards resulting from longline activity in the western Atlantic. In addition to data on billfishes, it should be noted that data on the size of many different species are also being collected, particularly for the target species of the longline fleet--yellowfin tuna and swordfish. For example, size data on 8,151 yellowfin tuna, 3,249 swordfish, and 2,479 bigeye tuna has been collected during these at-sea sampling trips from 1987-1995. Although the initial purpose of this research activity was intended to focus on billfishes, it seems obvious that this at-sea sampling program is now a valuable source of information for yellowfin tuna, swordfish, as well as other highly migratory species. The ICCAT Secretariat has been given an updated computerized data base that contains at-sea sampling data through 1995.

Table 1. Funds received in 1995 for Billfish Program (up to October 3, 1995)

SOURCE	*AMOUNT (in US $)*
Starting Balance (1995)	55,553.86
Bank interest	657.71
TOTAL FUNDS AVAILABLE IN 1995	56,211.57
TOTAL EXPENDITURES IN 1995 (see **Table 2**)	39,491.88
BALANCE IN BILLFISH FUNDS (as of Oct. 3, 1995)	**16,719.69**

Table 2. Budget & Expenditures of the Enhanced Billfish Research Program (as of Oct. 3, 1995) (US$)

	Amount Budgeted	*Expenditures*
SPECIES IDENTIFICATION KITS:	1,000.00	0.00
AGE AND GROWTH: Purchase of hard parts	500.00	0.00
TAGGING:		
Tag rewards	500.00	500.00
Lottery rewards	500.00	0.00
Hard part rewards	500.00	0.00
Printing posters and recapture cards in Japanese/Chinese/Portuguese	3,000.00	0.00
Tags and tagging equipment	2,000.00	0.00
STATISTICS & SAMPLING ENHANCEMENT		
-- *West Atlantic shore-based sampling:*		
Cumaná, Venezuela	300.00	0.00
Puerto La Cruz, Venezuela	240.00	0.00
Juangriego, Venezuela	864.00	700.00
Playa Verde, Venezuela	500.00	420.00
Playa Grande Marina, Venezuela	1,680.00	1,540.00
Venezuela tournaments in Puerto Cabello and Falcon	760.00	720.00
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	1,000.00	1,000.00
-- *West Atlantic at-sea sampling:*		
Venezuela (Cumaná, Puerta La Cruz, Carupano, Juangriego)	22,300.00	19,820.00
Insurance for Venezuelan Observers	1,000.00	1,000.00
St. Vincent and Grenada	2,000.00	0.00
Telemetry/Hook Timer studies (travel)	2,000.00	2,000.00
Brazil	1,000.00	0.00
-- *East Atlantic shore-based sampling:*		
Dakar, Senegal	1,500.00	0.00
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	9,169.19
Mailing & miscellaneous--East Atlantic	100.00	0.00
Secretariat support (data management, mailing, etc.)	2,500.00	2,500.00
Bank charges on Billfish account	500.00	122.69
GRAND TOTAL	**69,894.00**	**39,491.88**

Table 3A. Numbers of trips and sets, average number of hooks per set and longline length per set (km), numbers of billfish caught, and estimated mortality of billfish brought alongside the boat for at-sea sampling in Venezuela, 1987-1994.

Year:	*1987*	*1988*	*1989*	*1990*	*1991*	*1992*	*1993*	*1994**	*1987-94*
No. trips	3	3	3	7	16	32	37	36	137
No. sets	23	37	34	43	99	265	488	350	1,399
Avg.hooks/set	1171	1225	2439	1552	1646	1036	1231	1225	1,284
Avg. length/set	57	58	42	46	39	47	50	50	50
BUM caught (no.)	38	13	11	34	59	87	96	173	511
WHM caught (no.)	144	60	47	69	60	92	242	352	1,066
SAI caught (no.)	30	7	18	19	94	148	250	142	708
SPF caught (no.)	0	0	0	8	36	31	66	92	233
% BUM mortality	68	40	64	76	67	52	38	55	51
% WHM mortality	55	55	65	56	57	65	61	43	59
% SAI mortality	50	67	72	68	78	66	67	46	69
% SPF mortality	N/A	N/A	N/A	75	67	61	65	44	62

* 1994 data are preliminary.
BUM = Blue marlin; WHM = white marlin; SAI = Sailfish; and SPF = Spearfish.

Table 3B. Summary of industrial longline set data from Venezuela vessels targeting yellowfin tuna and swordfish, 1987-1994.

Season	*Winter*	*Spring*	*Summer*	*Fall*	*Total*
Trips					134.0
Sets	237.0	353.0	346.0	451.0	1387.0
Hooks	377,905.0	314,748.0	386,967.0	700,940.0	1,780,560.0
Hooks per set	1,594.5	891.6	1,118.4	1,554.2	1,283.7
Line length	13,554,556.0	15,216,305.0	16,118,978.0	23,888,079.0	68,777,918.0
Length per set	57,192.2	43,105.7	46,586.6	52,966.9	49,587.5

Appendix 5

1996 PROGRAM PLAN FOR THE ICCAT ENHANCED RESEARCH PROGRAM FOR BILLFISH

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 with the intention of developing the data necessary to assess the status of the billfish stocks. This goal was 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). Most recently, an exploratory stock assessment for east Atlantic sailfish was submitted to the 1995 SCRS (SCRS/95/105). However, many of the data acquisition problems remain and maintenance of important elements of the billfish data bases, to insure uninterrupted time series, requires the Enhanced Research Program for Billfish to be continued and expanded in critical areas as recommended by the Workshop (SCRS/92/16).

It was confirmed that Drs. B. Brown and E. Prince (U.S.A.) will continue to function as the General Coordinator and West Atlantic Coordinator, respectively. Drs. T. Diouf (Senegal) and M. Mensah (Ghana) will continue to be the Co-Coordinators for the east Atlantic Ocean. Research results (SCRS/95/107, SCRS/95/106, SCRS/95/63, SCRS/95/51) as well as a financial summary for 1995 (SCRS/95/13) were presented to the 1995 SCRS and Commission meetings.

The summary of the 1996 proposed budget is attached as **Table 1**. Highlight reports of research activities will continue to be provided to interested parties on a bi-annual basis. In addition, names and addresses of individuals receiving the reports and those involved or interested in the research program will continue to be available upon request. Projected funds for future research activities will be available in subsequent annual plans.

All agencies and/or personnel receiving ICCAT funding from the Billfish Program **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. In addition, all funded participating cooperators in this Program **will be required** to request the release of funds (via fax) from the General Program Coordinator and to submit data collected in previous years either to area Coordinators or directly to the ICCAT Secretariat.

a) Shore-based sampling

Brazil. Shore-based sampling of billfish tournaments will be initiated in Brazil for 1996. Dr. Alberto Amorin, Instituto de Pesca, will coordinate tournament sampling activities in the general vicinity of Santos, as well as other locations. The amount of $1,500 will be required for this activity in 1996.

Cumaná, Playa Verde, Puerto La Cruz, and 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 1996. 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 1996 and the requested funding for these segments is as follows: Puerto La Cruz $240; Juangriego $864; and Playa Verde $500. Several trips by the West Atlantic Coordinator or his designee (Mr. F. Arocha, U.D.O. now studying in Miami, Florida) will be necessary to organize sampling, collect data, and transport biological samples to Miami in 1996. The amount of $500 will be required for tag rewards in Venezuela for 1996 that are made by FONAIAP staff (see Section d, Billfish Tagging).

Caracas, Venezuela. Shore-based sampling and detailed analysis of the recreational fishery (centered in La Guaira, Venezuela) will be continued in 1996. This sampling includes coverage of four recreational billfish tournaments held in Puerto Cabello and Falcon. Requested funding for this activity in 1996 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 1996 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 (Mr. C. Isaac and Mr. P. Phillip) in 1996. Shore-based sampling activities will start in early November, 1995, to coincide with the start of the pelagic fishery at this location. This activity will also include sampling of the Spice Island Billfish tournament. At-sea sampling on the new longline vessels are discussed in the next section. Requested funding for 1996 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 1996. Efforts will also be made to obtain these data from the artisanal canoe fishery as well. Requested funding for 1996 is $1,000.

Martinique. Shore-based sampling of recreational billfish tournaments (about 8) in the Caribbean Island locations of Martinique, St. Lucia, and Guadeloupe will be conducted in 1996. This work will be coordinated by IFREMER in Martinique. Requested funding for 1996 is $1,500.

St. Maarten, Netherlands Antilles. Shore-based sampling of size frequency data for off-loaded billfish carcasses from longline vessels will be continued in 1996 through the Nichirei Carib Corporation. Requested funding for this in 1996 is $1,500. Shore-based sampling of the annual recreational billfish tournament, initiated in 1992, may be continued (there is some uncertainty due to hurricane damage in 1995) in 1996 by the West Atlantic Coordinator. Since this tournament will contribute 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.

U.S. Virgin Islands. Shore-based sampling of several recreational billfish tournaments in the U.S. Virgin Islands, as well as sampling of catch and effort from non-tournament fishing will be continued in 1996. Requested funding for 1996 is $1,000.

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 continued in 1996. This work is being 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 will be necessary to review the research plan and organize field research activities. Requested funding for 1996 is $1,000.

Dakar, Senegal. Shore-based sampling of the Senegalese artisanal, recreational and industrial fisheries for size frequency, sex determination, and catch and effort data will be continued in 1996 by Dr. T. Diouf, the East Atlantic Coordinator. Requested funding for 1996 is $1,500.

Côte d'Ivoire. Abidjan shore-based sampling of the artisanal and recreational fisheries for billfish will be continued and directed by CRO staff in 1996. Funding for 1996 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 1996 by Mr. S. N. K. Quaatey. Standardized CPUE's for sailfish will be developed for the time series, 1974-1994. Funding for 1996 will be $1,500. At least one coordination trip by Dr. T. Diouf will be required to accomplish this task in 1996.

Canary Islands. Shore-based sampling of size frequency of off-loaded billfish carcasses from Taiwanese longline vessels may be continued in 1996. Requested funding for 1996 is $400.

b) At-sea sampling

Venezuela. At-sea sampling out of the port of Cumaná, Puerto La Cruz, Carúpano, and Juangriego will be continued in 1996. A total of about 15 tuna trips ($9,000), 15 swordfish trips ($9,000), 2 long-range trips on large Korean-type vessels ($2,300), and 8 trips on smaller longline vessels ($2,000) will be made in 1996. Insurance will be $1,250 and the total funding for 1996 will be $23,550.

Brazil. At-sea sampling on Brazilian and Taiwanese longliners fishing out of Rio Grande do Sul, Santos, as well as other ports will be initiated in 1996. Dr. A. Amorim from the Instituto de Pesca and Dr. J. H. Meneses de Lima from IBAMA will direct these research activities. A total of 15 observer trips are planned for 1996 ($9,000). The Western Atlantic Coordinator may travel to Brazil in December 1995 to train observers and give a slide presentation on the tagging program. Requested funding for 1996 will be $9,000.

Telemetry and Hook Timing Studies. Proposals for telemetry studies to evaluate the survival of marlin caught and released off longline vessels were not received in 1995. However, a project to evaluate possible avoidance of billfish catches on longline gear, through the use of hook timing devices to document the time and depth of billfish catches, was funded by the U.S Government. This project will be conducted by staff at the Mote Marine Laboratory in Sarasota, Florida, during 1995/96. Data on the short-term survival of billfish caught on longline gear will also be obtained. To insure that this study will have a sufficient sample size of billfish in the longline catch, the Western Atlantic Coordinator has agreed to arrange for at least one longline trip to be made in the winter of 1995/96, from Cumaná, Venezuela, or in association with CARICOM and the Division of Fisheries in St. Vincent and the Grenadines. The by-catch rate of billfish in these locations is sufficiently high for sampling. Most of the funding for this project is already covered but travel costs of $2,000 for a Mote Laboratory scientist will be required for 1995/96 to test the hook timers on a Venezuelan or St. Vincent longline vessel.

c) Billfish Tagging Program

Some tagging supplies for the ICCAT Secretariat may have to be ordered for the 1995/96 tagging season and the funding required for 1996 will be $2,000. In order to further encourage the return of tagged billfish, two types of tagging posters will be printed in Japanese, Chinese, and Portuguese (Brazil) and distributed to longline vessels from these countries. In addition, the florescent orange tag-recapture cards now distributed by the U.S. National Marine Fisheries Service will be printed in the three ICCAT languages (English, French and Spanish) and distributed to participants of the tagging program. Requested funding for printing the new posters and cards is $3,000 for 1996 and $1,000 are required for various tag rewards for 1996. Large quantities of billfish tags needed to support tagging efforts from offshore longline vessels (i.e. Japan, Spain, U.S.) will be supplied by the National Marine Fisheries Service, out of the U.S. budget, using the ICCAT name and Miami address on the tags to defray costs and avoid the burden of large volumes of tagging data entry at the ICCAT Secretariat.

Grenada, St. Vincent and the Grenadines. A joint study to intensively tag and release west Atlantic sailfish will be continued between CARICOM and ICCAT on Grenada and St. Vincent and the Grenadines in 1995/96. New longline vessels obtained from Japan, with live bait holding capabilities, will be used to maximize catch rates on both islands to tag and release sailfish caught by longline gear. The funding allocated for this portion of the study will be $2,000 for 1996 and this amount will likely be matched again by CARICOM. This funding could provide from 10 to 20 trips during the year.

d) Age and growth

Requested funding for biological samples from juvenile and very large billfish, as well as tag-recaptured billfish, is $500 for 1996. The Western Atlantic Coordinator may travel to Madeira, Portugal, in order to sample very large blue marlin that are landed in this location. Only travel funds will be required for this activity.

e) Coordination

e-1 Travel/Coordination

Experience in the west Atlantic (SCRS/90/20, SCRS/91/18, SCRS/92/24, SCRS/93/102, SCRS/94/147, and SCRS/95/107) continues to indicate that it will be necessary to make a series of trips to specific Caribbean island

locations, and occasionally to west Africa 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 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 1996 will be $14,000. Travel may include the following areas:

- Cumaná, Margarita Island, and La Guaira, Venezuela
- Grenada
- St. Maarten, Netherlands Antilles
- Trinidad and Tobago
- Cancún and Cozumel, Mexico
- Dakar, Senegal
- Abidjan, Côte d'Ivoire
- Santos and Recife, Brazil
- Ghana
- St. Vincent
- Other west African and Caribbean countries

e-2 Miscellaneous/Mailing

The requested funding for 1996 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 and shipment of materials, data management, and samples ($1,000) and for miscellaneous expenses and contingencies ($1,500) for 1996 are included. Requested funding for 1996 is $2,500. Bank charges for 1996 are estimated at $500.

Because of unforseen changes in the fisheries and opportunities for sampling, it may be necessary for the General Coordinator to make adjustments in budgeted program priorities. These changes, if any, will be duly transmitted to the area Coordinators and to the ICCAT Secretariat. Also, the implementation of the proposed budget (**Table 1**) is **contingent upon receipt of sufficient funds**. The expansion or reduction of expenses will depend, to a large degree, on the available funds.

Table 1. 1996 Budget of the Enhanced Billfish Research Program (US$)

Budget Chapters	*Amounted budgeted*
AGE AND GROWTH:	
Purchase of hard parts	500*
TAGGING:	
Tag rewards	1,000
Lottery rewards	500
Hard part rewards	500*
Printing posters and recapture cards in Japanese, Chinese, and Portuguese	3,000*
Tags and tagging equipment	2,000
STATISTICS & SAMPLING	
— *West Atlantic shore-based sampling:*	
Brazil tournaments	1,500*
Cumaná, Venezuela	300
Puerto La Cruz, Venezuela	240
Juangriego, Venezuela	864
Playa Verde, Venezuela	500
Playa Grande Marina, Venezuela	1,680
Venezuela tournaments in Puerto Cabello and Falcon	760
Grenada	1,000*
Jamaica	1,000*
Martinique	1,500*
Trinidad & Tobago	1,000*
St. Maarten, Netherlands Antilles	1,500*
U.S. Virgin Islands	1,000*
— *West Atlantic at-sea sampling:*	
Venezuela (Cumaná, Puerto La Cruz, Carúpano, Juangriego)	22,300
Insurance for Venezuelan Observers	1,250
St. Vincent and Grenada	2,000
Telemetry / Hook timer studies (Travel only)	2,000
Brazil	9,000*
— *East Atlantic shore-based sampling:*	
Dakar, Senegal	1,500
Côte d'Ivoire	1,500
Ghana	1,500
Canary Islands	400*
COORDINATION:	
Travel by Coordinators	14,000*
Mailing & miscellaneous-East Atlantic	100
Secretariat support (data management, mailing, etc.)	2,500
Bank charges	500
GRAND TOTAL:	$78,894

* Authorizing these expenditures depends, in part, on additional funds being available.

Appendix 6

REPORT OF THE ICCAT PLANNING SESSION FOR THE BLUEFIN YEAR PROGRAM (BYP)

(Genoa, Italy, March 13-14, 1995)

I. OPENING OF MEETING

The ICCAT Planning Session for the Bluefin Year Program (BYP) was held on March 13 and 14, 1995, at the University of Genoa, Institute of Zoology, in Genoa, Italy, at the invitation of the University of Genoa. Professor G. Relini welcomed the participants on behalf of the Rector of the University of Genoa and introduced Professor L. Orsi Relini, who served as the local coordinator for the meeting, and staff of the University who attended the session. Drs. C. Piccinetti (Italy) and J. L. Cort (Spain) were elected Co-Chairmen for the meeting. Scientists from the following ICCAT Contracting Parties participated: Japan, Morocco, Sao Tomé & Principe, Spain, and the United States; Observers from Italy and Turkey also attended. Dr. P. M. Miyake represented the ICCAT Secretariat. The list of participants is included as **Addendum 2 to Appendix 6.**

II. ADOPTION OF AGENDA

The Tentative Agenda, circulated prior to the meeting, was adopted after introducing minor modifications and is attached as **Addendum 1 to Appendix 6.**

III. NOMINATION OF RAPPORTEURS

Drs. G. Scott (U.S.) and P. M. Miyake (ICCAT Secretariat) were appointed as General Rapporteurs for the meeting.

IV. REVIEW OF THE ORIGINAL PROGRAM PLAN AND REPORTS ON PROGRESS MADE UNDER EACH ITEM

The original program plan for the BYP, which was circulated to the meeting participants in advance of the meeting, was reviewed. National progress reports were presented by representatives of the nations present at the meeting. Summaries of the national reports are presented below. Documents presented at the meeting are shown in the attached List of Documents (**Addendum 3 to Appendix 6**).

a. National progress reports

ITALY

Two different research teams are actually working in Italy on bluefin tuna studies. One group, funded by the EU and coordinated by Italy, conducts research on large pelagic stocks. Another group (comprised of 10 teams) is funded by the Italian government (Ministry of Agriculture, Food and Forestry Resources). This group also carries out studies on large pelagic fishes as well as several related items.

The progress achieved by Italy was reported in general by Dr. C. Piccinetti, and by the scientists directly involved.

-- Ligurian Sea (Dr. L. Orsi Relini)

In the Ligurian Sea, the Operative Unit of the Institute of Zoology of the University of Genoa worked on the following aspects of the research:

i) measurements of length and weight of fish collected by the sport fishery (for tagging purposes) and by professional purse seine fishermen.

ii) sampling of tissues (muscle, liver, heart, eyes) for genetic analysis; hard parts, vertebrae, fin rays and otoliths for age studies; gonads for reproductive characteristics.

iii) tagging of juveniles: 543 fish, ranging from 23 to 47 cm FL, were tagged using ICCAT dart tags.

-- Tyrrhenian Sea and Strait of Sicily (Dr. A. Di Natale)

In these regions of the Italian Seas, there are well developed fishing activities on bluefin tuna, both as a target and as a by-catch species. In the Tyrrhenian Sea, catches are mostly due to by-catch in the longline and drift gillnet fisheries. The average bluefin tuna CPUE for the driftnet fleet in 1994 was 0.5kg/1km/day in Sicily and 1.3kg/1km/day in the Aeolian Islands.

The longline CPUE in 1994 from the Tyrrhenian Sea was 1.8kg/1000 hooks/day, but always as a by-catch. A new longline fishing method was recently developed in the Strait of Sicily, targeting bluefin tuna. The total catch from this fishery reached about 337 tons in 1994 (provisional data). CPUE data are also available from the swordfish longline fishery in the Strait of Sicily, in which the 1994 by-catch production of BFT was 15.5kg/1000 hooks/day.

Tuna traps obtained a total catch of 109 MT in 11 days of activity in 1994.

The average size of BFT taken in 1994 in the Italian fisheries of the Central-Southern Tyrrhenian Sea and in the Strait of Sicily were as follows:

Gear	*Measure*	*Ave. Size*	*Region*
TRAP	FL	145.57 cm	Strait of Sicily
HAND	FL	26.33 cm	Southern Tyrrhenian Sea
GILL	FL	106.62 cm	Southern Tyrrhenian Sea
TRAP	GGW	99.69 kg	Strait of Sicily
GILL	GGW	31.11 kg	Central-South Tyrrhenian Sea
LL	GGW	58.50 kg	Central-South Tyrrhenian Sea

All of the above data are preliminary, because some of them still need to be processed.

It is important to point out that 1993 and 1994 are classified as "anomalous" years, as concerns the availability of small juvenile bluefin tuna, possibly due to atypical environmental factors allowing a delayed spawning and a more prolonged reproductive period for bluefin (and also swordfish). Several bluefin specimens of about 2 kg were found from April to May in the region, although this size of bluefin is usually found in early December in the Southern Tyrrhenian Sea.

-- Ionian and South Adriatic Seas (Dr. G. DeMetrio)

Tuna purse seiners are not resident in the Ionian and Southern Adriatic Seas, but seine fleets from the Central Adriatic operated in this area and attained minor catches. These catches were not reported for that area but have been included in national catches.

There are only a few bluefin catches reported in the area, mostly attained as a by-catch in the longline and driftnet fisheries targeting swordfish and albacore. On average, bluefin tuna taken during swordfish fishing are considerably larger in size than those taken during albacore fishing.

During the 1994 fishing season, 25 juvenile bluefin (yearling or Age 0) were tagged using tetracycline as a chemical marker. Several samples for biological and genetic analyses were collected at the same time.

– Central and North Adriatic Sea (Dr. C. Piccinetti)

Data on the total catch per month and size frequencies were collected from the purse seine and sport fisheries in 1994. The bluefin catches from these fisheries amounted to about 1,000 MT from the region in 1994.

– Genetics (Dr. R. Cimmaruta)

Studies on genetic recognition of the bluefin stock utilized horizontal starch gel electrophoresis. Forty-three putative enzyme loci were analyzed from muscle, heart and liver tissues. Specimens were sampled from five different areas in the Mediterranean Sea.

Genetic differentiation observed between samples is comparable with that found within other species of pelagic fishes. Despite the observed level of genetic variability, not very high at some polymorphic loci, high frequencies of private alleles (i.e. alleles found in only one population) have been found. This finding allows the use of indirect methods in estimating levels of gene flow between populations. The results obtained will be compared with those from direct methods such as mark-recapture.

Assessing reliable frequencies of private alleles requires large numbers of specimens sampled per population, and estimating levels of gene flow using indirect methods requires comparisons of many populations from different geographic areas. Therefore, the exchange of samples and the cooperation of scientists from different countries are important and should be intensified.

– Larvae (Dr. C. Piccinetti)

A large-scale larval survey was conducted in 1994 in the Mediterranean Sea at 302 stations. All of the samples collected in the entire area by the 505u mesh bongo net were sorted and classified; it was possible to identify 103 bluefin larvae, 278 albacore larvae and 170 larvae of *Auxis rochei*. Samples from the 335u mesh bongo net are still being sorted and examined. Completion of the sorting and examination of these samples (335u) is expected to be completed before June, 1995. Periodical sampling was carried out weekly in the southern Adriatic and the southern Tyrrhenian Seas. These samples are also currently being sorted and the analysis of these will be completed before summer, 1995.

MOROCCO

A progress report on national research relative to the BYP by Morocco was presented to the group by Mr. A. Srour (Document SCRS/95/37). A continuous and notable improvement of collection of nominal catch data from several fishing gears that are used by Moroccan fishermen to catch bluefin tuna was carried out.

The joint Moroccan-Japanese farming project for bluefin tuna is providing a substantial amount of information on the biology of this species. The research conducted under this project is just now starting to provide valuable data on the biology of bluefin tuna. It is expected that even more valuable data will become available to the BYP as this project continues in the future.

A preliminary landing control system was established to monitor newly developing, artisanal deep (>200 m) handline fishing for large bluefin tuna. Data on individual weights from this fishery were collected from more than 300 specimens. A length-weight relationship was also developed from these samples. Because little is known about the deep handline gear fisheries, it will be important to improve sampling of the catch and effort by this gear as the fishery develops.

Further, 40 specimens of juvenile bluefin were collected and measured (length and weight) from the "Principe" tuna trap off the Mediterranean coast of Morocco.

TURKEY

A report on recent research conducted on bluefin tuna and swordfish at the University of Istanbul (Document SCRS/95/35) was presented by Dr. I. K. Oray. Most of the results of this research will be published as Masters or Doctoral theses.

Between October 1992 and May 1994, the length-weight relationships of bluefin tuna landed at the Istanbul fish market were determined. The data used in this research covers bluefin measuring between 59 and 225 cm FL. The weights of these fish varied between 4 and 300 kg.

Dorsal spines from 200 bluefin caught in Turkish waters were used in age determination studies. Due to some characteristics in the rings of the dorsal spines of the bluefin sampled in Turkey, there are some indications that about 20-25% of the catch came from a unique local sub-population.

SPAIN

A report (Document SCRS/95/34) on bluefin research activities addressing BYP objectives, undertaken by the Spanish Institute of Oceanography (IEO) was presented by Dr. J. L. Cort. The research carried out was sponsored by the Government of Spain and the European Union.

A final report on the EU financed project "Characterization of Large Pelagic Stocks in the Mediterranean," is currently under review by the funding agency. This study addressed the reproductive biology of bluefin tuna in the Mediterranean (fecundity at size, among other items). The research resulted in quantification of the increasing trend in average batch fecundity and size of bluefin tuna from the region.

The tagging of juvenile (<50cm) bluefin tuna continues, under the sponsorship of the IEO. In 1993 and 1994, more than 1469 fish in this size range were tagged. Recaptures of these tagged fish continue to show important relationships between western Mediterranean and Bay of Biscay fisheries for small bluefin.

A comparison of ageing results by means of dorsal spine analysis and vertebral analysis was also conducted. Ageing results were consistent between the two methods for fish up to about Age 7. Recoveries of oxytetracycline-tagged fish released on a joint cruise with colleagues from the University of Istanbul in 1991, revealed that the chemical marks are lost in the dorsal spine centrum when applied to fish of this size (<50 cm).

Samples of dorsal spines from Age 1-3 fish collected throughout the year were used to examine, through marginal increment analysis, the timing of ring formation in fish taken from the Mediterranean. These samples indicate that a single mark is laid down each year.

An observer was placed on board a purse seine vessel in the western Mediterranean during the 1993 and 1994 fishing seasons. Data from the observer provided a basis for improving the statistics on the Spanish purse seine fishery.

A Spanish scientist took part in the Japanese larval survey in the Mediterranean in 1994.

Research on the stock structure of bluefin tuna is underway, with funding from the EU.

UNITED STATES

A progress report on U.S. research activities within the framework of the BYP (Document SCRS/95/38) was presented by Dr G. P. Scott. As part of its commitment to the BYP, research supported by the U.S. has concentrated on improving catch and effort statistics from U.S. fisheries catching bluefin, ichthyoplankton sampling, as well as research on reproductive biology, and stock structure of bluefin. Other activities initiated under the BYP umbrella include evaluation of aerial surveys as a fishery independent means of assessing bluefin tuna abundance, evaluation of the information on mixing rates estimated from available tagging data, cooperating in biological sampling of hard parts for age validation studies, and some physiological evaluations of stress induced to individual fish by certain kinds of capture.

Improvements in fisheries statistics have focused on improving the precision and accuracy of estimates of catch and CPUE from U.S. fisheries used in monitoring the abundance of bluefin in the western Atlantic. Notable improvements have been made in the U.S. Large Pelagic Survey and in monitoring the U.S. Gulf of Mexico longline catch and CPUE through logbooks.

Annual ichthyoplankton surveys for bluefin larvae in the Gulf of Mexico spawning grounds are conducted (the 1995 survey will be conducted in May). The larval catch rate data are the only fishery-independent data now available for assessing stock status in the western Atlantic. In 1994, this sampling was conducted jointly with a Japanese research vessel. This sampling will provide a basis for comparison of vessel-specific catch rates and for comparing Mediterranean larval production with that observed in the Gulf of Mexico. Research on this topic is still underway.

Research on the reproductive and other aspects of the biology of bluefin was undertaken with national funding provided to the New England Aquarium. Research results available thus far, although preliminary, are consistent with previous information on the size of maturity of bluefin in the western Atlantic. This research is continuing in 1995.

Studies related to stock structure of Atlantic bluefin are being coordinated by the NMFS laboratory in Charleston, South Carolina. Research will concentrate on regions in the mtDNA or genomic DNA that contain a sufficient amount of genetic variation to be informative in stock structure analyses. The initial stage of this research was to develop a research plan to test specific hypotheses. This was completed in 1994 and, during 1995, the research plan will be initiated. Additional samples of young of the year bluefin from various eastern and western Atlantic fisheries will be needed to fully evaluate the proposed methods. Cooperation of national scientists participating in the BYP is needed.

In addition to the genetic analyses underway, in 1995, research will be undertaken to review the use of micro-constituent analyses for stock classification and to develop a pilot study design specifically for Atlantic bluefin tuna. This research will be coordinated through the NMFS Charleston, South Carolina Laboratory.

It has been demonstrated that the available tagging data alone are insufficient to allow discrimination between a wide range of possible transfer rates between western and eastern Atlantic and Mediterranean bluefin. Evaluations need to be conducted on the number and distribution of tags between the various fisheries that would be necessary to estimate with a high degree of precision and accuracy, annual rates of transfer between the eastern and western Atlantic fisheries. In 1995, preliminary evaluations of these issues will be conducted. In addition, initial evaluation of the feasibility of external attachment of archival tags and the use of archival tags for estimation of bluefin transfer rates will be conducted. A pilot study is planned in cooperation between U.S., Canadian, and Australian scientists to monitor the application of some archival tags on large bluefin tuna held in traps. Coordination with the research activities of other nations involved in BYP research and considering tagging designs is needed.

Aerial survey pilot studies were conducted in 1993 and 1994. Two types of surveys were evaluated and further research on this topic will be undertaken in 1995. A pilot survey of the Bahamas Bank region (an area across which presumed spawning fish from the Gulf of Mexico emigrate to feeding grounds) is anticipated to be undertaken in 1995.

Two physiological studies examining capture induced stress in bluefin have been initiated.

JAPAN

A progress report on Japanese national research in support of the BYP (Document SCRS/95/36) was presented by Dr. Z. Suzuki. Activities conducted under the BYP include improvement of fishery and import/export statistics, the development of a new abundance index for Japanese longline fisheries, several biological studies, including larval survey and genetic analysis, and a review of information on the development of a re-stocking technique.

The ICCAT Bluefin Tuna Statistical Document was implemented for frozen fish in 1993 and for fresh fish in 1994, in order to monitor the transaction of all northern bluefin tuna imported to Japan. The discrepancies found between the information collected through this system and the Japanese import/export statistics should be examined further. The format for the logbook for Japanese longliners was modified to incorporate sea surface temperature and gear description, including materials used for the lines.

As regards CPUE standardization for the Japanese longline fishery, a new model was developed assuming a Poisson error distribution. This approach allowed the direct incorporation of zero catch information into a model and showed a better fit to the results of the VPA than the previous approach with errors of log-normal distribution. Further

analysis and simulations will be continued to examine the statistical characteristics of CPUE and the robustness of the model. The effect of sea surface temperature on bluefin CPUE of Japanese longline in the Mediterranean was also examined, but no significant relationship was revealed.

Biological samples were collected from fish caught in the central north Atlantic during the winter of 1992-1993. Histological analysis of gonads showed these fish were inactive in reproduction. Dorsal spines and vertebrae were also collected but have not yet been analyzed.

A genetic study was conducted on samples collected from six different sources to examine the stock structure of bluefin. Preliminary results showed some differences among the samples when analyzing the D-loop region of mt-DNA. However, the number of samples analyzed was too limited to extract a firm conclusion. Exchange of materials, information, and expertise among the scientists concerned with genetic analyses of bluefin is strongly encouraged.

A plankton survey was conducted in 1994 both in the Gulf of Mexico and in Mediterranean Sea, on a cooperative basis with the U.S. and EC countries, respectively. The objectives of cruise included the collection of materials for genetic studies, the inter-calibration of sampling efficiency among cooperating institutions, and the improvement of knowledge on tuna larvae distribution. The processing and analysis of samples are now under way.

Finally, the progress of a bluefin tuna re-stocking project in Japan was reviewed. In recent years, obtaining fertilized eggs from fish in captivity became more frequent and the raising of a few thousand larvae to 4-5 cm is now possible, although there were still several critical problems, including robustness of seed and cannibalism, which still need to be resolved.

OTHER INFORMATION ON BLUEFIN RESEARCH

Representatives from Sao Tomé & Principe reported at the meeting that there were no catches of bluefin tuna by Sao Tomé and thus no bluefin research is conducted by Sao Tomé scientists.

No other information on BYP research was presented at the meeting, although some information on bluefin research activities was available at the 1994 SCRS meeting (see COM-SCRS/94/15).

b. Item by item review of the original Bluefin Year Program Plan

For each item in the original BYP Plan, the Group evaluated the progress made and tried to re-establish priorities, identifying the needs in planning the next generation of the BYP. The numbering in the following section corresponds to that of the original program plan.

1. IMPROVEMENT OF STATISTICS AND OTHER DATA BASES

A. Collection of information on bluefin in the eastern Mediterranean and Black Sea

A-1) Correspondence with Turkish and U.S.S.R. scientists

STATUS: Completed.

The collaboration with Turkish scientists has been achieved. It was reported that bluefin tuna have not been found in the Black Sea, at least since 1984. There seems to be no bluefin fishing activities in the Black Sea by any countries that belonged to the former U.S.S.R..

Communication among the scientists concerned has improved to a great extent, through the "Ad Hoc GFCM/-ICCAT Joint Working Group on Stocks of Large Pelagic Fishes in the Mediterranean Sea" and the European Community's Large Pelagic Research Program. Landings of bluefin tuna at the Istanbul market are now monitored, reported and sampled by the University of Istanbul.

This research item can be eliminated from the future BYP plan.

A-2) Special mission to the areas of interest if A-1) was positive

STATUS: Considerable improvements were achieved.

Several experts visited the area and considerable joint international research has been started and is being carried out.

This subject can be combined with B-1 and a new plan can be developed for the general improvement of statistics from non-member countries (possibly under two sub-titles, one for collaborating Mediterranean countries and another for non-collaborating countries, mostly flag of convenience countries).

B. Identification of non-reported catches

B-1) Encourage all countries, especially non-member countries, to provide catch statistics.

STATUS: Considerable improvements have been made for the Mediterranean. Problems continue with vessels that fly flags of convenience.

In the Mediterranean area, considerable progress has been achieved, particularly through the joint efforts of ICCAT, GFCM and the European Community Research Program. A common ground was established whereby statistical information and research plans, as well as the results, can be exchanged among the scientists of the Mediterranean and ICCAT countries.

However, the problems of non-reporting of catches has become even more serious for fleets of non-Mediterranean and non-ICCAT Contracting Parties, particularly in view of the regulatory measures adopted by ICCAT which prohibit the catch of bluefin tuna by large pelagic longliners in the Mediterranean area during June and July. The fishing activities in this area and their duration have been increasing and none of these catches are being reported by either the flag countries or by the countries that operate such vessels.

B-2) Cross-check import/export statistics by countries.

STATUS: Completed, with the implementation of the ICCAT Bluefin Tuna Statistical Document Program

The ICCAT periodically estimates non-reported catches through a comparison of reported catch statistics against the import statistics of bluefin tuna to the Japanese market.

The adoption by ICCAT of the Bluefin Tuna Statistical Document Program represented significant progress. According to this Program, all the ICCAT Contracting Parties require a Statistical Document whenever bluefin tuna are imported from anyplace in the world. The Program started in September, 1993 for frozen fish and in June, 1994 for fresh products. The data from this Program are now becoming available and it seems that there has been a major improvement in the reporting of catches which were previously unreported.

It was considered that any discrepancies found between reported catch and import data should be communicated to the countries of origin for further verification. Future BYP plans need not include this research item.

C. Establishing a common tag/recapture data file

C-1) Develop a combined tagging file for all bluefin tag/recovery data in the ICCAT database through the collaboration of national scientists

STATUS: Completed.

The ICCAT Secretariat has developed a new format for the tag file, on a fish basis, and most of the release and recovery information has been incorporated into the new tag data base. Therefore, this project is considered completed.

Further efforts to include some information that are missing from the historical tag releases, and continuous updating of the base on any annual basis, are still required.

2. STOCKS

A. Stock structure and mixing rate

STATUS: Considerable studies have been made on theoretical aspect of the stock structure and mixing rate. ICCAT has made several preliminary trials to incorporate possible mixing between stocks into the assessments models. However,continued research on these topics is considered to be high priority in the next generation of BYP.

A-1) Intensify opportunistic and scientific tagging for small fish from the eastern and western Atlantic and Mediterranean, including double tagging to compare old and new nylon streamer tags which have lower tag shedding rates than ordinary tags

STATUS: Partially carried out.

A considerable number of young fish have been tagged and released, on an opportunistic basis, in the east and west Atlantic. Mediterranean tagging activities are still low. Some tag shedding experiments were conducted on fish in captivity, with comparative double tags. A new type of tag tested seems to be shed less from fish. No estimation was made on the tag shedding by fish in natural conditions, but the present tag data base with double tagging might be useful in future research on this subject.

The tagging results were used in studies to estimate the exchange rate between east and west Atlantic, but the data are still not adequate enough to make reliable estimates of the mixing rate. In the next generation of the BYP,designing of experimental tagging should be included as an independent, multi-purpose item, i.e. to estimate the mixing rate and to estimate stock size.

As indicated later in this report, the designing of experimental tagging for the purpose of precise estimations of transfer rates, which uses both archival tags and conventional tags, should be considered.

The suggested time schedule for such a tagging program was that the designing of the program and the cost estimates should be made in the first year of the next generation of the BYP and, if feasible and if there is adequate funding, the program itself should be started in following years.

A-2) Feasibility study on genetic approaches through electrophoretic and mtDNA methods

STATUS: Several studies have been initiated and are continuing

Some studies have been carried out using mtDNA. Also, some preliminary studies have been conducted using electrophoretic techniques. For these studies, an exchange of samples has taken place among some of the scientists involved. The preliminary results of these studies are promising, although no conclusions have yet been reached.

Further exchange of scientists and/or samples will be required, since a large number of scientists are interested in working on this type of research and meaningful results can only be achieved through the extensive collaboration of countries and scientists involved. Joint research work is encouraged and applications of various techniques for the same sample could serve to verify the results. In order to avoid duplication of efforts and for purposes of comparisons of results of various research studies, it is requested that the results be made available to all the scientists involved, even before such results are finalized (i.e. through periodic progress reports).

This coordinated research might require establishing a "clearing house" for samples for the eastern Atlantic and Mediterranean, as well as one for the exchange of scientists, which should be supported by some Commission funding.

A-3) Verification of micro-constituent analysis

STATUS: Not done.

Some progress on this research technique is noted. However, no applications of the new techniques to Atlantic northern bluefin tuna were yet made.

For the BYP, in addition to the verification of past studies, feasibility studies using this techniques should be initiated on the general use of markers to identify the spawning grounds, including micro-constituent analysis. In this respect, the U.S. is planning some feasibility studies on the application of new micro-constituent methods to bluefin hard parts to be initiated in 1995.

B. Absolute stock size for small fish

STATUS: This research item should be merged with the next item, "Development of abundance indices for spawning fish" and expanded as "Development of abundance indices and direct measures for estimating stock sizes of various age fish" in the next generation of the BYP.

B-1) Experimental design for scientific tagging

a) Intensify opportunistic and scientific tagging for small fish from the eastern and western Atlantic and Mediterranean, including double tagging to compare old and new nylon streamer tags which have lower tag shedding rates than ordinary tags

STATUS: Not completed. See comments in section 2.A-1.

b) More publicity on tagging activities for a better recovery of tagged fish, especially in the Mediterranean

STATUS: Being tried.

The scientists involved are making every effort to increase the reporting rate of recovered tags, so some improvement has been realized. However, it seems that the problem still continues.

The differences in the reporting rate among different nations and fisheries should be estimated. For this purpose, during the first year of the next generation of the BYP, various measures to estimate such reporting rates (e.g. tag planting, interviews, etc.), should be examined, from the standpoint of feasibility, and research on these projects found feasible should be started in the second year.

B-2) Feasibility study of a direct counting method such as aerial survey and remote sensing.

STATUS: See Section 2-C-1), 2) and 3).

C. Development of abundance indices for spawning fish

C-1) Experimental longline fishing in the Gulf of Mexico including methods compatible with existing data series

STATUS: Not carried out.

No scientifically designed experimental longline fishing has been carried out for bluefin tuna. However, a CPUE series has been developed, based on the catch and effort data of historical Japanese and U.S. longline operations in the Gulf of Mexico.

It seems that this type of approach is not realistic under the present situation. The establishment of other types of fishery independent indices (e.g. aerial surveys, hydro-acoustic surveys, etc.) is encouraged.

C-2) Aerial survey in the North American fishing grounds

STATUS: Research has been started and is continuing.

A pilot program was conducted by the U.S. off its east coast. The preliminary results are promising, but not conclusive.

This item should be retained in the next generation of the BYP.

C-3) Study of detecting fish schools using micro-wave radar in the Mediterranean

STATUS: Feasibility studies completed.

Several feasibility studies for small fish using aerial remote sensing techniques has been conducted in the Mediterranean area, but the results at present are not very promising. A further development of the technology is required before any meaningful results can be obtained.

Commercial aerial surveys to assist purse seine fishing are being carried out in the Mediterranean area during summer by France. The data from these surveys have never been investigated as a potential index for abundance studies and could warrant further studies.

C-4) Study of feasibility of using egg abundance as spawning stock indices

STATUS: Completed.

Several surveys have been made for egg collection in the Mediterranean and in the Gulf of Mexico. However, there are difficulties to identify bluefin eggs easily from those of other species. Until this becomes possible, the abundance of eggs cannot be used as index of spawning stocks.

However, many useful samples of eggs and larvae have been collected from the Gulf of Mexico and the Mediterranean Sea during the past two years. Those samples should be compared and analyzed. The exchange of samples and scientists among the nations involved is highly recommended. Therefore, this item should be expanded to include larvae examination and include the scope of reproductive biology.

D. Development of abundance indices for the major Mediterranean fisheries

STATUS: Some progress has been made.

Several trials were made to establish new abundance index series for Mediterranean fisheries, but no major improvements were made. Currently, only Japanese longline data have been standardized. A new purse seine index series for Spanish Mediterranean coastal fishery has been developed, using observer data. However, the time period for which this series is still available is too short for VPA tuning, although continued data collection will allow an expanded time series. The EC program just initiated includes improvement of the CPUE information of the purse seine fishery.

A standardized index is available for Italian purse seiners up to 1989 and the series should be updated to include more recent years. The standardization of French purse seine catch and effort data is still not done and this should be given first priority, given that the catch comprise an important part of the Mediterranean bluefin catches.

E. Feasibility study of restocking the bluefin population

E-1) Review of the results of the Japanese Marine Ranching Plan for Pacific Bluefin

STATUS: Progress made.

Studies have progressed to the extent that bluefin spawning is induced and larvae collection can be made from the bluefin spawners in captivity. A similar experiment has started in Moroccan waters through the joint efforts of Japan and Morocco and has succeeded in producing larvae. Similar research is on-going in the U.S.

The feasibility of restocking, through fish ranching, has not been studied. With the present level of technology, it would not be practical to consider restocking. However, feasibility studies might become necessary in the future when the bluefin culture technology is more advanced.

Basic studies on the biology and behavior of larvae and juveniles of bluefin produced from spawners in captivity should be continued. At the same time, any effects on the genetics of these juveniles should be investigated.

3. BIOLOGY

A. Inter/intra-annual sex-specific growth

A-1) Analysis of hard parts (particularly with the materials obtained from tagged fish given a tetracycline or strontium chloride injection)

a) Comparison of spine and vertebra ageing methods

STATUS: Considerable progress made.

Ageing studies, using hard parts such as vertebrae and dorsal spines have been carried out on Mediterranean and east Atlantic bluefin tuna up to Age 7. The ageing results based on both spine and vertebrae are in conformity. Verification of a single mark per year has been made through analysis of specimens from April-December for Age 1 through Age 3 fish. These specimens (spine samples) were obtained through collaborative international efforts. However for fish older than Age 7, vertebrae would be better material to age.

For younger fish, no difference in growth was detected between sexes.

Similar research should be conducted for the west Atlantic.

Studies should be further expanded to large fish and the feasibility of establishing age-length keys for bluefin over 7-8 years old, using hard parts, should be initiated.

b) Further study with the use of marginal increment data obtained throughout the year

STATUS: Started.

The collection of hard part samples from bluefin caught in the central and western Atlantic has started. These samples now have to be analyzed and more samples collected to complete the studies.

Further analytical work can be achieved by an institute that specializes in ageing, or by an outside contract with Commission funding.

A-2) Tagging experiments

STATUS: Partially achieved.

Considerable tagging with tetracycline injection has been carried out and has produced a significant number of recoveries, together with samples of hard parts. Those samples are to be analyzed. It seems that for this type of analysis, vertebrae are more useful than spines.

Similar studies are recommended for the west Atlantic to test the hypothesis of different growth rates between east and west stocks.

A-3) Modal progression method for younger age groups

STATUS: Completed.

Modal progression studies were conducted on Mediterranean bluefin growth and the results were very similar to the growth curve established by past studies. MULTIFAN (similar to the modal progression approach) applied on the catch at size for the west Atlantic produced catch at age that was similar to that resulting from the slicing methods using the growth curve.

This research item need not be included in the next generation of the BYP.

A-4) Micro-constituent analysis

STATUS: No research has been conducted on this aspect and no further plan is being made in relation to the growth studies.

B. Study of reproductive biology

B-1) Histological analysis of gonads from the samples from off the North American coasts and in the Mediterranean

STATUS: Research is underway.

Many samples were collected through collaboration of various researchers and analyses of these samples are currently being carried out. The study of fecundity of bluefin tuna in the Mediterranean area was completed and demonstrated a relation between fecundity and size of fish with large variability for a single spawning. Some other studies on maturity are still being carried out, but the preliminary results are consistent with the knowledge obtained several years ago.

The current studies should be continued, particularly for the west Atlantic.

B-2) Plankton net survey for unsurveyed areas such as in the eastern Mediterranean Sea, the Black Sea and outside the Gulf Stream

STATUS: Notable progress has been achieved.

During the recent joint Italian-Turkish larval sampling cruise carried out in the Black Sea, no bluefin larvae were found in the Black Sea. A recent report by Russian scientists indicated that the past studies on the presence of bluefin larvae in the Black Sea seem to have been based on misidentification of other tuna larvae as bluefin tuna.

Besides the above, several surveys were carried out in the eastern Mediterranean area, some of which were by internationally collaborated cruises. The samples collected throughout these cruises are being analyzed.

This research should be continued.

C. Various length and weight relationships by season and by fisheries

STATUS: Complete for the west and east Atlantic.

For bluefin tuna caught in the Bay of Biscay, studies were carried out on seasonal length-weight relationship for fish measuring 50 cm to 2 meters. Similar studies should be carried out for Mediterranean fish.

4. ENVIRONMENT

A. Relation between distribution (including CPUE) and environment

A-1) Analyses on Japanese longline data vs hydrographic conditions, including surface temperatures in the Mediterranean

STATUS: Partially done.

Longline catch data were analyzed together with surface temperature information. However, no significant relationships were found between surface temperature and catch rates. This could be due to the large aggregation of data and hence any future studies should be made on more detailed data sets.

These research efforts will be continued.

A-2) Analyses on U.S. and Canadian surface data and Japanese longline vs. surface temperature in the west Atlantic

STATUS: Some progress has been made.

Analyses were made using the data base of 5x5° areas and month. However, no significant relation was found between catch rates and surface temperature. The longline data became available in detail (e.g. set by set) only for recent years. The use of such detailed data (e.g. set by set data) for the comparison is being considered.

Efforts will be continued.

A-3) Analyses on French purse seine vs. oceanographic conditions in the Mediterranean

STATUS: The Group is unaware of any progress made.

The Group was unaware of any progress made on the French purse seine data. However, the scientific observer's data on Spanish purse seiners, which are fishing in the same area as the French purse seine, (130 days observations) included catch and environmental information (e.g. temperature, wind force, etc.). The analysis of these data is being carried out.

Data on catch and oceanographic conditions are collected from Turkish purse seiners fishing bluefin tuna in the eastern Mediterranean Sea and the data are being analyzed.

Studies on the variability of the trap catches with in relation to environmental conditions, and investigation into the possibility of using the data for VPA tuning should be made.

B. Relation between biology of very young fish and environment

B-1) Collection of biological information on very small juveniles before entering the fisheries in the Gulf of Mexico and adjacent waters as well as in the Mediterranean

STATUS: Has been initiated, but without any success up to the present.

In the Gulf of Mexico, an attempt were made to obtain samples of small fish in 1994, But without success. The catch of juveniles, generally in October-December, is occasionally reported by sport fishermen.

The results of recoveries of tagged juvenile fish are analyzed for the east Atlantic and Mediterranean, with respect to migration routes and to the oceanographic conditions of the area.

This research should be continued.

B-2) Experimental fishing of the very small juveniles using methods such as light attracting devices

STATUS: It was reported that only fish under 10 cm can be caught using light. Also, some opinions were expressed that the relationship between small juvenile bluefin and environmental conditions is found minor, since fish have good adaptability to the environment.

This program will be discontinued.

C. Archival Tags

STATUS: Over the last year, a great deal of interest has been generated in the application of archival tags for bluefin tuna and other pelagic fish studies. The group was informed of proposed research on the use of archival tags for bluefin by at least two different groups conducting bluefin research (the U.S. and a consortium of European scientists seeking EU funding). The group recommended the coordination of these studies.

V. MODIFICATIONS OF THE PROGRAM PLAN

In general, the group was of the opinion that the BYP has been quite successful thus far (See Chapter VI-C of this Report). Although funding for BYP activities has not been available from the ICCAT budget, the BYP, and the concern over the status of the Atlantic and Mediterranean bluefin resource, has resulted in increased funding for various national and international research programs directed at bluefin. Recent general recommendations for research items provided by the U.S. National Academy of Sciences review of bluefin generally echo the more specific recommendations already made by ICCAT under the BYP umbrella.

Because funding has not been available directly through ICCAT, some important research activities have not yet received adequate attention. The group identified several research activities which ICCAT should either consider funding directly or identify sources of, and attempt to arrange for, external funding to conduct these studies. It is apparent that funding the BYP directly through ICCAT might help to focus and coordinate the research already underway within various national or international research programs. Greater progress on BYP research recommendations could also be made if additional funds for research were identified. Methods for increasing the available funds for research could include a "user tax" on nations in proportion to the value received from bluefin tuna.

Among the projects identified as in need of ICCAT funding within the next year were:

(1) Funding to support for travel (between Europe and the U.S., estimated at $25,000) required to improve the scientific exchange of information, specimen sharing, and coordination of the various genetic-based studies (e.g. U.S., Spain, Italy, Japan) examining stock discreetness questions;

(2) Funding support (estimated at $10,000 for the initial project) to establish a "clearing house" for eastern Atlantic and Mediterranean biological specimen materials to be shared among the various studies involved in examination of the genetic differences between bluefin tuna from the Gulf of Mexico and Mediterranean spawning areas;

(3) Funding to support characterization of the developing, small boat, deep handline fishery for large bluefin tuna off Morocco and the collection of biological specimen materials from fish taken in scientific fishing experiments in the region (estimated at $20,000 charged to Morocco, and $20,000 charged to ICCAT, for initial phase of the project); and

(4) Funding support for larval surveys and biological specimen collections of bluefin tuna from off Turkey, conducted by scientists at the University of Istanbul (estimated at $20,000 charged to the University of Istanbul and $20,000 charged to ICCAT, for the initial phase of the project).

Based on the new proposals mentioned above, and the recommendations which came out of the review of the original BYP Program Plan (IV-C), the group agreed to develop, before the next SCRS meeting, a Modified Program Plan (BYP-next generation). The Coordinators and Dr. P. M. Miyake were asked to draw up the first draft Plan, including a budget and a time schedule for carrying it out. The draft should then be circulated together with this report

(translated), among the participants of this meeting and other scientists involved in the Bluefin Year Program for review, by the end of April, 1995. After receiving all the comments, the second draft Program Plan should be delivered to the Delegates and scientists by June, 1995, for their review. Particularly, it contains a requirement of funding by the Commission, the early distribution with a note to that effect would be essential.

In general, if the next generation of BYP started in 1996, the progress will be reviewed every year but more closely after three years to determine whether further modification is necessary.

VI. ELECTION OF NEW COORDINATORS

Dr. S. Tsuji (Japan) was elected Coordinator of the western Atlantic components of the BYP. Drs. B. Liorzou (France) and J. L. Cort (Spain) were nominated to coordinate eastern Atlantic and Mediterranean BYP components. Dr. Cort agreed to discuss arrangements for the coordinator activities with Dr. Liorzou, who was unable to attend this session due to other commitments.

VII. OTHERS

No other matters were discussed.

VIII. ADOPTION OF REPORT

The group agreed to proceed with adoption of the report through correspondence.

IX. ADJOURNMENT

At the adjournment of the meeting, the participants expressed their thanks to the Institute of Zoology of the University of Genoa, for hosting this meeting, and commended Professor L. Orsi Relini, and the Institute staff for their excellent hospitality and support of meeting activities.

The meeting of the ICCAT Planning Session for the Bluefin Year Program was adjourned.

Addendum 1 to Appendix 6

Agenda of the BYP Planning Session

I. Opening of meeting
II. Election of Chairman
III. Adoption of Agenda and meeting arrangements (rapporteurs, etc.)
IV. Review of the original program plan and progress made under each item
V. Modification of program plan

a) Any additional items
b) Re-establish the new priorities of plan
c) Funding requirements

VI. Election of new coordinator(s)
VII. Others
VIII. Adoption of Report
IX. Adjournment

Addendum 2 to Appendix 6

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Addendum 3 to Appendix 6

List of Documents for the BYP Planning Session

SCRS/95/34 ICCAT BYP Programme - IEO

SCRS/95/35 Workshop and Research of Bluefin tuna (*Thunnus thynnus*, L. 1758) and swordfish (*Xiphias gladius*, L. 1758) sponsored by the University of Istanbul, in 1993, in Istanbul.

SCRS/95/36 Japanese progress report on ICCAT Bluefin Year Program (BYP) - Z. Suzuki and S. Tsuji

SCRS/95/37 Projet de programme de rescherche sur le thon rouge propose dans le cadre du "Programme ICCAT Annee Thon Rouge (BYP) - Morocco

SCRS/95/38 U.S. Bluefin Tuna Research in Support of BYP

Reference documents:

SEFSC Pelagic Longline Observer Program Data Summary for 1992-1994. NOAA Technical Memorandum NMFS-SEFSC-347 - Lee, D. W., C. J. Brown, A. J. Catalano, J. R. Grubish, T. W. Greig, R. J. Miller, M. T. Judge

Bluefin tuna: a report on a Workshop on the Genetics of Highly Migratory Oceanic Pelagic Fishes - Dean, J. M., C. Woodley

Aerial survey applications for assessing bluefin tuna abundance, distribution, and age structure in the Northwest Atlantic: a pilot study

Archival tags 1994: present and future. NOAA Technical Memorandum NMFS-SEFSC-357 - Klimley, A. P., E. D. Prince, R. W. Brill, K. Holland

A field guide to othe sharks commonly caught in commercial fisheries of the southeastern United States. NOAA Technical Memorandum NMFS-SEFSC-338

Appendix 7

MODIFIED PROGRAM PLAN
(Second Generation of the BYP)

I. INTRODUCTION

There has been concern about the stock status of Atlantic bluefin tuna for more than two decades. Improvement in knowledge of biological characteristics of and improved statistical data on Atlantic bluefin tuna are needed to provide a basis for more precise scientific advice related to management of the resource. The Bluefin Year Program (BYP) started in 1992 as a collaborative research program to improve our understanding of Atlantic bluefin. The first phase of the BYP was reviewed in early 1995. Based on this review, a modified program plan (BYP-Second Generation) was developed and is described in this document.

An ICCAT Planing Session for BYP was held on March 13 and 14, 1995, at the University of Genoa, Institute of Zoology, in Genoa, Italy, to review activities during the first generation of the Program and to develop a proposal for modifications needed for the second generation.

This review of BYP concluded that, in general, the initial phase of the Program has been quite successful. Although funding for BYP activities has not been available directly from ICCAT, BYP and the concern over the status of the Atlantic and Mediterranean bluefin resource, resulted in increased funding for various national and international research programs directed at bluefin.

This Modified Program Plan (BYP-next generation) is based on progress made during the first generation and also takes account of recent technological advances. It is anticipated that the second generation BYP will begin in 1996. Annual progress reviews will be held for the first three years, followed by a more detailed Program Review after 3 years to determine if further modification of the Program is necessary. For the second generation BYP, two Co-Coordinators, S. Tsuji (Japan) for the western Atlantic and J. Cort (Spain) for the eastern Atlantic and Mediterranean, were nominated to facilitate collaboration among research efforts.

Because funding has not been available directly through ICCAT, some important research activities have not yet received adequate attention. It is apparent that funding the BYP directly through ICCAT might help to focus and coordinate the research already underway within various national or international research programs. Greater progress on BYP research recommendations could also be made if additional funds for research were identified.

II. RESEARCH ACTIVITIES

1. Improvement of statistics and other databases

Collection of reliable statistics on the fisheries is one of the essential tasks needed to monitor and more precisely assess stock status. Although splendid progress was made for improvement of statistics during the first generation of BYP, additional areas for improvements were identified.

These improvements in the catch statistics are the result of two ICCAT activities. The joint GFCM/ICCAT meetings including the recent work by the Permanent GFCM/ICCAT Ad Hoc Working Group has resulted in great improvement in Mediterranean fishery statistics, especially catch and size composition and for some species catch per effort data. In addition the recent implementation of the Bluefin Statistical Document Program has been associated with a recent increase in the number of countries reporting bluefin catches.

A. Improvement of catch statistics

Despite the above improvements, further improvements in the catch statistics and reporting are necessary. The problems of non-reporting or under-reporting of catches continues to be a major problem especially in recent years.

Methods

A-1) Encourage all countries, especially non-member countries, to provide catch statistics.

A-2) Investigate market-based methods for controlling these catches.

B. Review and updating a common tag/recapture data file

During the first generation of Program, the ICCAT Secretariat has developed a new format for the tag file, on a fish basis, and most of the release and recovery information has been incorporated into the new tag data base. Further efforts to continue correcting and updating of the base are still required.

Methods

B-1) Review of historical tag release and recapture information for accuracy

B-2) Update the ICCAT tag/recovery data file on annual basis.

2. Stocks

A. Stock structure and mixing rate

Several studies were made on the theoretical aspects of the stock structure and mixing rate during the first generation. ICCAT has made several preliminary trials to incorporate possible mixing between stocks into the assessments models.

An increased number of young fish have been tagged and released in the east Atlantic and Mediterranean. The west Atlantic releases have been on an opportunistic basis by recreational fishermen, while the recent Mediterranean tagging has been conducted by scientists. Double tagging experiments designed to estimate tag shedding rates were conducted in the west Atlantic during the 1970's. However additional research is needed to estimate tag shedding rates for different sizes of fish released, different types of tags, and different tagging experts. The tagging results have been used in studies to estimate the exchange rate between east and west Atlantic, however the reliability of those estimates is low in part because the data are still quite limited. In the next generation of the BYP, designed tagging experiments should be included to address specific questions such as tag reporting rates, spawning site fidelity and mixing rates.

Some studies have been carried out using mtDNA. Also, some preliminary studies have been conducted using electrophoretic techniques. For these studies, an exchange of samples has taken place among some of the scientists involved. The preliminary results of these studies are promising, although no conclusions have yet been reached. Further exchange of scientists and/or samples will be required. Joint research work is encouraged and applications of various techniques for the same sample could serve to verify the results. In order to avoid duplication of efforts and for purposes of comparisons of results of various research studies, it is requested that the results be made available to all the scientists involved, even before such results are finalized.

Continued research on these topics is considered to be high priority in the next generation of BYP.

Methods

A-1) Continue theoretical investigations on an effect of different level of mixing rate on stock assessment and fishery management.

A-2) Design and seek sufficient funding to implement experimental tagging for the purpose of precise estimation of annual age-specific transfer rates using both conventional and archival tags, as appropriate..

A-3) Estimate differences in reporting rates among different nations and fisheries as well as develop various measures to estimates reporting rates.

A-4) Establish coordination for genetic studies including exchange of scientists as well as samples and encourage joint studies as well as applications of various techniques for the same samples.

A-5) Verification of past studies and feasibility studies on the use of other markers to identify the spawning grounds, including micro-constituent analysis.

B. Development of abundance indices and direct measures of stock size.

Questions exist about the reliability of available abundance indices for various size or age groups. The success of various fisheries may be subject to environmental factors which may not be adequately accounted for in analyses of fishery-based catch rate series. Shifting the target species may have also influenced catch rate in fisheries, although many analyses of bluefin catch rates have been developed which attempt to control for these effects through modelling of gear effects or general catch levels of other species. Fishery-independent approaches are necessary to provide improved bases for indexing abundance and to provide additional tuning data for assessments. The development of refined abundance indices for the various ages of population is urgently needed. Development is also needed of methods which are robust and also accommodate the structure of the available data, since it is unlikely that in the short term, sufficient fishery independent measures of abundance can be developed to substitute for the available fishery-based measures.

Methods

B-1) Develop the abundance indices for the major Mediterranean fisheries.

B-2) Establish various approaches of fishery independent indices including aerial surveys, hydro-acoustic surveys, and the use of micro-wave radar.

B-3) Continue a study of using egg and larval abundance as spawning stock indices, including the scope of reproductive biology.

B-4) Continue development of methods for abundance index standardization and sequential population assessment modelling that are robust and accommodate the available data structures. It is important to test the methods applied to see if applications to the available data meet the basic underlying assumptions of the models used.

C. Feasibility study of restocking the bluefin population

Studies have progressed to the extent that bluefin spawning is induced and larvae collection can be made from the bluefin spawners in captivity. With the present level of technology, it would not be practical to expect large scale restocking would start in near future. Basic studies on the biology and behavior of larvae and juveniles of bluefin produced from spawners in captivity should be continued. At the same time, any effects on the genetics of these juveniles should be investigated.

C-1) Continue studies on the biology and behavior of larvae and juveniles of bluefin produced from spawners in captivity.

C-2) Investigate effects in genetics to release fish produced from spawners in captivities to wild population.

3. BIOLOGY

A. Inter/intra-annual sex and area-specific growth

The current stock assessment of Atlantic bluefin is conducted mainly by the VPA using catch at age derived from age at length relationship based on tagged fish information. However, little validated growth information is available, the studies related to growth should be given high priority.

Methods

A-1) Validate hard tissue aging techniques using various approaches including comparison among different techniques, analysis of marginal increment, use of tagging information, and micro-constituent analysis. These analyses should be done in both eastern and western Atlantic.

A-2) Develop year/area/sex specific age-length keys.

B. Study of reproductive biology

The study of fecundity of bluefin tuna in the Mediterranean area demonstrated a relation between fecundity and size of fish with large variability for a single spawning during the first generation of Program. However, little additional information became available for the western Atlantic. There is a big difference in the size (age) at first maturity between the eastern and western stock: for the western stock, fish over 200 cm (assumed to be age 8 and older) and for the east stock, fish 150 cm (assumed to be age 5 and older). The size at first maturity presently assumed for the western stock is larger than that estimated for other bluefin stocks, but it is noted that it is thought that west Atlantic bluefin achieve larger sizes than bluefin from other stocks. This difference in the size at first maturity can have significant implications to the stock structure and the stock assessment.

Methods

B-1) Continue histological analysis of gonads especially for samples collected in the west Atlantic.

B-2) Develop methods of estimating fractions of the population in each age group that are mature, recognizing that the reproductive sampling occurs primarily near the spawning areas while immature fish of potentially mature ages might occur at the same time in unsampled areas.

B-3) Plankton net survey for unsurveyed areas such as in the eastern Mediterranean Sea, the Black Sea and outside the Gulf Stream.

C. Length and weight relationships by season and by fisheries

This was considered to be completed for the west and east Atlantic. For example, for bluefin tuna caught in the Bay of Biscay, studies were carried out on seasonal length-weight relationship for fish measuring 50 cm to 2 meters. Similar studies should be carried out for Mediterranean fish.

Methods

C-1) Develop length and weight relationship by season and by fisheries in the Mediterranean.

4. Environment

A. Relation between CPUE and environment

The CPUE used to tune the various assessment models may be significantly affected by various natural factors such as ambient temperature, ocean current systems and availability of the prey animals. It is also noted that changes in fishing strategy such as a change in target species due to socio-economic changes should be considered.

Several efforts were made on this subject in advance of and during the first generation of Program. Some of the CPUE standardization methods applied, notably those from the U.S. fisheries, make use of surface temperature information. Additional research on this topic is needed. The effect of environmental condition to the behavior, distribution, and transfer rate of bluefin might be investigated using archival tagging, although tagging experimental designs need to be developed.

Methods

A-1) Examine relationships between oceanographic conditions including surface temperature and CPUEs derived from various fisheries, including Japanese longline, and Canadian surface fisheries, and French purse seine fishery.

A-2) Incorporate effects of oceanographic conditions to standardize CPUEs for abundance indices, when appropriate.

A-3) Design and implement a collaborative research program using archival tags to investigate environmental effects on biology of fish. (See also **2.** A)-2.)

III. FUNDS

Several research activities were identified as those which ICCAT should either consider funding directly or identify sources of, and attempt to arrange for, external funding to conduct these studies. Among the projects identified as in need of ICCAT funding within the next year were:

(1) Funding to support for travel (between Europe and the U.S., estimated at $25,000) required to improve the scientific exchange of information, specimen sharing, and coordination of the various genetic-based studies (e.g. U.S., Spain, Italy, Japan) examining stock discreetness questions;

(2) Funding support (estimated at $10,000 for the initial project) to establish a "clearing house" for eastern Atlantic and Mediterranean biological specimen materials to be shared among the various studies involved in examination of the genetic differences between bluefin tuna from the Gulf of Mexico and Mediterranean spawning areas;

(3) Funding to support characterization of the developing, small boat, deep handline fishery for large bluefin tuna off Morocco and the collection of biological specimen materials from fish taken in scientific fishing experiments in the region (estimated at $20,000 charged to Morocco, and $20,000 charged to ICCAT, for initial phase of the project); and

(4) Funding support for larval surveys and biological specimen collections of bluefin tuna from off Turkey, conducted by scientists at the University of Istanbul (estimated at $20,000 charged to the University of Istanbul and $20,000 charged to ICCAT, for the initial phase of the project).

Appendix 8

REPORT OF THE SUB-COMMITTEE ON ENVIRONMENT

1. Opening

The meeting of the Sub-Committee on Environment was held on 12 October 1995 at the Hotel Chamartin, Madrid. Dr. J Pereira (Portugal), Convener of the Sub-Committee, who chaired the session, welcomed all the participants.

2. Adoption of Agenda and arrangements for the meeting

The Tentative Agenda was modified to include the "Environment" day of the Symposium next year (**Addendum 1 to Appendix 8**). Dr. J.M. Stretta (France) was elected rapporteur.

3. Review of contribution papers

This year, seven of the documents presented to the SCRS dealt with issues relating to the Sub-Committee on Environment (SCRS/95/50, 63, 70, 71, 94 and 110).

Document SCRS/95/50 dealt with the appearance of blue-green colored tropical tunas reported by the fisheries in the Gulf of Guinea in the years 1993-1995. These catches pose the problem, among others, of the biological and ecological consequences of this phenomenon.

Documents SCRS/95/63 and 65 dealt with the feeding habits of billfishes and swordfish caught by longliners in the maritime province of Venezuela. Their diet is mainly comprised of pelagic fish, cephalopods and crustaceans. The Swordfish Species Group had also taken due note of these two documents.

Document SCRS/95/70 covered a study on bluefin tuna, which was presented to the SCRS last year (document SCRS/94/78) dealing with the relationship between area distribution of catches and environmental parameters (temperature and surface currents, wind, sea conditions). It appears that bluefin tuna are linked to cyclone-like structures.

Document SCRS/95/71 dealt with the connection between yellowfin and bigeye catches and small and medium scale oceanographic phenomena in the area around the Canary Islands. This study found that the best bigeye yields were rendered at a thermal range of 17.5° to 24.5°C, compared with a range of 20.5° to 25.5°C for yellowfin. Oceanographic factors which determine the best fishing yields of the two species are thermal fronts generated by the upwelling on the African coast, and the extensions emitting from this upwelling.

Document SCRS/95/94 compared the analyses of stomach contents of sea birds in the south of Florida. The analyses of these stomach contents showed the presence of tunas (7% of the species found in the alimentary tracts in 1994).

Document SCRS/95/110 presented a view of the relationship between the environment and tuna catches on a world-wide scale. The environmental data are from the data bases to which the scientific community currently has access. This work is still preliminary, but will lead to an understanding of how tunas have adapted their biology and migrations to the different environmental conditions.

4. Anomalies in oceanographic conditions in recent years

The existence of a positive thermal anomaly in the eastern Atlantic has been brought to the attention of the Sub-Committee. This anomaly is comparable to those observed in 1968 and 1984 only affects purse seine fisheries.

Baitboats do not appear to be affected by this thermal anomaly. However, landings of skipjack by Moroccan purse seiners have increased. The Azores-Madeira region, which is a particularly sensitive area to surface temperature variations, has seen a decrease in skipjack around the Azores and an increase in this species around Madeira.

These thermal variations are not only found in the Atlantic but also in other oceans as they are inter-linked, and have particular effects on the movements and recruitment of tunas. To study these anomalies, the Sub-Committee reiterated its request to the Secretariat to make available a data base of an environmental nature, available on CD-ROM (NODC and CEOS bases) either free or at a low cost. Possible access, through Internet, to environmental data bases was brought to the attention of the Sub-Committee.

5. Ecology of tunas

Work on the ecology of tunas (in association with floating objects and with other marine animals, and species interaction) ought to be supported by reliable and precise data. The data currently available from logbooks are not sufficient for this type of study. Such studies cannot be carried out with data raised by the scientific observers on board fishing vessels.

The Sub-Committee on Environment recommended that on-board observer programs on tuna fishing vessels be developed. This would have major implications and would provide information on the different fishery systems, such as fishing with floating objects which is becoming more and more developed, and by-catch. This would fall within the framework of responsible fishing.

6. Review of studies on the effect of the environment on tuna ecology and the conclusions of international meetings on the environment

This year a short chapter dealing with the environment was included in the detailed report of each species.

France has made progress with the PICOLO program which aims to study the mechanisms for improving conditions in the fishing grounds of the Atlantic north of the Equator.

The SCRS Chairman presented hypotheses to the Sub-Committee which had been presented to a symposium on north Pacific albacore. These hypotheses show the changes to the albacore fishery over the decade. The changes in the catches are linked to low pressure which have been prevalent in this region for the last twenty years. The proceedings of this symposium have not yet been published. Changes in the entire pelagic ecosystem in the north Pacific highlight the difficulty in defining maximum sustainable catch, especially for temperate tunas.

7. Working plan for the Sub-Committee

The Convener of the Sub-Committee on the Environment recalled the low levels of participation of SCRS scientists in Sub-Committee discussions and proposed that the establishment of a small discussion group to seek new working methods be considered. Given the difficulty in instigating discussions at the plenary sessions, it was suggested that a Working Group be created to meet a week before the SCRS and to present its findings at the Plenary Session. This Working Group could focus its discussions on documents submitted or reports of relevant meetings on topics related to the environment and tunas.

Discussions also took place on the possible links between the Sub-Committee and the by-catch group.

8. "Environment" day of the 1996 Symposium

Dr. Fonteneau recalled that a day would be dedicated to tuna environment during the 1996 ICCAT Tuna Symposium. The aim is to attract experts and to present synthesized papers on this topic, bearing in mind that the term "environment" should be taken in the broad sense, i.e. it should take into account problems linked to biological environment (diet, predators, relationships between species, association with floating objects, etc.)

9. Date and place of next meeting of the Sub-Committee on Environment

The next meeting of the Sub-Committee on Environment will take place at the same time and place as the next SCRS session.

10. Other matters

No other matters were discussed.

11. Adoption of the report

The report was adopted.

12. Adjournment

The meeting was adjourned.

Addendum 1 to Appendix 8

Agenda of the Sub-Committee on Environment

1. Opening of the meeting
2. Adoption of Agenda and arrangements for the meeting
3. Review of contribution papers
4. Anomalies in oceanic conditions in recent years
5. Ecology of tunas
6. Review of studies on the effect of the environment on tuna ecology and the conclusions of any international meetings on the environment
7. Working plan for the Sub-Committee (short-term and long-term plan)
8. "Environment Day" of the 1996 Tuna Symposium
9. Date and place of the next meeting of the Sub-Committee on Environment
10. Other matters
11. Adoption of Report
12. Adjournment

Appendix 9

REPORT OF THE SUB-COMMITTEE ON STATISTICS

1. Opening of the meeting

The 1995 meeting of the ICCAT Sub-Committee on Statistics was held in Madrid, Spain, at the Hotel Chamartin on October 11, 1995. Dr. S. Turner (U.S.A.), Convener of the Sub-Committee, welcomed all the participants.

2. Adoption of Agenda and arrangements for the meeting

The Tentative Agenda was adopted and is attached as **Addendum 1 to Appendix 9** to this Report. Dr. P. M. Miyake (Secretariat) served as rapporteur.

3. Review of national statistics

The Sub-Committee studied the table attached to the COM-SCRS/95/12, which showed the submission of data by various nations. The table form was changed and it was noted that the table was much easier to read in the new format.

The Sub-Committee noted that Task I nominal catch data should always be submitted separately, preferably on the official ICCAT form, and it should not be assumed that Task I figures can be taken from Task II data submissions. The Secretariat cannot accept responsibility for errors in Task I data which have been calculated or extracted from catch at size or Task II catch and effort data, since figures arrived at by such processes may not always show the correct total catch in round weight.

3.a Timeliness of reporting

The Secretariat reported that the earlier date of this year's SCRS meeting of the SCRS (October 9-13 in 1995 as opposed to November 21-25 in 1994) caused many problems for the Secretariat and consequently for the scientists, as the Task I catch data were not available for many important fisheries at the time of the meeting. Many new data were delivered during the meetings of the species groups, and the landings tables had to be revised several times (in some cases as many as seven updates were printed). These late submissions caused a delay in completing the SCRS analysis and in finalizing the Report.

After studying the situation, the Sub-Committee strongly recommended that the 1996 SCRS Meeting be held at a later date next year (e.g., the last week of October or in early November), with the Species Groups meeting approximately one week before that time, to assure that the most recent statistics are available to the Committee for its assessments on the state of the stocks and that effects of regulatory measures be available.

After experiencing the delay in receiving data at the meeting of *Ad Hoc* GFCM/ICCAT Joint Working Group on Stocks of Large Pelagic Fishes in the Mediterranean Sea, the Sub-Committee insisted that catch and effort data and catch-at-size data (or at least catch and size data) be submitted three weeks in advance of any stock assessment sessions and meetings of the Species Groups. Even if no assessment is to be made, the catch-at-size data are essential for the Species Groups. Catch and effort data should be made available in the finest possible strata, unless the national scientists analyze the data and standardize the CPUE series properly.

The Sub-Committee expressed serious concern about the lack of justification for changes to past statistics, which has been strongly recommended since 1994. Almost none of the changes were well explained or documented.

3.b Mis-reporting or non-reporting

Details can be found in COM-SCRS/95/12. It was noted that many data for non-Contracting Parties of the Mediterranean area are not submitted, unless a joint GFCM/ICCAT meeting is held. The Sub-Committee noted that the Mediterranean swordfish data have been improved to a great extent and hoped that such improvements could be made for other species, even without holding the joint meeting of GFCM/ICCAT.

3.c Catches of non-Contracting Parties

Details are given in COM-SCRS/95/12 and also in section 5.a of this Report.

3.d EEZs vs high seas

Details were provided in COM-SCRS/95/12. The Secretariat reported that the map of the world in 1°x1° and by 5°x5° rectangles, with codings for each rectangle showing high seas, EEZ, land and inland waters have been completed by FAO, and ICCAT has received a copy. On the other hand, FAO is planning to develop a digital map program, requesting each regional agency to provide catches by 5°x5° areas for all tuna species. If ICCAT provides such data, FAO could attempt to divide the tuna catches into EEZ and high seas, with the aid of this digitalized high seas map. The Sub-Committee noted, however, that some caution should be taken when separating data using the map FAO has provided, since any rectangle through which a border passes is assigned to the zone of the majority. This separation of the data is difficult for 1°x1° statistics and almost impossible for 5°x5° statistics.

Progress made on the FAO World Tuna Atlas project, which was discussed at the 1994 SCRS meeting where it was agreed that ICCAT would collaborate, was reviewed. The Secretariat informed the Sub-Committee that the data on Mediterranean tunas have been provided to FAO. A further request was made to FAO to clarify the types of maps that are required for this program.

The FAO representative stated that the data requested be defined as catch, preferably in weight but alternatively in number, by species, fishing gears, quarters and year in 5°x5° rectangle areas (and if possible in 1°x1° areas), for the total Atlantic, since 1960. The project is well advanced for the Pacific and Indian Oceans for industrialized fisheries. For the Atlantic, the data of industrialized fisheries will serve this purpose. He further noted that these data, once provided to FAO, will serve as the basis for FAO to create a paper atlas, statistics for EEZ and high seas, and the digital map project, and it is expected that this be developed in the 1996-1997 period.

The Sub-Committee noted that this request was quite reasonable and that such a data file would be very useful to all the ICCAT scientists, to be used together with proper mapping software. It recommended that the Secretariat comply with this request, and if feasible (i.e. if the Secretariat has sufficient time and if FAO provide clear cut criteria), and if acceptable to FAO, the Sub-Committee strongly recommended that the Secretariat prepare the paper maps for FAO and for the SCRS.

4. Secretariat's statistical work in 1995

4.a Secretariat's data management policy and data collection and compilation

Details are given in COM-SCRS/95/12.

The Secretariat informed the Sub-Committee that the possibility of maintaining the basic data in data base format had been studied. However, for reasons of data security, easier and error-free data entry and updating, and maintaining all the full history of data updating, the current system of an ASCII file with FORTRAN data processing has been maintained.

4.b. Dissemination and publication of data

There has been no change in the policy of data dissemination.

The Sub-Committee noted that the Commission's 1994 Proceedings had been published late, due to the failure to adopt the Report in time. This has caused serious problems for the scientists as it is vital for them to know what requests and recommendations have been made by the Commission in order for their work to be effective. In addition, the Sub-Committee noted that the *"Collective Volume of Scientific Papers"* had not yet been received by scientists from Canada and the U.S., although the first volume had been mailed in July and the second in late September.

Considering the cost increase of sending all the publications by air mail, the Sub-Committee recommended that one copy of the Biennial Report be sent by air mail to the Head Delegate and chief scientist of each country that attended either the SCRS or the Commission meeting for that year, and that a copy of the *"Collective Volume"* be sent by air mail to the chief scientists of each country which attended the SCRS meeting. All other mailing of publications should be by surface mail.

The Sub-Committee also suggested that if many scientists are from the same institute and do not require individual copies, they should inform the Secretariat, so that a reduced number of copies can be sent to that Institute.

The Sub-Committee noted that the use of inferior quality recycled paper for copying reports and drafts made them very difficult to read. It was also commented that the weight of such paper, which is heavier than normal paper, may increase postage costs. The Secretariat was asked to compare the cost of using better quality paper with the recycled paper currently used and, if the difference is not significant, that better quality paper be used for future meetings.

The Sub-Committee was informed that IPTP made Task I type information available on diskette with user friendly software. The Sub-Committee strongly recommended that the Secretariat provide Task I data in a similar format and that this be put into effect in 1996. This would not, however, eliminate the publication of the *"Statistical Bulletin"*.

4.c. Other matters

No other matters were discussed.

5. Review of the progress made on recommendations for statistics (as contained in the 1993 SCRS Report), and future plans

There were several important assignments and recommendations made by the SCRS and the Commission during the 1994 meetings. The Secretariat has already taken steps to put most of these recommendations into effect. Details can be seen in COM-SCRS/95/12.

5.a. Evaluation of data obtained through the ICCAT Bluefin Tuna Statistical Document Program.

Details are given in COM-SCRS/95/12 and SCRS/95/116. The Sub-Committee noted that major improvements had been made in reporting or estimating bluefin catches by member and non-member countries, mainly due to the ICCAT Bluefin Tuna Statistical Document Program.

In examining document SCRS/95/116, the Sub-Committee was informed that for some countries, the exports to Japan exceeded the reported catches. In most cases, it was considered that data reported to ICCAT by the national offices (Task I) were either missing or under-reported. However, the case of Spain is very special, where exports exceeded the reported catch by over 5,000 MT. As it is considered that the Task I catch figures show reliable estimates, it seems that the exports included a considerable quantity of bluefin that was transshipped at Spanish ports: at Mediterranean ports, by other EU countries, at Canary Island ports, and possibly by non-Contracting Parties.

Given that a considerable amount of the bluefin tuna caught by non-Contracting Parties in the Mediterranean area may be transshipped at the Canary Islands, the Secretariat was asked to study the feasibility of obtaining information from sources in the Canary Islands on the activities of such longliners in the Mediterranean Sea and, if it was considered feasible, to visit the ports for further investigation before the next SCRS meeting on bluefin assessment.

5.b Unreported statistics of Contracting Parties and non-Contracting parties

See Section 3.b and c.

5.c Improvement of computer facilities and software

All the computer items purchased by the Secretariat since the 1994 SCRS meeting are listed in COM-SCRS/95/12. The Sub-Committee was satisfied to note that most of the items recommended at the 1994 SCRS had been purchased and were being used effectively. The Sub-Committee also thanked the U.S. scientists for their assistance in purchasing software in English for use by the Secretariat.

In particular, the replacement of the Digital Micro VAX by a Digital Work Station system has greatly facilitated data processing work. All the files have been transferred to this new system which has substantially more memory and faster processing speed.

The Secretariat proposed that three "notebook" computers be purchased in 1996 instead of three desk-tops (as had been recommended by the 1994 SCRS). The notebooks are very convenient, especially since the majority of meetings are being held outside the Secretariat offices. Also, the Sub-Committee considered that software for mapping was essential for the Secretariat.

The Sub-Committee formed a small group to study computer hardware and software needs. The report of the Group was later submitted to the Sub-Committee and then forwarded to the SCRS (**Addendum 2 to this Report**).

5.d Restructuring of the sampling strategy for the surface fisheries

According to the decision of the SCRS in 1994, the Secretariat renewed the contract with the Autonomous University of Madrid in 1995, to continue the studies on sampling strategy. The report by the contractee was presented as SCRS/95/8. The Sub-Committee noted progress over the study presented last year (SCRS/94/9) as regards the comparison of effects due to type of set which had not been possible to address in 1994. The Sub-Committee would have preferred a full study of set type, geographic and temporal effects with recommendations on sampling design, even from the limited data available, but accepted the progress made as a useful contribution.

The Sub-Committee considered that this task was originally proposed to be carried out by a biostatistician hired by the Commission, and expressed disappointment that the Commission had not funded this position at the Secretariat. As a result, this work had to be contracted to an outside organization which was not familiar with tuna fishery. It recognized that the initial pilot study has been completed and the French and Spanish scientists had proposed a plan to the EU to continue such work based on the findings of these initial studies. Once accepted, this EU program is expected to be completed within 18 months.

The Sub-Committee considered that, in principle, such a program should be carried out with ICCAT funding and not by outside funding, and reiterated its requests of previous years to hire a biostatistician at the Secretariat. At the same time, it expressed its gratitude to the EU for funding this important program.

The Sub-Committee also noted that document SCRS/95/39, which attempted to separate Venezuela tropical tuna catches by species using sampling results, took an analytical approach to the overall data base, but dealt with a very similar problem. Even though the areas of fishing are different, it was felt that this study should be taken into account when studying east Atlantic tuna sampling strategy.

5.e. Others

It was reported that ICCAT hosted the 16th Session of the CWP at its Headquarters from March 20 to 25, 1995. The report of this meeting was presented as SCRS/95/23 and was reviewed by the Sub-Committee. The FAO representative thanked the ICCAT for hosting and chairing this meeting.

6. Recommendations

While there are several recommendations made in this Report, particular attention should be paid by the Commission to the following:

- The SCRS meeting should be held no earlier than last week of October (Section 3a).

- FAO requests for the provision of detailed tuna catch data base should be met (Section 3d).

- Time permitting, ICCAT should create the maps for FAO, if this is acceptable to FAO (Section 3d).

- Some copies of the *"Biennial Report"* and *"Collective Volume"* should be sent by air mail (Section 4b).

- ICCAT should format and disseminate the Task I data base on diskette, with user friendly software (Section 4b).

- The excess export of bluefin tuna over the reported catches should be clarified (Section 5a).

- Computer hardware and software at the Secretariat should be updated, as recommended by the small group (Section 5c and Addendum 3 to this Report).

- Previous recommendations to hire a bio-statistician are reiterated (Section 5d).

7. Date and place of the next meeting of the Sub-Committee on Statistics

The Committee decided to meet at the same time and place as the meeting of the SCRS in 1996.

8. Other matters

No other matters were discussed.

9. Adoption of Report

The Report of the Sub-Committee on Statistics was adopted.

10. Adjournment

The 1995 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
2. Adoption of Agenda and arrangements for the meeting
3. Review of national statistics
   - 3.a Timeliness of reporting
   - 3.b Mis-reporting or non-reporting
   - 3.c Catches of non-Contracting Parties
   - 3.d EEZs vs high seas
4. Secretariat's statistical work in 1995
   - 4.a Secretariat data management policy and data collection and compilation
   - 4.b Dissemination and publication of data
   - 4.c Other matters
5. Review of the progress made on recommendations for statistics (as contained in the 1994 SCRS Report), and future plans
   - 5.a Evaluation of data obtained through the Bluefin Tuna Statistical Document Program
   - 5.b Un-reported statistics of Contracting Parties and non-Contracting Parties
   - 5.c Improvement of computer facilities and software
   - 5.d Restructuring of the sampling strategy for the surface fisheries
   - 5.e Others
6. Recommendations
7. Date and place of the next meeting of the Sub-Committee on Statistics
8. Other matters
9. Adoption of Report
10. Adjournment

Addendum 2 to Appendix 9

Report of the Small Group
to Review Secretariat Computer Facilities

A small group was formed to review the computer facilities of the Secretariat. The group noted the excellent progress made by the Secretariat since the last meeting as reported in COM-SCRS/95/12. The Small Group commended the Secretariat on the improvements.

The Group recommended that the Secretariat continue with the PC upgrade program for the staff by replacing the three remaining 286 machines before they break down at a crucial time. The Group noted the Assistant Executive Secretary's suggestion that the old desktop PC's be replaced by portable PCs (notebooks). The Group reconsidered its 1994 recommendation for replacement of the desktop machines, but decided not to change that recommendation. Having experienced far more equipment problems with portables (faulty hard drives, screens and keyboards ...) the Group felt strongly that even at equal prices (desktops are less expensive) desktop computers would represent a superior choice because of durability, adaptability and ease of repair. The Group did urge the Secretariat to buy high quality color monitors and good keyboards for the new PC's. (See 1994 recommendations for minimum specifications).

The Group recommended that two hard drives (internal or external, if possible 800-1,000 MB; if system BIOS will not support drives of that size, then as large as possible) be purchased for the Assistant Executive Secretary and the Systems Analyst because of the increasing need for disk space for operating systems (Windows, etc.) and the wide

array of software essential to accommodate needs and for files provided by scientists at meetings and for publications. High capacity disk drives are recommended to accommodate current and future needs.

The Group recommended that the Secretariat continue upgrading and/or expanding its available software as recommended over the past few years.

The Group reiterated its recommendation for the purchase of a CD-ROM drive and an associated adapter for portables (preferably an adapter which can easily be used on more than one machine). It was further recommended that a portable PC backup device (perhaps a Trakker parallel port tape drive) be purchased and, if funds permit, a color printer be purchased.

A list of recommended purchases is provided below:

Product	*Price (US$)*	*Comments*
Software		
6 copies WORDPERFECT	1800	total cost
MICROSOFT OFFICE with EXCEL and WORD and other components	500	1 copy
MAPINFO or similar	1000	1 copy, basic version for mapping not full GIS
QUATTRO PRO	530	2 copies
PC FORTRAN	400-700	capable of accessing > 640 K RAM. 1 copy
VISUAL BASIC	400	if above FORTRAN does not provide similar windowing/menu capabilities. DOS, not restricted to Windows
Bibliographic Software	300	1 copy, perhaps PROCITE
Hardware		
3 PC's with color monitors and keyboards	3500	as recommended last year. Group recommends desktop, not portable, models
2 hard disks	2000	probably portable with printer port access
Backup Device and 10 tapes	900	print port access, price approximate
color printer	600	if funds available

Appendix 10

REPORT OF THE AD HOC WORKING GROUP ON BY-CATCHES
Future plans for the collection of by-catch statistics

1. Opening of discussions and arrangements

At the request of the Chairman of SCRS, the Coordinator of the *Ad Hoc* Working Group on By-catches opened the meeting discussions on the issue of by-catch and sharks.

2. Adoption of Agenda

The Tentative Agenda, which was circulated before the meeting, was reviewed and adopted after minor modification. The Agenda is attached as **Addendum 1 to Appendix 10**.

3. Sharks and ICCAT

Following the Agenda, extensive discussions on sharks and ICCAT were carried out. The discussion focussed on: (a) the recent CITES Resolution (Conf.9.17 on sharks), which was recently adopted (see **Addendum 2 to this Report**); and (b) ICCAT responsibilities with respect to fishery statistics for shark catches and stock assessments for shark species.

An observer representing CITES informed the Committee of the motivation for CITES Resolution Conf 9.17 (**Addendum 2**). The Committee was informed that the work of CITES relative to the Resolution, thus far has been preliminary as the Resolution was only recently adopted at the Ninth Meeting of the Conference of the Parties (Fort Lauderdale, USA, November 1994). The motivation for the Resolution was the concern expressed over the high level of international trade in shark flesh and shark fins and uncertainty about the effects of such trade on the status of world-wide shark stocks. Under the Resolution adopted, the CITES Animals Committee was requested to review information on shark catches and trade statistics available through FAO and other international fisheries management organizations and to review appropriate information from non-governmental organizations; summarizing the available biological and trade status of sharks subject to international trade; and to prepare a discussion paper on the biological and trade status of sharks. Although the Resolution calls for the discussion paper for the 10th meeting of the CITES Conference of Parties, to be held in 1997, the Committee was informed that it is unlikely that a comprehensive report and recommendations about possible listing status under the CITES Convention (using so-called Ft. Lauderdale Criteria) on the basis of this report will not likely be completed until the 11th CITES Conference of Parties to be held in 1999. Consultations with FAO have been initiated, but formal requests from CITES to ICCAT for information on shark catches in Atlantic and Mediterranean tuna and tuna-like fisheries have not yet been received by ICCAT. A meeting of the Shark Study Group of the CITES Animals Committee is tentatively scheduled for early 1996 in Panama to further discuss progress on actions undertaken in response to the CITES Resolution.

The Committee reviewed Article IV of the International Convention for the Conservation for the Conservation of Atlantic Tunas. Article IV 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 species of fishes exploited in tuna fishing in the Convention area as are not under investigation of another by another international fishery organization". The Committee interpreted this language to indicate that ICCAT has responsibility for collecting information on catches of sharks and other fishes which are coincidental to fishing effort directed toward tunas and tuna-like species. The Committee recommended that as a responsible first step, the Secretariat incorporate into the ICCAT statistical data base, information on catches of these by-catch fish species. The Committee further recommended that methods be investigated and incorporated into various national statistical data collection systems to improve the reliability of these by-catch estimates for the full range of fisheries directing effort at Atlantic tuna and tuna-like fishes. Estimates of by-catch resulting from these improved data collection systems should then be reported to ICCAT on a regular and timely basis. The Committee noted that the information needed to most accurately estimate shark by-catch in Atlantic tuna fisheries will result from scientific observer sampling on-

board fishing vessels. Improving logbooks to allow fishermen to record shark catches might also provide a basis for estimating these catches, however logbooks then need to be designed to record the by-catch kept and discarded, and if the discard are dead or alive. The Committee felt that observer sampling should be employed when possible, because of concern about the accuracy of self reported catch information recorded in logbooks, especially when attempting to estimate by-catch which is frequently discarded at sea.

The Committee discussed the difficulties of assessing the effect of by-catches of sharks in Atlantic tuna fisheries on the status of shark stocks in the Atlantic. Without information on the fishing mortality levels resulting from effort directed toward sharks as well as fishing mortality resulting from by-catch in effort directed at species other than tunas and tuna-like species, such assessments could not be completed. The Committee recommended that should sufficient data become available to support shark stock assessments in the future, ICCAT should focus attention on the pelagic shark species (e.g. blue, mako, thresher, silky, etc.), since these are likely to be more frequently caught in effort directed at Atlantic tunas.

4. Review of contributed and information papers

The Committee noted that more documents were prepared for discussion under this Agenda item than in the recent past, indicating the increasing interest in by-catch and shark issues within SCRS.

A number of the documents presented related to shark fisheries and fishery descriptions. Document SCRS/95/53 presented a general overview of world-wide shark landings and highlighted concerns about shark stock status in general, resulting from increased landings, which might or might not represent increasing catch. Concerns result from the uncertainty about the capability of shark stocks world-wide to sustain increasing catches, and our general knowledge about the likely low recovery potential for many shark species. However, the generalizations in this paper might not be applicable to species which are most frequently taken as by-catch in the Atlantic tuna fisheries. Although, without more detailed information on the total catch and abundance trends for these species, it may not be possible to make more definitive assessments of the actual situation. SCRS/95/112 reviewed the shark fisheries of South Africa including catch, stock status, management, and description of other by-catch species, e.g., batoids, teleost, sea turtles, birds and dolphins. This document points to the complex issues related to better understanding of shark catches and landings and the fact that a wide array of fisheries take sharks either as a by-catch or as a directed harvest.

Other documents related to shark fisheries, other by-catch species and research activities on sharks were reviewed by the Committee. Shark fisheries descriptions, including by-catch of sharks in tuna and tuna-like fisheries, catch statistics of shark and species composition of sharks taken of Venezuela, Canada, the United States, and Brazil are introduced in SCRS/95/64, SCRS/95/66, SCRS/95/74, SCRS/95/125, respectively. Documents SCRS/95/66 and SCRS/95/74 also described shark fishery management measures implemented for controlling Atlantic shark harvests in Canada and the U.S. Species composition of sharks available for directed fisheries was investigated with a research cruise in Mauritius and as deduced through observer activities in the United States are also reported upon in SCRS/95/69 and SCRS/95/103.

By-catch of other species were also described in SCRS/95/102 (swordfish) and SCRS/95/68 (remoras). SCRS/95/102 demonstrated that by-catch of undersized targeted species also requires detailed information from scientific observer programs if we are to estimate these catches accurately, since in some fisheries, many of the undersized fish are discarded at sea. SCRS/95/102 also indicated that indicated that by-catch species need not be directly taken by the fishing gears used to harvest Atlantic tunas. In this case, remoras which attach themselves to swordfish, billfish, or turtles which are caught on longlines.

The Committee was also informed of the results of the Scientific Technical Economic Committee for Fisheries (STECF) of the European Commission which met in January, 1995, on the subject of driftnet fisheries for tuna and tuna-like species in the European EEZ. The aim of the meeting was: (1) updating descriptions of fisheries; (2) updating information on status of stocks (target and by-catch stocks); (3) description of technical means to reduce by catches of driftnets; and (4) compare economic results of gillnet versus other fisheries.

The French driftnet fishery was described as during SCRS (1994); the Irish and U.K. driftnet fisheries are thought to be very similar to the French fisheries in terms of by-catch. New information was given on Spanish driftnet fisheries for swordfish in the Strait of Gibraltar, which ended in 1990; another coastal Spanish gillnet fishery along the Mediterranean coast of Spain targets small tunas. There is no information on by-catch from this coastal fishery.

Italy has an important gillnet fishery targeting swordfish and secondarily albacore in the Mediterranean. There was no more information available on this fishery than was presented during SCRS 1994. Many other countries (e.g. Albania, Turkey, Libya, Tunisia, Algeria, Morocco) are known to use gillnets, sometimes for tuna fishing. There was no information on by-catches presented to STECF on these fisheries. It was noted that Greece does not use gillnet for tuna.

Some technical means have been described to decrease marine mammal by-catches in these driftnet fisheries. More experimentation is needed to statistically verify the effects of such technical modifications to fishery operations.

The STECF noted that observer programs (as done by Italy and France) gave much better and more complete information in both a quantitative and qualitative way, than did other programs. Effects of drift gillnet fishing on non-target species were evaluated for two species of dolphins in the Atlantic. Some considerations of blue shark and wreck fish potential sensitivity to mortality due to GILL fisheries were initiated, but not included in the report of the meeting.

5. Review of Report of the *Ad Hoc* Working Group on By-catches

The Report of the *Ad Hoc* Working Group on By-catches (SCRS/95/19) was presented to and reviewed by the Committee (**Addendum 3 to Appendix 10**). The Committee endorsed the recommendations of the report and also identified the need to collect information from the full-range of ICCAT Atlantic tuna fisheries. The Committee recognized that the time available for responding to the 1995 ICCAT questionnaire on by-catch. A more complete response to the questionnaire is needed to provide the most accurate picture of by-catch composition in Atlantic tuna fisheries given the current available knowledge. This information available will serve to guide research activities into obtaining improved estimates of by-catch in the Atlantic tuna fisheries in the future. This information is also needed to provide a comprehensive response to anticipated requests for information.

6. Future direction

The Committee discussed future activities of the *Ad Hoc* Working Group on By-catches and made several recommendations.

It was suggested that a Sub-Committee on By-catch be established to guide research and analytical activities related to by-catch issues and that a Shark Working Group be formed, specifically to deal with issues relating to by-catch and, in some cases, directed catches of sharks.

The Committee recommended that the work of the group on describing by-catch characteristics of Atlantic tuna fisheries continue and that an intercessional meeting be convened, in early 1996, preferably in advance of the CITES Animals Committee Shark Study Group meeting, to prepare a more complete characterization of shark by-catch in Atlantic tuna fisheries, based on updated responses to the 1995 ICCAT questionnaire on by-catches.

The Committee recommended that as a responsible first step, the Secretariat incorporate into the ICCAT statistical data base, information on catches of these by-catch fish species. The Committee further recommended that methods be investigated and incorporated into various national statistical data collection systems to improve the reliability of these by-catch estimates for the full range of fisheries directing effort at Atlantic tuna and tuna-like fishes.

The Committee recommended that should sufficient data become available to support shark stock assessments in the future, ICCAT should focus attention on the pelagic shark species (e.g. blue, mako, thresher, silky, etc.), since these are likely to be more frequently caught in effort directed at Atlantic tunas. However, the Committee recognizes that comprehensive assessments can only be possible if the full range of catch and effort statistics be included in evaluations. Much, if not most, of these catches could occur in fisheries other than Atlantic tuna fisheries. Thus, the Committee noted that further collaboration and cooperation with other fishery organizations (FAO, ICES, NAFO, GFCM) as well as a range of non-member nations would be required to develop sufficient data sets for stock assessment purposes. The Committee recommended that ICCAT maintain communications with such interested organizations and nations and provide these organizations with reports of progress made by ICCAT on the issue of by-catch and sharks.

Addendum 1 to Appendix 10

Agenda of *Ad Hoc* Working Group on By-catches

1. Opening of discussions and arrangements
2. Adoption of Agenda
3. Sharks and ICCAT
4. Review of contributed and information papers
5. Review of Report of the *Ad Hoc* Working Group on By-catches
6. Future direction

Addendum 2 to Appendix 10

RESOLUTION OF THE CONFERENCE OF THE PARTIES TO CITES
(CONF.9.17)

Status of International Trade in Shark Species

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

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

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

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

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

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

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

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

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

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

THE CONFERENCE OF THE PARTIES TO THE CONVENTION

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

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

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

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

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

REQUESTS

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

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

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

Addendum 3 to Appendix 10

INTER-SESSIONAL REPORT OF THE *AD HOC* WORKING GROUP ON BY-CATCHES

(Madrid, Spain - October, 1995)

(SCRS/95/19 -Revised)

1. Introduction

1.1 Establishment of the Ad Hoc Working Group

At the 1994 SCRS, discussions held indicated the need for more detailed information on by-catch in Atlantic tuna fisheries. At the 1994 meeting of the International Commission for Conservation of Atlantic Tunas (ICCAT) it was decided to expand the Commission's research activities to include collection of by-catch statistics in tuna fisheries, including statistics on the by-catches of sharks. In response, SCRS established an *Ad Hoc* Working Group on By-catches to guide initial development of information gathering mechanisms which may, in the future, provide a basis for determining the magnitude and characteristics of by-catch of non-target species in Atlantic tuna fisheries. Dr. G. Scott (USA) was appointed the Coordinator of the Working Group which also included Drs. L. Antoine (France), H. Nakano (Japan), and Ms. V. Ortiz de Zarate (Spain).

1.2 Activities undertaken by the Group

The *Ad Hoc* Working Group was assigned the task of developing a questionnaire which would allow initial evaluation of the status of knowledge about the species composition and magnitude of by-catch in Atlantic and Mediterranean tuna and tuna-like fisheries. To this end, the Working Group met through correspondence and developed a questionnaire. This questionnaire was subsequently distributed by the ICCAT Secretariat for response by statistical correspondents and heads of scientific delegations of the ICCAT member nations and other Atlantic and Mediterranean fishing nations. At the time the questionnaire was distributed a request for submission of scientific documents on by-catch issues to the 1995 SCRS was also made.

The *Ad Hoc* Working Group also collaborated with the International Council for the Exploration of the Sea (ICES) Study Group on Elasmobranch Fishes, chaired by Dr. H. da Silva (Portugal). At the invitation of ICES, Drs. H. Nakano and Y. Uozumi (Japan) represented SCRS at the Second ICES Study Group meeting which was held from 15-18 August at the ICES headquarters in Copenhagen, Denmark. A report on this meeting, which was held to review the available information on fisheries statistics (including by-catches in non-targeting fisheries), biological characteristics, and stock status of Elasmobranch fishes in the Northern Atlantic (generally north of 35°N latitude), was prepared (SCRS/95/11). The ICES Study Group was informed of ICCAT's progress on collection of shark catch and by-catch statistics: that the SCRS has not established a data base sufficient to assess the status of Atlantic shark resources, although SCRS data collection efforts could contribute to such a data base, especially for pelagic shark species (*e.g.* blue, mako, thresher, etc.). Document SCRS/95/11 points out that continued collaboration of this type will be beneficial to both ICES and ICCAT. However, the region and fisheries of main concern to ICES (Atlantic waters north of 35°N, and mainly demersal fisheries) limits the amount of information available through ICES on the pelagic species taken in many of the Atlantic tuna fisheries.

Members of the *Ad Hoc* Group have also participated in by-catch discussions relating to sharks and other species at other meetings during the year. However, participation in these meetings was made representing individual nations, rather than representing SCRS. The report of one of these meetings (Report of the Scientific, Technical and Economic Committee of the European Commission on tuna driftnet fisheries) was distributed for information purposes to the members of the Group. This document was also transmitted by the ICCAT Secretariat to the Head Delegates of Canada, France, Japan, Korea, Morocco, Portugal, Spain, and the USA.

2. Definition of by-catch for the ICCAT questionnaire

2.1 Definition of by-catch for ICCAT questionnaire

A strict definition of by-catch could include any species of the animal kingdom which is caught coincidentally to fishing effort directed towards a target species (or group of target species). In this sense, the catch of tunas and tuna-like species in the Atlantic and Mediterranean can result as either a targeted catch or as a by-catch. Because some species resulting as by-catch in other fisheries are landed and sold in markets (*e.g.* tunas caught in demersal gears), these by-catches are at least partially accounted for in landings statistics and are reported to ICCAT. However, many species caught are of no economic importance and are typically discarded at sea. In effect, information needed to address by-catch issues is the same information needed to estimate the species composition and disposition of the total (landed and discarded) catch. Logbook reports, if sufficiently detailed, can provide a basis for estimating the proportion of different species in the catch as well as their disposition, but direct observations of fisheries usually provide an improved basis for these estimates.

For the purposes of the ICCAT questionnaire, by-catch relating to the unintentional capture of fish (including sharks), marine mammals, sea turtles, and sea birds was of primary interest. The questionnaire was structured to allow nations to report by fishery, the quantity and disposition of major and minor fish by-catch as well as by-catch quantity, disposition, and utilization of marine mammals, sea turtles and birds. Major by-catch fish species were defined as those fish species taken frequently or consistently with the target species, while minor by-catch fish species were defined as those taken infrequently or inconsistently with the target species. The questionnaire was also structured to allow member nations to indicate the source of information used to prepare the report (i.e. if either logbook or scientific observer data were used to complete the report).

2.2 Definition of ICCAT fisheries

To evaluate the amount of information available through response to the questionnaire on by-catches in Atlantic and Mediterranean tuna and tuna-like fisheries, a definition of ICCAT fisheries was based on the national reports of catches of tunas and tuna-like fishes by gear and general fishing areas. For this report, fishing areas are taken as the ICCAT general fishing areas. The listing of nation-gear-fishing areas for which tuna and tuna-like fishes have been reported are shown in **Table 1 (revised)**.

3. Status of by-catch reports

In total, responses to the ICCAT questionnaire were received from nine ICCAT member nations and five non-member nations (SCRS/95/7). Additional or revised responses to the questionnaire were received from four member nations and one non-member nation and reviewed at the first meeting of the ICCAT Shark Working Group in Miami, Florida (February 26-28, 1996). The additional information presented was used to revise this report. The responses to the questionnaire are indicated in **Table 1 (revised)** and are summarized in **Table 2 (revised)**. Only a small number (14 fisheries reported by nine nations, see **Table 2 (revised)** of the total possible (more than 95, see **Table 1 (revised)**) of the by-catch reports submitted in response to the ICCAT questionnaire were based on direct observations of the fisheries for which reports were made. An additional 5 fisheries reports (by 4 nations) were made on the basis of logbook data. Reports from 3 nations indicated that there was not sufficient available data to provide quantitative reports. A list of species reported by respondents to the 1995 ICCAT by-catch questionnaire are shown in **Table 3 (revised)**, but the table is incomplete since reports were not available for all fisheries.

Numerous fisheries (more than 95) catch tunas and tuna-like fishes in the Atlantic and Mediterranean (see **Table 1 (revised)**). Most of the major fisheries targeting tunas and tuna-like species use purse seines, longlines, bait-boats, gillnets or rod&reel to attain catches. For many of the unclassified gears in **Table 1 (revised)**, tunas and tuna-like fishes are caught as by-catch in fisheries directed at other species. A high diversity of species are caught in the Atlantic and Mediterranean tuna and tuna-like fisheries, coincident to catches of species of major interest. The diversity of species in the catch relates to the gear used as well as the fishing area and season of fishing. Some of these are landed and sold at market, some are not sold, but are utilized for food, bait, or for other purposes, and still others are discarded at sea. Of those animals discarded at sea, some proportion does not survive capture. Generally speaking, complete records of catch and disposition of the catch are not maintained by fishermen, especially for species in the catch of no economic importance to the fishermen. Logbook reports, if sufficiently detailed, can provide a basis for estimating the proportion of different species in the catch as well as their disposition, but direct observations of the fisheries usually provides an improved basis for these estimates.

Longline fishing occurs throughout the Atlantic and Mediterranean by most of the ICCAT member nations and several non-member nations. Species reported caught by longline fisheries include at least 31 Elasmobranch species, 20 teleost (excluding tuna and tuna-like species), three marine turtle species, seven species of sea birds and three species of cetaceans. However, this listing is likely to be incomplete since detailed reports were received from five countries with longline fisheries.

Reports on gillnet fisheries from France (targeting albacore) and the U.S. (targeting swordfish) and Ghana (targeting billfishes and sharks) indicated that at least 12 species of Elasmobranchs, 17 teleost (excluding tunas and tuna-like species), three marine turtle species, two sea bird species and 16 species of cetaceans were taken as by-catch in these fisheries. Although not reported in the ICCAT by catch questionnaire for 1995 additional information on gillnet fishery by catches is available in the August 1995 Report of the Scientific, Technical and Economic Committee of the European Commission on tuna driftnet fisheries, which was distributed to the *Ad Hoc* Working Group for information purposes. Previous reports submitted to ICCAT on Italian driftnet fisheries focus on by-catches of marine mammals in these fisheries. Again, this listing is likely to be incomplete since reports were not received from all nations using gillnets to capture tunas and tuna-like fishes in the Atlantic and Mediterranean.

A report on purse seine fishing targeting bluefin in the Adriatic Sea indicated one species of shark, one species of teleost (excluding tuna and tuna-like species), one marine turtle species, and two species of marine mammals were part of the by-catch. As above, the species listing is believed to be incomplete since reports were not received from most Atlantic and Mediterranean nations using purse seines for catching tunas and tuna-like species.

4. Population status of by-catch species

At present, it is not possible to present a comprehensive evaluation of the level and disposition of by-catch in Atlantic and Mediterranean since information sufficient to estimate the composition, disposition, and utilization of the total catches of these fisheries are not yet available. Furthermore, the effect of these fishery removals on by-catch species stock status cannot be evaluated unless fishery mortality resulting from directed and other fisheries (i.e. other than Atlantic and Mediterranean tuna and tuna-like fisheries) are also taken into account. More comprehensive evaluations of by-catch species stock status will require consultation with appropriate scientific experts and Commissions which have responsibilities for these species stocks.

4.1 Elasmobranches

There are several countries which reported target and non-target fishery catches of sharks. In some of these reports, sharks represent a large proportion of the total catch. In some cases, the catches of sharks are discarded and relatively high proportions of the discarded catch is reported or observed alive when discarded. Although information on shark population status is not at all certain due to lack of species-specific information, several nations have implemented regulations designed to limit catches of sharks due to concern over the sustainability of those catches. Much of the concern relates to increases in landings of sharks and scientific understanding of shark life history characteristics, which indicates that sharks in general have lower reproductive potential and productivity than many marine teleost. A summary of information on the life-history parameters for a number of shark species is shown in **Table 4**, extracted from Pratt and Casey (1990).

5. Recommendations

Evaluation of the total fishery-related mortality of by-catch species in Atlantic and Mediterranean tuna and tuna-like fisheries cannot be conducted until more detailed information on total catch species composition, disposition and utilization is available for the full range of Atlantic and Mediterranean fisheries directed toward tuna and tuna-like species. There is a relatively small proportion of these fisheries for which reports were prepared in response to the 1995 ICCAT questionnaire on by-catches, and an even smaller proportion of the reports were based on sufficiently detailed information to provide estimates of total catch species composition, disposition, and utilization of the catches, which makes comparisons between and among fisheries and nations inappropriate. It is recommended that improvement in estimates can best be achieved by implementation of scientific observer programs designed to provide representative samples of the fisheries for which insufficient information is presently available. Implementation of this recommendation would be applicable to most of the Atlantic and Mediterranean tuna and tuna-like fisheries since very few, at present, utilize on-board scientific observer sampling programs.

At a minimum, ICCAT should incorporate into its statistical data base, estimated catches of by-catch species which result from fisheries directing effort to catch Atlantic and Mediterranean tunas and tuna-like species. However, effects of fishery removals on by-catch species stock status cannot be evaluated unless fishery mortality resulting from directed and other fisheries (i.e. other than Atlantic and Mediterranean tuna and tuna-like fisheries) are also taken into account. Thus, more comprehensive evaluations of by-catch species stock status will require consultation with appropriate scientific experts and Commissions which have responsibilities for these species stocks. The role and responsibilities of ICCAT for these assessments needs thorough evaluation.

6. References

Pratt, H.L. and J.G. Casey 1990. Shark reproductive strategies as a limiting factor in directed fisheries, with a review of Holden's method of estimating growth-parameters. In: Elasmobranchs as living resources: Advances in the biology, ecology, systematics, and the status of the fisheries. NOAA Tech. Rep. NMFS 90: 97-109.

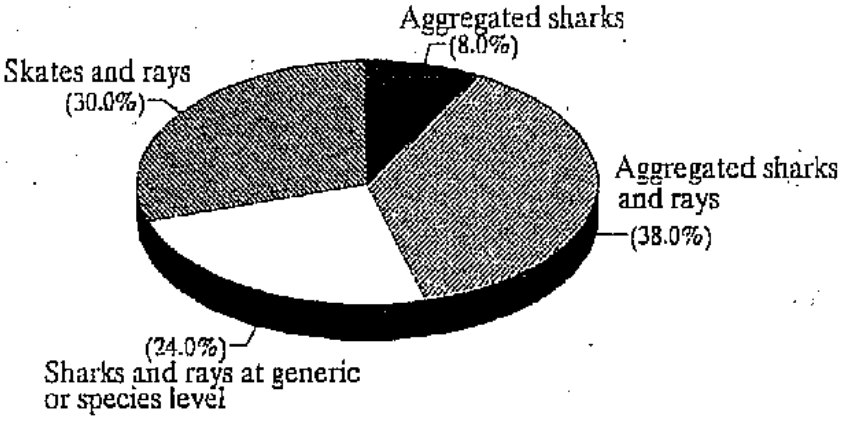

Figure 1. Species concentrations - FAO nominal catch data on Elasmobranchs, 1985-1994.

Table 1 (Revised). Major Atlantic tuna fisheries and by-catch information available.

SOURCES			NATION	GEAR	AREAS	MAJOR SPECIES CAUGHT						
B	L	O				BFT	YFT	ALB	BET	SKJ	SWO	BON
MEMBERS												
			ANGOLA	TRAP								X
				BB	ETRO		X			X		
			BRAZIL+J.H.T.K	LL	SW	X	X	X	X		X	
			BRAZIL-JAPAN	LL	SW	X	X	X	X		X	
B	L	O	BRAZIL	LL	SW	X	X	X	X		X	
				BB			X			X		
				SURF			X			X		X
B			CANADA	LL	NW	X	X	X	X		X	
B				RR		X						
B				TL		X						
B				TRAP		X						
				HARP		X					X	
			CAPE VERDE	BB	ETRO		X			X		
			CÔTE D'IVOIRE									
			EQUAT. GUINEA									
			FRANCE	PSG	ETROP		X	X	X	X		
				TROLL	NE			X				
				BB	NE	X		X				
				BB	ETROP		X		X	X		
				PSM	MED	X						
B		O		GILL	NE			X			X	
				MWTD	NE			X			X	
			GABON									
B	L		GHANA	BB			X		X	X		
B	L			PS			X	X	X	X		
				UNCL (TRAW)			X		X	X	X	X
B	L		JAPAN	LL	ALL	X	X	X	X		X	X
			KOREA	LL	ALL	X	X	X	X		X	X
B			MOROCCO	TRAPS	ATL, MED	X				X	X	X
				SURF		X					X	X
				LL							X	
				GILL							X	
			PORTUGAL-MAINLAND	LL	E.ATL						X	
			PORTUGAL-AZORES	LL	E.ATL	X			X		X	
				BB	E.ATL		X	X	X	X		
			PORTUGAL-MADEIRA	BB	E.ATL		X	X	X	X		X
				LL	E.ATL, MED	X			X		X	
				HAND	E.ATL			X	X	X		
			GUINEA REP									
B		O	RUSSIA	PS	ETRO		X			X		
			S.TOME & PRIN									
B	L		S. AFRICA	BB	SOUTH EAST		X	X	X	X	X	
				SPOR			X	X		X		
			SPAIN-PENINSULA	BB	NE.MEDI.	X		X				
B		O		LL	NE, SE	X			X		X	
				BB	E-TROP		X		X	X		
				PSG	E-TROP		X	X	X	X		
				PSM	MED	X						
				TRAP	E.AT. MED	X						X
B		O		LL	MED	X		X			X	
				TROL	NE MED	X		X				
			SPAIN-CANARY IS.	BB	CANARIAS	X	X	X	X	X		

SOURCES			NATION	GEAR	AREAS	MAJOR SPECIES CAUGHT						
B	L	O				BFT	YFT	ALB	BET	SKJ	SWO	BON
B	L		URUGUAY	LL	SW			X	X		X	
B	L	O	USA	LL	NW	X	X	X	X		X	
B	L	O		LL	GOM	X	X	X	X		X	
B	L	O		LL	W-TROP		X		X		X	
				RR	NW	X	X	X	X			
				TRAP	NW							
B	L	O		GILL	NW							
				HAND	NW		X					
				HARP	NW	X						
				MWTD	NW		X					
				TROL	NW		X					
			VENEZUELA	BB	W.TROP		X	X	X	X		
B	L	O		LL	W.TROP		X	X	X		X	
				PS	W.TROP		X		X	X		
				RR	W.TROP							
				SURF	W.TROP							X
NON MEMBERS												
B		O	ALGERIA	LL HAND, RINGNET	MED	X					X	X
			ARGENTINA	BB. LL	SW			X				X
			BARBADOS	UNCL	WTRO							
B	L	O	BERMUDA	UNCL	NW			X				
B			CHI.TAIWAN	LL	ALL	X	X	X	X		X	
B		O	CROATIA	PS	ADRIA	X						
B	L		CYPRUS	LL	MEDI	X		X			X	
			DOM.REPUBLIC	UNCL	WTRO		X			X		
			ENGLAND	GILL	NE, AZOR			X				
			GREECE	LL	MED	X		X			X	
			GRENADA	UNCL	WTRO,NW		X		X	X	X	
			IRELAND	GILL	NE			X				
			ITALY	GILL	MED	X		X			X	X
				LL	MED	X		X			X	X
				HARP	MED							X
				TRAP	MED	X					X	X
				PS	MED	X					X	X
				UNCL	MED	X		X			X	X
			LIBYA	LL	MEDI.ATL	X			X		X	
				PS		X			X			
				TRAP		X						
B			MALTA	LL	MEDI	X					X	
B		O	MEXICO	LL	GOFM	X	X		X	X	X	
			NAMIBIA	BB	SE		X	X	X	X	X	
			STA LUCIA*	UNCL	WTRO	X	X	X	X	X	X	X
			ST VINCENT	UNCL	W TROP		X	X	X	X	X	
			STA HELENA	BB	SE		X	X	X	X		
			TRINI & TOBAGO	UNCL	WTRO (CARICOM)	X	X	X	X	X	X	
			TURKEY	LL	MED	X		X			X	
				UNCL	MED							X
			TUNISIA	TRAP	MED	X		X				
				PS	MED	X					X	

Columns B L O: A "B" under column B indicates that a response to the by-catch questionnaire was submitted. An "L" under the L column indicates that the report was based on logbook data while an "O" under the O column indicates the report was based on observer data. Countries with only a "B" under the B column indicated that data were not sufficient to estimate by-catches for the report. Major catch species for each gear-nation-area combination is shown with an "X".

Table 2 (Revised). Summary of responses to ICCAT 1995 By-catch questionnaire.

Country	Area	Year	Target	Gear	Observers			Logbooks			By-catch	Main By-catch	Others Indicated
					Q1	Q2	Q3	Q4	Q5	Q6	(%)		
Canada	WNATL	1994	SWO	LL	y	n	n	y	n	n	?	Sharks	
	WNATL		SWO	Harp	n			y	n	n			
	WNATL		BFT	RR	y	n	n	y	n	n			
	WNATL		BFT	Lines	y	n	n	y	n	n			
	WNATL		BFT	Traps	n			n					
	WNATL		BFT	Harp	n			y	n	n			
	WNATL		Oth	LL	y	n	n	y	n	n			
France	ENAtl	92-93	ALB	Gill	y	y	y	n			15	Blue shark	MM, turtles, birds
Ghana	ETAtl	1993	Tunas	BB	n			y	y		9.7	SMT	
	EAAtl	1993	BIL & sharks	Gill	n			n			55.5	Tunas	
Japan	ATL	1994	Tunas	LL	n			y	y	y	?	Sharks	
[1]Spain	ATL	83-84	SWO	LL	y	n	n	n			?	Blue, mako, porbeagle	Other sharks, other fish
		91-94	SWO	LL	y	n	n	n			?	Blue, mako, porbeagle	Other fish, turtles
	MED	79-83	SWO	LL	y	n	n	n			?	Blue, mako shark	Other fish, turtles
USA	CARIB	1993	SWO & tunas	LL	y	y	y	y	y	y	51.5	Sharks	Coryphaena, BIL, turtles
	GBank	1993	SWO & tunas	LL	y	y	y	y	y	y	29.4	Blue shark	Other sharks, BIL, MM, turtles
	GOM	1993	YFT & SWO	LL	y	y	y	y	y	y	34.4	Sharks	Coryphaena, oilfish, BIL, MM, turtles
	NEC	1993	Tunas & SWO	LL	y	y	y	y	y	y	38.5	Blue shark	Other sharks, MM, turtles, birds
	SEC	1993	SWO & tunas	LL	y	y	y	y	y	y	41.7	Coryphaena	Sharks, MM, turtles
	NEC	1993	SWO & tunas	LL	y	y	y	y	y	y	36.9	Little tunny	Sharks, MM, turtles
Venezuela	WTA	93-95	SWO	LL	y	y	y	y	y	y	5-20	Sharks	
Mexico	GOM	1994	YFT	LL	y	y	y	y	n	n	20	BIL	
Bermuda	WAtl	93-94	Tunas	LL+RR	y	y	y	y	y	y	?	Sharks	Other fish
[2]Brazil	SWAtl	71-94	Tunas & SWO	LL	y	y	y	y	y	y	45	Blue, mako shark	Other sharks, birds
Croatia	MED-Adr	91-94	BFT	PS	y	y	y	y	n	n	?	Sharks, turtles, MM	
Cyprus	E MED	76-95	SWO	LL	n			y	y	y	10-20	Sharks	
Malta	MED	95	Tunas	LL	y	y	y	y	n	n	0	None	
[3]Taiwan	ATL	94	Tunas	LL	n	n	n	n	n	n	1.5	Sharks	
[4]Uruguay	SWAtl	81-94	SWO & tunas	LL			n	y	y	y	4-35	Mako, blue, porbeagle	Other sharks
[5]S Africa	SEAtl	85-95	ALB	BB	n			y	y	y	<8	YFT, BET	SKJ, other fish
[6]Morocco	Atl&Med	90-95	SWO & tunas	LL	n			n			15	Blue, thresher, hammerhead	Other sharks,
			SWO & Tunas	GILL								Other sharks	Other fish

% : Reported percentage of by-catch (non-target) species in catch by number or weight, comparisons between nations and gears are not appropriate since these reports vary widely in the level of detailed information on which they are based.

Q1: Are scientific observer data available for this fishery? y=yes, n=no, na= not available

Q2: Can the scientific observer data be used to estimate by-catch?;

Q3: Are scientific observer data used to estimate by-catch for this report?

Q4: Are fishing logbook data available for this fishery?;

Q5: Can the logbook data be used to estimate by-catch?

Q6: Are the logbook data used to estimate by-catch for this report?

[1] Spanish response based on published literature resulting from at-sea observations. These studies, though, were not designed to provide quantitative estimates of by-catch.

[2] Brazilian listing revised based on additional response to questionnaire, some shark directed effort may be included in estimates.

[3] Taiwanese listing based on reported 1994 Far-Seas landings of fish as submitted to ICCAT in response to 1 December 1995 request for additional information, no records of discarded catch are available in the Taiwanese report.

[4] Uruguayan listing based on document BYC/96/19 submitted to the Working Group. Some effort reported may have targeted sharks.

[5] South African report received in response to 1 December 1995 request for additional by-catch information.

[6] Moroccan report received in response to 1 December 1995 request for additional by-catch information.

Table 3 (Revised). By-catch species list in the ICCAT area by major fisheries collected from ICCAT the ICCAT questionnaire on by-catch, 1994-95

LONGLINE FISHERY:

Elasmobranches

Skates and rays

Dasyatis centroura	Roughtail stingray
Dasyatis violacea	Pelagic stingray
Manta birostris	Manta ray
Mobula hypostoma	
Mobula mobular	Manta ray
Raja straeleni	
Torpedo nobiliana	Torpedo ray

Coastal sharks

Carcharias taurus	Sand tiger shark
Carcharhinus altimus	Bignose shark
Carcharhinus brachyurus	Copper shark
Carcharhinus brevipinna	Spinner shark
Carcharhinus limbatus	Blacktip shark
Carcharhinus leucas	Bull shark
Carcharhinus longimanus	Oceanic whitetip
Carcharhinus obscurus	Dusky shark
Carcharhinus perezi	Caribbean reef shark
Carcharhinus plumbeus	Sandbar shark
Carcharhinus porosus	Smalltail shark
Carcharhinus signatus	Night shark
Carcharodon carcharias	White shark
Cetorhinus maximus	Basking shark
Centrophorus granulosus	Gulper shark
Centrophorus uyato	Little Gulper shark
Centroscymnus crepidater	Longnose velvet dogfish
Deania calcea	Birdbeak dogfish
Etmopterus spinax	Velvet belly
Heptranchias perlo	Sharpnose sevengill shark
Hexanchus griseus	Bluntnose sixgill shark
Galeocerdo cuvieri	Tiger shark
Galeorhinus galeus	Tope shark
Megachasma pelagios	Megamouth shark
Mustelus asterias	Starry smoothhound
Mustelus mustelus	Smoothhound
Negaprion brevirostris	Lemon shark
Odontaspis noronhai	Bigeye sandtiger
Rhincodon typus	Whale shark
Rhizoprionodon terraenovae	Atlantic sharpnose shark
Sphyrna lewini	Scalloped hammerhead
Sphyrna mokarran	Great hammerhead
Sphyrna zygaena	Smooth hammerhead
Squaliolus laticaudus	Cigar shark
Squatina aculeata	Sawback angelshark
Squatina oculata	Smoothback angelshark
Squatina squatina	Angelshark

Pelagic sharks

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

Teleosts (Scombridae and billfishes)

Acanthocybium solandri	Wahoo
Istiophorus platyptarus	Sailfish
Makaira nigricans	Blue marlin
Sarda sarda	Bonito
Scomberomorus cavalla	King mackerel
Tetrapturus albidus	White marlin
Tetrapterus pfluegeri	Spearfish
Thunnus alalunga	Albacore
Thunnus albacares	Yellowfin tuna
Thunnus atlanticus	Blackfin tuna
Thunnus thynnus	Bluefin tuna
Xiphias gladius	Swordfish

Teleosts (excluding Scombridae and billfishes)

Alepisauridae	Lancet fish
Coryphaena hippurus	Dolphin fish
Coryphaena equiselis	Pompano dolphin
Cubiceps spp.	Bigeye cigarfish
Epinephalus sp.	Grouper
Lampris guttatus	Opah
Lepidocybium brunneum	Escolar
Macrouridae	Rat-tail
Mola mola	Ocean sunfish
Mola sp.	Sunfish
Ophichthidae	Eel
Polyprion americanus	Stone bass
Rahycentron canadum	Cobia
Ruvetus pretiosus	Oilfish
Scienops ocellatus	Red drum
Seriola dumerili	Greater amberjack
Seriola sp.	Amberjack
Sparnus pagrus	Common sea bream
Sphyraena barracuda	Barracuda
Taratichtys longipi	Big scale pomphret
Tetraodontidae	Puffer
Trichiuridae	Snake mackerel

Sea Turtles

Chelonia mydas	Green turtle
Caretta caretta	Loggerhead turtle
Dermochelys coriacea	Leatherback turtle

Sea Birds

Diomedea chlorhychos	
Diomedea exulans	Wandering albatross
Diomedea melanophris	Black-browed albatross
Fulmarus glacioloides	Southern fulmar
Larus sp.	Gull
Procelaria aequinoctialis aequinoctialis	White chinned petrel
Procelaria aequinoctialis conspicillata	Petrel
Puffinus grabis	Greater shearwater

Marine Mammals

Globicephala melaena	Pilot whale
Grampus griseus	Grampus
Tursiops truncatus	Bottlenose dolphin

GILLNET FISHERY

Elasmobranches

Skates and rays

Dasyatis violacea	Pelagic stingray
Manta birostris	Manta ray
Myliobatis sp	Eagle ray
Torpedo nobiliana	Torpedo ray

Coastal sharks

Carcharhinus obscurus	Dusky shark
Carcharodon carcharias	White shark
Cetorhinus maximus	Basking shark
Galeocerdo cuvieri	Tiger shark
Galeorhinus galeus	Tope shark
Galeus melastomus	Blackmouth catshark
Heptranchias perlo	Sharpnose sevengill shark
Hexanchus griseus	Bluntnose sixgill shark
Mustelus asterias	Starry smooth hound
Mustelus mustelus	Smooth hound

Pelagic sharks

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

Teleosts (Scombridae and billfishes)

Auxis rochei	Bullet tuna
Auxis thazard	Frigate tuna
Euthynnus alletteratus	Atlantic little tuna
Istiophorus albicans	Sailfish
Katsuwonus pelamis	Skipjack tuna
Makaira nigricans	Blue marlin
Sarda sarda	Bonito
Thunnus alalunga	Albacore
Thunnus albacares	Yellowfin tuna
Thunnus obesus	Bigeye tuna
Thunnus thynnus	Bluefin tuna
Xiphias gladius	Swordfish

Teleosts (excluding Scombridae and billfishes)

Brama brama	Pomfret
Brama raii	Pomphret
Balistes sp.	Triggerfish
Belone belone	Needlefish
Centrolophus niger	Black ruff
Coryphaena hippurus	Dolphin fish
Echeneidae	Remora
Lampris guttatus	Opah
Lepidocybium flavobruneum	Escolar
Mola mola	Ocean sunfish
Mola sp.	Sunfish
Naucrates ductor	Pilotfish
Polyprion americanus	Wreckfish
Pomatomus saltatrix	Bluefish
Pseudotolithis sp.	Cassava fish
Regalecus glesne	Oarfish
Remora remora	Remora
Schedophilus medusophagus	
Spinex niger	

Sea Turtles

Caretta caretta	Loggerhead turtle
Dermochelys coriacea	Leatherback turtle
Eretmochelys imbrica	Hawksbill turtle

Sea Birds

Calonectris diomedea	
Fulmarus glacialis	

Marine Mammals

Balaenoptera acutorostrata	Minke whale
Balaenoptera physalus	Fin whale
Delphinus delphis	Common dolphin
Eubalaena glacialis	Northern right whale
Globicephala melaena	Pilot whale
Grampus griseus	Grampus
Kogia breviceps	Pygmy sperm whale

Lagenorhynchus acutus	Atlantic whiteside dolphin
Megaptera novaeangliae	Humpback whale
Mesoplodon sp.	Beaked whale
Physeter macrocephalus	Sperm whale
Phocoena phocoena	Harber porpoise
Stenella coeruleoalba	Striped dolphin
Stenella plagiodon	Atlantic spotted dolphin
Tursiops truncatus	Bottlenose dolphin
Ziphius cavirostris	Goosebeaked whale

PURSE SEINE FISHERY

Elasmobranches

Pelagic sharks

Prionace glauca	Blue shark

Teleosts (Scombridae and billfishes)

Xiphias gladius	Swordfish

Teleosts (excluding Scombridae and billfishes)

Mola mola	Ocean sunfish

Sea Turtles

Caretta caretta	Loggerhead turtle

Marine Mammals

Delphinus delphis	Common dolphin
Tursiops truncatus	Bottlenose dolphin

BAITBOAT FISHERY

Elasmobranches

Teleosts (Scombridae and billfishes)

Auxis thazard	Frigate tuna
Euthynnus alletteratus	Atlantic little tuna
Katsuwonus pelamis	Skipjack tuna
Sarda sarda	Bonito
Seriola lalandii	Yellowtail

Note: Shark classifications based on those adopted by the ICES Study Group on Elasmobranchs (distributed as addendum to SCRS/95/11) except that silky sharks *(Carcharhinus falciformis)* are classified as pelagic rather than coastal sharks in this Table. The species list is likely incomplete since detailed responses are not yet available from a full range of the Atlantic and Mediterranean tuna and tuna-like fisheries.

Table 4. Shark life-history parameters (adapted from Table 2, in Pratt & Casey, 1990)

	Gestation time (months)	Maximum length TL (cm)	Max. size at birth TL (cm)	Birth size ratio	Female length at maturity TL (cm)	Female age at maturity (years)	Max. No. of young in litter	Calculated K	
								Holden (1974)	Holden update (1974)
Galeorhinus australis	6	174	30	17	135	10	28	0.095	0.095
Lamniformes									
Alopias superciliosus	--	450	105	23	350	--	2	0.163	0.266
A. vulpinus	9	491	151	31	415	7	4	0.147	0.367
Carcharodon carcharias	--	594	110	18	457	12	7	0.113	0.205
Cetorhinus maximus	18	980	150	15	500	5	6	0.143	0.166
Isurus oxyrinchus	12	364	80	22	258	7	16	0.143	0.248
Lamna nasus	8	365	72	20	225	7.5	4	0.112	0.220
Eugomphodus taurus	10.5	318	100	31	237	--	2	0.193	0.378
Carcharhiniformes									
Carcharhinus acronotus	12	176	50	40	113	8	6	0.392	0.440
C. amblyrhynchos	12	255	60	23	137	7.5	6	--	0.268
C.brevipinna maculipinnis	12	196	75	27	180	7	12	0.314	0.314
C. falciformis	12	305	70	23	225	9	13	--	0.260
C. isodon	12	189	48	25	139	5	6	0.293	0.293
C. leucas	11	300	75	25	225	18	13	0.125	0.288
C. limbatus	11	180	60	24	155	7	10	0.139	0.278
C. longimanus	12	270	75	28	175	--	15	0.186	0.325
C. obscurus	12	365	100	27	280	--	14	0.171	0.320
C. plumbeus milberti	12	239	56	23	183	13	13	0.133	0.267
Galeocerdo cuvieri	12	550	85	15	320	10	55	0.106	0.168
Galeorhinus japonicus	10	116	25	19	93	5	22	--	0.242
G. zyopterus	12	200	35	17	170	--	52	0.104	0.192
Mustelus californicus	12	163	30	18	70	3	16	--	0.203
M. canis	10	152	39	26	970	2	20	0.149	0.296
M. henlei	12	100	281	28	57	3	10	--	0.328
M. manazo	10	96	30	30	13	25	14	--	0.375
Negaprion brevirostris	12	320	60	18	243	13	19	0.132	0.208
Prionace glauca	12	383	50	13	218	5	135	0.110	0.140
Rhizoprionodon terranovae	11	107	32	30	85	4	7	0.110	0.140
Sphirna lewini = diplana	12	309	45	15	250	15	30	0.150	0.160
S. mokarran=Holden's tudes	12	560	70	11	300	--	40	0.133	0.133
Other orders									
Squatina californica	10	152	26	17	95	--	11	--	0.188
Triakis semifasciata	12	198	20	--	100	10	18	0.150	0.106
Squalus acanthias	22	128	26	20	93	25	14	--	0.023
C. galapagensis	--	370	80	22	235	--	16	--	0.244
C. oxyrhynchus	--	152	39	26	--	--	4	0.296	0.296
Centroscymnus coelolepis	--	120	30	25	--	--	16	0.230	0.288
Etmopterus hillianus	--	32	9	28	--	--	5	0.330	0.330
E. spinax	--	52	13	25	36	--	19	0.290	0.287
Ginglymostoma cirratum	--	425	28	7	150	--	30	0.141	0.068
Heptranchus perlo	--	137	25	18	100	--	20	0.121	0.201
Hexanchus griseus	--	482	74	15	421	--	108	0.157	0.167
Pseudotriakis microdon	--	295	85	29	--	--	2	0.340	0.340
Scoliodon laticaudus	--	74	15	20	35	2	14	--	0.226
Sphyrna tiburo	--	110	32	27	75	--	12	0.318	0.344
S. zygaena	--	396	50	13	220	--	40	0.135	0.135
Triakis barbouri	--	40	10	25	--	--	2	0.288	0.288

Appendix 11

BUDGET ESTIMATE -- 1996 ICCAT TUNA SYMPOSIUM *

		Estimated cost (Pts) 1996	1997	TOTAL
1. MEETINGS				
Symposium				
Meeting facilities (meeting room, Secrt. working rooms, etc.)		Assumed by the host		
Simultaneous interpreters		Assumed by the host		
Translation equipment		Assumed by the host		
Local help (reception, etc.)		Assumed by the host		
Photocopying (copying machine rentals etc.)		Assumed by the host		
Miscellaneous (coffee etc.)		Assumed by the host		
Travel and per diem for Secrt. staff		Assumed by the host		
Transportation of equipment and documents		Assumed by the host		
Supplement for Secrt. staff (overtime, etc.)		1,000,000	0	
Steering Committee/Moderators meeting				
Meeting facilities		0	0	
Reporting (photocopying, mailing etc.)				
SUB-TOTAL		1,000,000	0	1,000,000
2. TRAVEL				
Steering Committee/Moderators meeting				
Financial aid for participants	6 persons x 400,000 Pts	0	0	
To finalize preparation of meeting				
Secretariat staff		400,000	0	
Symposium				
From developing countries	15 persons x 500,000 Pts	7,500,000	0	
Invited guest scientists	20 persons x 500,000 Pts	10,000,000	0	
Editorial meeting				
Financial aid for participants	6 persons x 400,000 Pts		2,400,000	
SUB-TOTAL		17,900,000	2,400,000	20,300,000
3. SECRETARIAT EXPENSES				
Preparatory work				
Miscellaneous (printing, mailing etc.)		400,000	600,000	
Temporary assistant		1,500,000	1,000,000	
Publication of Symposium results			2,100,000	
SUB-TOTAL		1,900,000	3,700,000	5,600,000
				0
4. CONTINGENCIES		1,000,000	500,000	1,500,000
				0
TOTAL		21,800,000	6,600,000	28,400,000

* Budget is based on the assumption that the Symposium will be held at Ponta Delgada, San Miguel, Azores, Portugal, and that all the meeting costs (including interpreters, translation equipment, travel and per diem for the Secretariat staff, local help, photocopying) will be assumed by the host.

Appendix 12

DEFINITION OF TECHNICAL TERMS

***Biological Reference Points** / Points de référence biologique / Puntos de Referencia Biólogicos*

Measure of fishing mortality rates, biomass or yield that are used as signposts for the status of the stock. Biological reference points are most often used to establish safe biological limits (SBL's) for a particular stock. They are usually calculated from equilibrium yield per recruit curves and stock recruitment data. Examples are MSY, F_{MSY}, B_{MSY}, F_{max}, $F_{0.1}$, and $F_{30\%SPR}$.

***Bootstrap simulations** / Simulations itératives / Simulaciones de procesos iterativos de reajuste a partir de submuestras (bootstrap)*

See "simulations" below.

***Catchability (q)** / Capturabilité (q) / Capturabilidad (q)*

The fraction of the stock which is caught by a standardized (effective) unit of effort. When cast as an instantaneous rate, it is the constant of proportionality that relates effective effort to fishing mortality ($q \times f = F$). Catchability is affected by fish availability. Thus, specific climatic conditions may result increased or decreased availability of the fish. This would lead to increased (decreased) catchability and, thus, increased (decreased) fishing mortality rate with the same fishing effort.

***Catch per unit effort (CPUE)** / Capture par unité d'effort (CPUE) / Captura por unidad de esfuerzo (CPUE)*

The amount of catch that is taken per unit of fishing gear, e.g. Number of fish per longline hook-months is one way to express CPUE. CPUE can be used as a measure of the economic efficiency of a type of gear, but normally it is used as an index of abundance, i.e. a proportional change in CPUE is hoped represents the same proportional change in abundance. Nominal CPUE is simply the measure of CPUE from the fishery. However, it is known that there are many factors (including economics, geographical distributions) which may affect CPUE but do not represent changes in abundance. Therefore, CPUES are often "standardized" using a variety of statistical techniques to remove the effect of those factors which are known not to be related to abundance. Thus, using the standardized CPUE will be more appropriate for an index of abundance. Most assessment analyses (production models, virtual population analyses) use the index of abundance data to fit to calibrate (tune) the models.

***Effective effort** / Effort effectif / Esfuerzo efectivo*

Measures of fishing effort such as hooks per day of fishing that have been standardized so that the measure is proportional to the fishing mortality rate that the gear(s) impose on the stock of fish. Limitation of "effective effort" implies that the fishing mortality rate is to be limited. Effective effort is impacted by availability (see "catchability" above).

***Equilibrium** / Equilibre / Equilibrio*

A situation that arises when the fishing mortality, selectivity pattern and other fishery or stock characteristics (growth, natural mortality, recruitment) do not change from year-to-year. Many yield per recruit analyses assume equilibrium. That is, equilibrium yield per recruit that is computed for a give fishing mortality can be achieved if that fishing mortality is held constant for many years (as many years as there are age classes in the fishery); equilibrium yield per recruit values computed for a new level of fishing mortality or a change in selectivity would not be expected to reach equilibrium until several years from the time of implementation. Other types of stock assessments such as

variants of stock production models or catch curves also assume equilibrium. Their non-equilibrium variants aim to better explain the dynamics of the observed data through time.

Exploitation pattern / Caractéristiques d'exploitation / Esquemas de explotación

The distribution of fishing mortality over the age composition of the fish, determined by the type of fishing gear and spatial and seasonal distribution of fishing, and the growth and migration of the fish. The pattern can be changed by modifications to fishing gear; for example, increasing mesh or hook size or changing the ratio of harvest by gears exploiting the fish (e.g., gill net, trawl, hook and line).

Exploitation rate / Taux d'exploitation / Tasa de explotación

The proportion of a population at the beginning of a given time period that is caught during that time period (usually expressed on a yearly basis). For example, if 220,000 fish were caught during the year from a population of 1 million fish alive at the beginning of the year, the annual exploitation rate would be 0.22.

Fishing mortality rate / Taux de mortalité par pêche / Tasa de mortalidad por pesca

The part of the total mortality rate applying to a fish population that is caused by man' harvesting. Fishing mortality is usually expressed as an instantaneous rate, as discussed under Mortality rate, and can range from 0 for no fishing to very high values such as 0.7 or 1.0. Fishing mortality rates are estimated using a variety of techniques, depending on the available data for a species or stock.

For example, if F = 0.3, then approximately 0.3/365 or 0.082% of the population dies each day from fishing. If fishing were the only cause of death, then the number of fish that survive the fishery over the year from a population of 1 million alive at the beginning of the year is 1 million multiplied by $e^{0.3}$ or 740,818 fish. During fishing, there are other causes of death that also act on the population of fish, and must be considered in calculating the number that die from fishing. The number of fish that die from fishing is the proportion of the total mortality that is caused by fishing, multiplied by the number of fish that die from all causes [i.e., F/Z multiplied by $(1 - e^{-Z})$ multiplied by 1 million]. If the total mortality rate is 0.5 then this calculation is:

$(0.3/0.5)\ (1-e^{-0.5})\ (1{,}000{,}000)$

or

$(0.6)\ (0.3934)\ (1{,}000{,}000)$

or

236,082 fish that die from fishing.

F_{MSY} / F_{PME} / F_{RMS}

The rate of fishing mortality for a given exploitation pattern that maximizes yield in the long-term (see Maximum Sustainable Yield). Normally, F_{MSY} is derived from production models. In general, F_{MSY} is different than F_{max} (see below).

F_{max}

The rate of fishing mortality for a given exploitation pattern, rate of growth and natural mortality, that results in the maximum level of yield per recruit. This is the point that defines growth overfishing. In general, F_{max} is different than F_{MSY} (see above).

$F_{0.1}$

The fishing mortality rate at which the increase in yield per recruit in weight for an increase in a unit of effort is 10% of the yield per recruit produced by the first unit of effort on the unexploited stock (i.e., the slope of the yield per

recruit curve for the $F_{0.1}$ rate is only 1/10 the slope of the curve at its origin). Originally, $F_{0.1}$ was linked to investment strategies where investors would stop putting money into additional production equipment when the marginal increase in production was 10%.

$F_{30\%\ SPR}$

The fishing mortality rate for a given exploitation pattern, rate of growth, natural mortality, and reproductive schedule that will reduce the spawning potential per recruit to 30% of what it would be with no fishing mortality (see definition for the "spawning potential ratio" below).

Growth overfishing / Surpêche en état de croissance / Sobrepesca en período de crecimiento

Growth overfishing occurs when the fishing mortality rate is above F_{max} on a yield per recruit curve. This means that individual fish are caught before they have a chance to reach their maximum growth potential. More catch yield could be achieved by fishing less hard and letting the fish grow.

Long-term potential yield / Rendement potentiel à long terme / Rendimiento potencial a largo plazo

The largest annual sustainable harvest in weight which could be removed from a fish stock year after year, under existing environmental conditions. This can be estimated in a variety of ways, ranging from maximum values from production models to average observed catches over a suitable period of years.

Maximum Sustainable Yield / Rendement maximal soutenu / Rendimiento máximo sostenible

The maximum amount of sustainable yield that can be removed annually from a stock of fish while maintaining the stock's biomass at a steady level from year to year for a given set of environmental conditions.

Monte Carlo simulations / Simulations de Monte Carlo / Simulaciones de Monte Carlo

See "simulations".

Mortality rate / Taux de mortalité / Tasa de mortalidad

The rate at which fish die from natural causes (disease, predation, old age) or fishing. Mortality rates can be described in several ways. Conceptually the easiest way is the total annual mortality rate, the fraction of the fish alive at the beginning of a year that die during the year. For example, a total annual mortality rate of 0.50 means that 50% of the population of fish died for whatever reason during the year. In general, annual mortality rates can range from 0 to 1.0, that is 0% to 100% mortality. Note that the exploitation rate is the same as the annual fishing mortality rate.

Annual rates are easy to understand, but difficult to use when describing the relative contribution of different types of mortality, such as fishing and natural causes, to the total mortality of fish during a year because they cannot be added. One way to describe mortality and overcome this limitation of annual rates is by using instantaneous rates, although this approach is conceptually more difficult. An instantaneous mortality rate is the fraction of the population of fish that dies in each very short period of time.

The derivation of instantaneous rates is mathematically complex, but there is a relatively simple connection between them and the simpler annual rates. Any particular instantaneous mortality rate, often denoted by Z, is equivalent to one specific annual rate A, according to the formula:

$$A = 1 - e^{-Z}$$

That is, the annual rate is equal to e, (this is the number 2.718, the base of the natural logarithms) raised to the negative power of the instantaneous rate, subtracted from 1.0. For example, the instantaneous mortality rate of 0.5

is equivalent to an annual mortality rate of 0.39, or 39%. In practice, instantaneous rates range from 0 to values as high as 0.70 or 1.0, but theoretically could take on any large value. Because instantaneous rates make comparing the relative importance of different sources of mortality very easy, as discussed next, they are frequently used by fishery biologists, and are used throughout this report. To aid in interpretation, the following shows the relationship between instantaneous mortality rate and annual percentage mortality:

Instantaneous mortality rate	*Percentage mortality*
0.0	0
0.1	10
0.2	18
0.3	26
0.4	33
0.5	39
0.6	45
0.7	50
0.8	55
0.9	59
1.0	63

Instantaneous rates are used in assessments because they are mathematically easy to use (e.g., they can be added directly while annual percentage rates cannot). If a year is divided into a large number (n) of equal time intervals, Z/n is the proportion of the population which dies during each time interval. For example, if Z = 0.5 and a day represents the time interval, then approximately 0.5/365 or 0.137% of the population is dying daily, but the instantaneous rate is constant. (Actually 0.137% of the population dies each day instead of 0.137% because a day only approximates an instantaneous time period. If hours were used, the approximation would be even closer.) During the first day of the year, about 1369 fish will die and 998,631 will survive out of a population of 1 million. The survival rate over the year is $e^{-0.5}$ or 0.6065. Multiplying 0.6065 by the number of fish alive at the beginning of the year (1 million) gives 606,531 fish that survive to the beginning of the next year. The proportion that actually dies during the year is, therefore, $1 - e^{-0.5}$ or 0.3935. This is called the annual mortality rate (A) which, of course, can never exceed 1.0.

The part of the total mortality rate applying to a fish population attributed to natural causes is usually assumed to mean all causes other than fishing. These many causes of death are usually lumped together for convenience since they often account for much less than fishing mortality in adult fish, and are usually of less immediate interest. Natural mortality is usually expressed as an instantaneous rate and can range from 0 to very high values 0.6 or 0.8. The corresponding annual mortality due to natural causes acting alone can be computed in the same manner shown for total mortality rates. The most important causes are predation, disease, cannibalism, and perhaps increasingly, environmental degradation such as pollution. When particular natural mortality factors are of interest, separate instantaneous mortality terms are often defined. Natural mortality rates have proven very difficult to estimate, and often values are assumed based on the general life history of a particular fish. Indeed, natural mortality rates are an indicator of the longevity of a fish species. Fish with natural mortality rates of $M < 0.2$ often live long, perhaps to 15 to 25 years (without fishing).

Following the examples given above, M is equal to Z-F or 0.5 - 0.3 = 0.2. The number of fish that die during the year from natural causes is, therefore, the proportion of total mortality (M/Z) due to natural causes multiplied by the total number that actually die:

$$(M/Z)\ (1 - e^{-Z})\ (1{,}000{,}000)$$

or

$$(0.4)\ (0.3935)\ (1{,}000{,}000)$$

Therefore, 157,388 fish or 15.7% of the population of one million die from natural causes during the year when the fishing mortality rate is 0.3 and the total mortality rate is 0.5. If fishing mortality were less, more fish would die from natural causes because some fish are caught by the fishery before they die from natural causes. For example, if the fishery did not exist, an M of 0.2 applied over the year to 1 million fish would cause a mortality of $(1-e^{-0.2})$ multiplied by 1 million or 181,269 fish and 18.1% of the beginning population.

Nominal CPUE / CPUE nominale / CPUE nominal

See "catch per unit effort".

Nominal landings / Débarquements nominaux / Desembarques nominales

The sum of catches that have been reported as live weight or equivalent of the landings. Nominal catches do not include such measures as unreported discards. Remember these are not catches but landings.

Nominal effort / Effort nominal / Esfuerzo nominal

Measures of fishing effort such as hooks per day of fishing or vessel carrying capacity that have not been standardized (see standardized effort). When catchability changes, e.g., through changes in gear technology, trends in nominal effort can give a misleading picture of trends in exploitation.

Production Model / Modèle de production / Modelo de producción

An analyses of catch and catch-per-unit-effort (CPUE) used to determine stock status relative to maximum sustainable yield. Standardized CPUE is a relative index of stock biomass, hence the changes in CPUE reflect changes in the biomass. The production model aggregates all of the biological characteristics of growth, natural mortality and reproduction into a simple model using two or three parameters from which maximum sustainable yield, stock biomass relative to that which produces maximum sustainable yield and fishing mortality rate (effective effort) relative to that which will produce maximum sustainable yield can be estimated. Newer versions of production models allow the use of age structured data, i.e. biomass is distributed between age groups in the model.

Quota / Quota / Cuota

A portion of a TAC (Total Allowable Catch) allocated to a fishery or to an operating unit, such as a size class of vessels or a country.

Recruitment / Recrutement / Reclutamiento

The amount of fish, added to the fishery each year due to growth and/or migration into the fishing area. For example, the weight or number of fish that grow to become vulnerable to the fishing gear in one year would be the recruitment to the fishable population in that year. This term is also used in referring to the number or weight of fish from a year class reaching a certain age. For example, all fish reaching their second year would be age-2 recruits.

Recruitment overfishing / Surpêche des recrues / Sobrepesca del reclutamiento

The rate of fishing above which the recruitment to the exploitable stock becomes significantly reduced. This is characterized by a greatly reduced spawning stock, a decreasing proportion of older fish in the catch, and generally very low recruitment year after year. Recruitment overfishing leads rapidly to stock collapse.

Replacement yield / Production de remplacement / Rendimiento de reemplazo

The amount of yield in weight that can be removed from a population of fish and have that stock neither increase or decline in biomass. When the population productivity is high under proper exploitation, then replacement yield will also be high. Conversely, when the population is underexploited or overexploited, then replacement yields will be low. In either case, if the actual yield taken is equal to the replacement yield, then the biomass will not change.

Safe Biological Limits / Limites biologiques de sécurité / Límites biológicos seguros

The upper limit on fishing mortality rate and/or the amount of biomass or spawning biomass that is needed to assure that recruitment is maintained and the fishery does not collapse due to recruitment overfishing (see above). Often these limits are established using data from the history of exploitation of a population or using the experience of these limits relative to biological reference points (see above) from other populations.
Safe biological limits are implemented in fisheries to avoid collapse.

Sensitivity analysis / Analyse de sensibilité / Análisis de sensibilidad

The process of testing the sensitivity of input parameters on calculations of important management results. For example, an estimation procedure such as virtual population analysis might be used to determine the fishing mortality rates over several years. The results might be based upon an input natural mortality rate (M) of 0.2. Then "sensitivity" of this choice might be examined by redoing the virtual population analysis based upon a different M, perhaps M=0.3. From the sensitivity analysis one can determine the importance of particular parameters to the overall scientific advice.

Simulations / Simulations / Simulaciones

The body of numerical techniques in which a calculation is performed using specified inputs in order to simulate how a population of fish might react. Simulations may be deterministic (for each set of inputs there will be one output of the calculation) or stochastic (multiple calculations are performed to characterize the range of variability in the results). Sensitivity analyses (see above) are a form of simulation. Projections of the status of the population into the future is another type of simulation.

Often stochastic simulations are conducted in which an assessment calculation is repeated a large number of times, where each time the inputs are randomly selected with error. The range of outcomes in the calculations will indicate how sure one is of the results. There are two usual ways of generating the random error in the inputs: Monte Carlo simulations and bootstrap simulations. In Monte Carlo simulations, the inputs are selected assuming that the distribution of error around the estimates are known and conform to typical error models. In bootstrap simulations the errors are selected from the deviations between a model prediction and observations of inputs such as catch per unit effort. In either case, stochastic methods are used to determine confidence in the results of a particular analysis.

Spawning Potential Ratio (SPR or %MSP [percent maximum spawning potential]) /
Ratio de frai potentiel (SPR ou %MSP [Pourcentage potentiel maximum de frai]) /
Proporción de Potencial de Desove (SPR o %MSP [Porcentaje de potencial máximo de desove] :

The ratio of spawning potential per recruit under a given fishing regime relative to the spawning potential per recruit with no fishing. SPR's require information on natural mortality, growth, spawning potential at age and the relative vulnerability by age to fishing. If possible, spawning potential per recruit is measured in egg mass or number of eggs per recruit, but often spawning stock biomass per recruit (SSB/R see below) is an appropriate substitute. SPR and SSB/R are simple extension to yield per recruit (see below) in that there are two ways in which recruits can be used: they can be caught in which case they are part of the yield (yield per recruit), or they can be let to survive in which case they are part of the SPR, SSB/R. SPR (%MSP) is expressed as a ratio of a fished condition to an unfished condition, thus the ratio varies from 0 to 1. Additionally, empirical studies have shown that for some populations SPR's in the order of 30% may run the risk of recruitment declines, thus there is a basis of comparison between populations. Therefore, fishing mortality rates that result in an SPR of (for example) 30% are sometimes used as biological reference points ($F_{30\%SPR}$; see biological reference points above).

Spawning Stock Biomass (SSB) / Biomasse de stock reproducteur (SSB) / Biomasa del stock reproductor (SSB)

The total weight of all sexually mature fish in the population (both males and females). This quantity depends on the abundance of year classes, the exploitation pattern, the rate of growth, both fishing and natural mortality rates, the onset of sexual maturity, and environmental conditions.

Spawning Stock Biomass per Recruit (SSB/R) / Biomasse de stock reproducteur par recrue (SSB/R) / Biomasa del stock reproductor por recluta (SSB/R)

The expected lifetime contribution to the spawning stock biomass for a recruit for a specific age (e.g., per age-2 individual) such as the spawning stock biomass divided by the number of fish recruited to age-2. For a given exploitation pattern, rate of growth, natural mortality, an equilibrium value of SSB/R is calculated for each level of F. This means that under constant conditions of growth, natural mortality, and exploitation patterns over the life span of the species, an expected average SSB/R would result from each constant rate of fishing.

Standardized CPUE / CPUE standardisée / CPUE estandarizada

See "catch per unit effort".

Status of exploitation / Situation d'exploitation / Estado de la explotación

An appraisal of the status of exploitation is given for each stock of each species in the Species Synopses section, using the terms unknown, protected, not exploited, underexploited, moderately exploited, fully exploited, and overexploited. These terms are used to describe the effect of current fishing effort on each stock, and represent the educated opinion of assessment scientists based on current data and the knowledge of the stocks over time.

Sustainable yield / Rendement soutenu / Rendimiento sostenible

The number or weight of fish in a stock that can be taken by fishing while maintaining the stock' biomass at a steady level from year to year, assuming that environmental conditions remain the same. Sustainable yields can take all sorts of values from very low in underexploited or overexploited fisheries to very high in properly exploited ones.

Total Allowable Catch (TAC) / Total de prises admissibles (TAC) / Total admisible de capturas (TAC)

Total Allowable Catch is the total regulated catch allowed from a stock in a given time period, usually a year.

Total mortality rate / Taux global de mortalité / Tasa de mortalidad total

The combined effect of all sources of mortality acting on a fish population. This is conveniently expressed in terms of instantaneous mortality rates because the total instantaneous mortality rate is simply the sum of the instantaneous fishing and natural mortality rates. For example, the total instantaneous mortality rate that is occurring when the instantaneous fishing mortality rate is 0.3 and the instantaneous natural mortality rate is 0.2 would be 0.5.

Virtual population analysis (VPA) or Cohort Analysis / Analyse des populations virtuelles (VPA) ou analyse de cohortes / Análisis de población virtual (VPA) o Análisis de Cohortes

An analysis of the catches from a given year class over its life in the fishery. If 10 fish were caught each year from the 1968 year class for 10 successive years from 1970 to 1979 (age-2 to age-11), then 100 fish would have been caught from the 1968 year class during its life in the fishery. Since 10 fish were caught during 1979, then 10 fish must have been alive at the beginning of that year. At the beginning of 1978, there must have been at least 20 fish alive because 10 were caught in 1978 and 10 more were caught in 1979. By working backward year by year, one can be virtually certain that at least 100 fish were alive at the beginning of 1970. A virtual population analysis (VPA) goes a step further and calculates the number of fish that must have been alive if some fish also died from causes other than fishing. For example, if the instantaneous natural mortality rate was known in addition to the 10 fish caught per year in the fishery, then a virtual population analysis calculates the number that must have been alive each year to produce a catch of 10 fish each year in addition to those that died from natural causes.

If one knows the fishing mortality rate during the last year for which catch data are available (in this case 1979), then the exact abundance of the year class can be determined in each and every year if the catches are known with

certainty. If the fishery removes a large proportion of the stock each year so that the population declines quite rapidly over time, then an approximate fishing mortality rate can be used in the last year (1979), and by calculating backward year by year for the year class, a very precise estimate of the abundance can be determined for the previous three or four years (1976 or 1975). Accuracy depends on the rate of population decline and the correctness of the starting value of the fishing mortality rate (in the most recent year). Normally, the starting value is estimated by calibrating the VPA estimates with auxiliary information, such as indices of abundance. This technique is used extensively in fishery assessments since the conditions for its use are so common: many fisheries are heavily exploited, the annual catches for a year class can be determined, and the natural mortality rate is known within a fairly small range.

***Year Class (or Cohort)** / *Classe annuelle (ou Cohorte) / Clase anual (o Cohorte)*

Fish of the same stock born in the same year. For example, the 1987 year class of a stock includes all fish of that stock born in 1987, and they would be age-1 in 1988. Occasionally a stock produces a very small or very large year class and this group of fish is followed closely by assessment scientists since it can be pivotal in determining the stock abundance in later years.

***Yield Per Recruit Analysis** / *Analyse de production par recrue / Análisis de rendimiento por recluta*

The expected lifetime yield per fish of a specific age (e.g., per age-2 individual). For a given exploitation pattern, rate of growth, and natural mortality, an equilibrium value of Y/R is calculated for each level of F. This means that under constant conditions of growth, natural mortality, and exploitation patterns over the life span of the species, an expected average Y/R would result from each constant rate of fishing.

NATIONAL REPORTS

NATIONAL REPORT OF BERMUDA (UNITED KINGDOM) *

1. Introduction

The Bermuda fishery consists of 195 local fishing vessels which fish near the Island on a daily basis, seldom venturing more than 480 km offshore. Only about one-third of this fleet is active on a continual basis and the bulk of fishing effort occurs during April through November.

Bermuda has a declared 200 mile (320 km) Exclusive Fishing Zone and licenses foreign fishing vessels to fish the outer 125 miles (200 km) of the zone.

In 1994, Bermuda licensed three Taiwanese longliners and seven Canadian longliners to fish in the Bermuda EFZ.

2. The fisheries

The Bermuda domestic fleet utilizes rod and reel for the taking of tuna and tuna-like pelagic species. There is also some very limited use of longlines.

Foreign fishing vessels licenses by Bermuda to fish in the Bermuda EFZ are exclusively longliners.

Details of the landings in 1994 are summarized in **Table** 1.

3. Research and statistics

All fishing vessels licensed by Bermuda are required to submit detailed catch and effort statistics. In addition, foreign fishing vessels calling at Bermuda undergo port inspections by Bermuda Fisheries authorities.

The Canadian vessels based in Bermuda during 1994 were subject to rigid port inspections and were required to carry Bermuda Fisheries observers who conducted at-sea sampling.

Bermuda Fisheries scientists collected length/weight data and conducted otolith studies on tunas and tuna-like species landed at Bermuda in 1994.

Bermuda has also made important contributions to the ICCAT Enhanced Research Program for Billfish and continues to be involved in this research.

4. Management measures

Bermuda Fisheries Regulations include all ICCAT recommendations for minimum weights for yellowfin and bluefin tunas.

* Original report in English.

Table 1. Landings (in MT) by Bermuda and Bermuda-licensed foreign flag vessels of tunas and tuna-like species in 1994

Species	*Bermuda vessels*	*Taiwanese vessels**	*Canadian vessels**
Albacore	**	76.0	4.7
Atlantic black skipjack	5.5	-	-
Billfish (marlins, etc)	15.5	0.8	-
Bigeye tuna	-	0.9	1.5
Blackfin tuna	7.3	-	-
Bluefin tuna	-	-	3.3
Swordfish	-	0.6	13.1
Wahoo	50.0	0.4	-
Yellowfin tuna	44.0	2.3	1.8
Totals	**122.3**	**81.0**	**24.4**
GRAND TOTAL			**227.7**

* Licensed to fish in the Bermuda EFZ.
** Less than 0.1 MT.

NATIONAL REPORT OF BRAZIL *

by

J. H. Meneses de Lima **

1. Status of the fisheries

1.1 Fleet Development

In 1994, the Brazilian longline fleet, which consisted of 16 vessels, 13 based at Santos (Sao Paulo) and three at Natal (Rio Grande do Norte), showed a decrease as compared to 1993. The number of foreign flag leased longliners that operated in Brazilian waters in 1994 was 27, which is less than the number of boats in operation in recent years (30 in 1992; 36 in 1993). This fleet was comprised mainly of Taiwanese flag vessels (20), which were based at Rio Grande do Sul and Parà States. The other foreign flag vessels chartered by Brazilian companies were two Honduran, one Panamanian, two Japanese and two Korean vessels.

In 1994, the Brazilian baitboat fleet consisted of 54 vessels, which is slightly less than the number in 1993. There were no fishing activities by foreign leased baitboats in Brazilian waters in 1994.

The annual number of tuna vessels (longliners and baitboats) operating in Brazilian waters for the period 1992-1994 is shown in **Table 1.**

1.2 Catches

Catches of tuna and tuna-like species taken by longliners in Brazilian waters during the years 1988 through 1994 are shown in **Table 2.** The total longline catch in 1994 was 4,434.6 MT, which represented a decrease of 61.6% as compared to the previous year's catch, as a result of a significant decrease in the size of the leased fleet. Although a total number of 27 foreign chartered vessels operated in Brazilian waters in 1994, all the Taiwanese flag vessels based at Rio Grande ceased their operations in March, leaving only 17 vessels operating during the rest of the year. This represents less than 50% of the number of vessels in 1993.

Species composition of catches taken by the leased longliners changed in relation to recent years, and has shown a predominance of albacore catches. In 1994, the most important species caught was yellowfin, representing 30.8% of the total catch in weight, followed by albacore with 25.7%. As for the Brazilian longline fleet, species composition of the catches was very similar to that of 1993, showing a predominance of swordfish.

Table 3 shows catches by baitboat fishery for the period 1988-1994. The total catch in 1994 amounted to 23,229 MT, an increase of 9.8% over the 1993 catch. Skipjack is the target species of this fishery, representing about 85% of the total catch. Skipjack catches increased from 17,579 MT in 1993 to 20,372 MT in 1994, which resulted in an increase of 15.6%.

Preliminary landing estimates of the main tuna species taken by the artisanal fishery, from two of the nine States of the northeast region of Brazil, are shown in **Table 4.**

Although at present there are no complete landing statistics for the northeast Brazilian artisanal tuna fishery, and considering that Ceará State is the main producer of mackerels (king mackerel and Spanish mackerel), it can be assumed that the trends shown in catches for these species are representative of the overall trend in the region.

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* Original report in English.

** Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA)

2. Research

The "Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA)", through its regional units (CEPENE and CEPSUL) located in the northeast and south regions of Brazil, respectively, has been in charge of the collection and compilation of Brazilian fishery data, except for the State of São Paulo, where this activity is carried out by the "Instituto de Pesca".

The collection of tuna statistics and sampling for size frequency of the main species continued in 1994. The compilation of part of these data is still in progress, but the majority of the size data and the catch and effort data collected by IBAMA in 1994 have been submitted to the ICCAT Secretariat.

In 1994, a total of 6,974 skipjack and 556 yellowfin tunas were measured for length frequency distribution from landings of baitboats at Santa Catarina. Port sampling for size frequency of yellowfin landed by Brazilian longliners in northeast Brazil was also carried out, with a total of 880 yellowfin measured. As this fleet targeted yellowfin (using handline) during part of the year, past length frequency data collected are being revised to obtain the size composition of yellowfin catches by each fishing gear.

Efforts to improve the monitoring of fishing operations carried by the Taiwanese leased longliners based at Belem resulted in an increase of logbook returns, which reached the same levels as those of the other foreign leased longliners. The coverage rate of logbooks for the Brazilian baitboat and longline fleets has remained unchanged.

To enhance the monitoring of the fishery by foreign flag chartered longliners, a plan to implement a scientific observer program in 1996 is being developed for at-sea sampling, to evaluate discard levels, fishing strategies, etc.

3. Shark fisheries

In recent years there has been an increase in shark catches taken by Brazilian longliners, which represent about 50% of total catch in weight. As regards the leased longline fleet, the catch of sharks by this fleet is believed to be higher than is currently reported. Data from on-board observations on longline fishing trips have shown that for the majority of shark species caught, fishermen usually remove only the fins, discarding the remainder of the sharks at sea. Only the catches of a few species of higher economic value are retained on board. Shark catches by both the Brazilian and the leased longline fleets are shown in **Table 5**, for the period 1989-1994.

A pelagic driftnet fishery has been recently developed in the south and southeast regions of Brazil. Although there are no accurate statistics on shark catches taken by this fishery, based on data collected on-board observations, it is estimated that sharks represent more than 80% of the total weight of the catches. Smooth hammer *(Sphirna zygaena)* and scalloped hammer *(Sphirna lewini)* are the most important shark species caught followed by shortfin mako *(Isurus oxyrinchus)* and blue shark *(Prionace glauca)*.

Action is being taken to initiate monitoring of catches by this fishery through the mandatory submission of logbooks and by placing observers on board some driftnet vessels.

4. Statistical collection systems

As part of a national program for the collection of fishery statistics, Brazil has implemented two statistical collection systems, one for landings and one for logbooks.

All masters of fishing vessels over 20 GRT, licensed to fish in Brazilian waters, are required to submit logbooks, completed in full on a daily basis, at the end of each trip. This requirement also applies to foreign flag leased vessels authorized to fish in Brazilian waters. Penalties applied if logbooks are not submitted include fines and the cancellation of fishing licenses.

Statistics on catches landed by the industrial tuna fleet are collected after each fishing trip, directly from the buyers' sales sheet, or are submitted on the appropriate forms by the fishing companies or boat owners.

Authorizations for foreign chartered tuna vessels to fish in Brazilian waters are issued on a yearly basis. In order to improve the rate of logbook returns of these vessels, after the completion of each year of operation, a new authorization is issued only on the condition that logbooks for all fishing trips have been submitted.

During 1994, after a complete review of the logbook form for the longline fishery, a new logbook format was developed which requires that the catches of the main shark and other species caught incidentally be reported.

In order to monitor the shark catches taken in the pelagic driftnet fishery initiated in the south and southeast regions of Brazil, all fishing vessels operating in this fishery are now required to submit logbooks.

Up to 1989, the statistics on tunas caught by the artisanal fisheries off northeast Brazil were collected by the "Instituto Brasileiro de Geografia e Estatistica" (IBGE), the government agency responsible for providing the official statistics of Brazil. IBAMA also had a statistical collection system, which complemented IBGE's activities of data collection relative to the artisanal fisheries.

The methodology for data collection used by both systems consisted of a total census of all fishing boat landings made at the principal landing sites, which made it very expensive to maintain the extensive network of data collectors employed to operate these systems. By the mid-1980s, both statistical systems started to collapse due to the shortage of funds. However, non-systematic data collection activities continued at some landing places.

In 1990, a new data collection system based on statistical sampling was developed by IBAMA and was tested in Ceará State, the main fish producer of the artisanal fishery in the northeast region of Brazil. This system was gradually extended to other States and, at present, it has been fully implemented in six out of the nine States in the region. First estimates of landings of the main tuna species are now available for Ceará and Rio Grande do Norte States (**Table 5**). For the other States of the region, the compilation of data collected is in progress and it is expected that the first landing estimates will be available from early 1996 onwards.

In order to fill the gap in statistics on landings by the artisanal fishery in the region, joint efforts are being made by IBAMA and IBGE to obtain annual estimates of landings based on the existing partial data collected at some of the main landing sites.

5. Tuna management measures

ICCAT recommendations of minimum weight limits for yellowfin and bigeye tunas were implemented by domestic legislation in 1973 and 1981, respectively. In relation to these recommendations, as there are no Brazilian fisheries catching small bigeye and yellowfin, no inspections have been conducted at Brazilian ports. As regards ICCAT's recommended management measures for swordfish, the minimum size (125 cm) and weight (25 kg) limits have been implemented this year by domestic legislation. Up to now, actions in relation to this recommendation have been limited to giving due publicity to this regulation for the fleet, in order to make fishermen aware of the need to protect young swordfish.

Although at present there is no regulatory measure in force for shark fisheries, some studies are being conducted to introduce management measures which could include the prohibition of finning sharks and the implementation of a scheme to limit the entry of vessels into the pelagic driftnet fishery.

Table 1. Distribution of tuna vessels that operated in Brazilian waters, by type of fishery, vessel flag, and base port, 1992-1993

Fleet	*Base port*	*1992*		*1993*		*1994*	
		Baitboat	*Longline*	*Baitboat*	*Longline*	*Baitboat*	*Longline*
Brazilian	Rio G. do Norte	--	3	--	5	--	3
	Rio de Janeiro	25	--	23	--	21	--
	Sao Paulo	--	14	--	14	--	13
	Santa Catarina	32 *	--	30 **	--	29 **	--
	Rio G. do Sul	--	--	4 ***	--	4 ***	--
Sub-total		57	17	57	19	54	16
Honduran (1)	Sao Paulo	--	1	--	1	--	2
Japanese (1)	Rio G. do Sul	--	1	--	2	--	2
Portuguese (1)	Sao Paulo	--	2	--	--	--	--
Panamanian (1)	Sao Paulo	--	--	--	1	--	1
Taiwanese (1)	Para	--	11	--	14	--	10
	Rio G. do Sul	--	15		18	--	10
Korean (1)	Rio G. do Sul	--	--	--	--	--	2
Sub-total		--	30	--	36	--	27
TOTAL		**57**	**47**	**57**	**55**	**54**	**43**

(1) Foreign vessels leased by Brazilian companies and licensed to fish in Brazilian waters.
* Including 6 freezer baitboats over 151 GRT.
** Including 2 freezer baitboats in 1993 and 3 freezer baitboats in 1994 over 151 GRT.
*** Freezer baitboats (over 151 GRT).

Table 2. Catches (MT) of tuna and tuna-like fishes taken by the Brazilian and foreign leased longline fleets, 1988-1994

Species	*Fleet*	*1988*	*1989*	*1990*	*1991*	*1992**	*1993**	*1994*
	Brazilian	421.6	491.6	532.8	247.5	257.8	395.6	233.1
Yellowfin	Leased	477.0	634.1	121.9	333.6	968.6	1627.4	918.3
	Brazilian	66.3	61.1	129.0	57.8	92.0	54.0	68.1
Albacore	Leased	327.4	372.4	355.5	1021.9	2629.1	4533.3	767.3
	Brazilian	61.1	41.0	56.9	42.6	28.5	46.0	37.2
Bigeye	Leased	884.9	471.5	534.4	307.2	759.3	1510.5	557.2
	Brazilian	692.5	926.2	1023.7	720.7	623.9	618.8	955.5
Swordfish	Leased	469.5	241.6	679.3	590.4	1979.4	1602.3	602.0
	Brazilian	109.5	122.7	91.9	57.3	32.1	45.6	40.4
Sailfish	Leased	5.7	0.9	1.5	8.6	251.3	176.7	24.9
	Brazilian	113.6	172.7	160.7	280.5	117.1	78.0	72.3
White marlin	Leased	34.8	31.5	40.9	95.5	91.0	349.5	18.0
	Brazilian	19.9	30.0	19.2	16.5	16.8	15.9	18.0
Blue marlin	Leased	44.3	28.8	30.8	42.7	108.8	139.3	56.9
	Brazilian	4.1	4.1	10.9	40.2	61.3	48.2	26.6
Other**	Leased	3.2	6.9	10.1	35.7	213.5	304.2	38.8
	Brazilian	**1488.6**	**1849.4**	**2025.1**	**1463.1**	**1229.5**	**1302.1**	**1451.2**
TOTAL	**Leased**	**2246.8**	**1787.7**	**1774.4**	**2435.6**	**7001.0**	**10243.0**	**2983.4**

* Preliminary estimates.

** Includes *Acanthocybium solandri*.

Table 3. Catches (MT) of tuna and tuna-like fishes taken by the Brazilian and Japanese leased baitboat fleets, 1988-1994

Species	*Fleet*	*1988*	*1989*	*1990*	*1991*	*1992*	*1993*	*1994*
	Brazilian	9963	14218	13290	14477	18944	17570	20372
Skipjack	Leased	7264	6331	6735	5947	---	---	---
	Total	17227	20549	20025	20424	18944	17570	20372
	Brazilian	1446	1331	862	1109	2731	3157	2616
Yellowfin	Leased	149	45	92	60	---	---	---
	Total	1595	1376	954	1169	2731	3157	2616
	Brazilian	342	184	268	368	288	428	241
Others	Leased	3	2	15	---	---	---	---
	Total	345	186	283	368	288	428	241
	Brazilian	**11751**	**15733**	**14420**	**16065**	**21963**	**21155**	**23229**
TOTAL	**Leased**	**7416**	**6378**	**6842**	**6007**	---	---	---
	Total	**19167**	**22111**	**21262**	**22072**	**21963**	**21155**	**23229**

Table 4. Preliminary landing estimates (MT) of the main tuna species caught by the artisanal fishery in the northeast region of Brazil for the period 1991-1994

		Species				
Year	*Landing site*	*King mackerel (KGM)*	*Serra Spanish mackerel (BRS)*	*Blackfin tuna (BLF)*	*Others (OTH)*	*TOTAL*
1991	Ceará	910.3	1363.4	--	501.3	2775.0
	R. Grande do Norte	--	--	--	--	--
Total		**910.3**	**1363.4**	--	**501.3**	**2775.0**
1992	Ceará	739.3	981.8	--	767.8	2488.9
	R. Grande do Norte	193.9	131.7	138.8	27.6	492.0
Total		**933.2**	**1113.5**	**138.8**	**795.4**	**2981.0**
1993	Ceará	1136.1	629.0	--	606.6	2372.0
	R. Grande do Norte	--	--	--	--	--
Total		**1136.1**	**629.0**	--	**606.6**	**2372.0**
1994	Ceará	1138.2	855.1	--	681.7	2675.0
	R. Grande do Norte	189.1	269.1	347.1	34.1	839.4
Total		**1327.3**	**1124.2**	**347.1**	**715.8**	**3514.4**

Table 5. Catches of pelagic sharks by the Brazilian and foreign flag leased longline fleets and their percentage composition in relation to the total catches, 1988-1994

	— F l e e t —			
Year	*Brazilian fleet*	*%*	*Leased fleet*	*%*
1988	1298.4	45.0	481.4	17.7
1989	1962.4	50.0	211.1	10.6
1990	2706.4	55.3	391.4	18.1
1991	2517.9	60.1	403.5	14.2
1992	1999.8	60.0	574.8	7.6
1993	2137.2	60.6	1439.0	12.3
1994	1892.4	53.6	719.9	19.4

NATIONAL REPORT OF CANADA, 1994-95 *

by

J. M. Porter **

1. Introduction

The Canadian Department of Fisheries and Oceans has responsibility for Canadian fisheries management and statistics, and for research on Atlantic large pelagic species fished in Canadian waters in support of the ICCAT Convention. Canadian research programs are conducted for swordfish and tunas at the Biological Station, St. Andrews, New Brunswick, and for large pelagic sharks at the Bedford Institute of Oceanography, Dartmouth, N.S. Beginning in 1994, all fisheries are managed on a calendar year basis; prior to 1994, bluefin tuna management was on an April to March basis.

2. Status of the Fisheries

2.1 Bluefin tuna

The total Canadian quota to be caught by all gear types and for all areas for 1994 and 1995 according to the 1993 ICCAT agreement was 817 MT. This 1994-95 quota was divided equally between the 1994 and 1995 seasons (408 MT/408 MT). By the provision of the ICCAT regulatory recommendations, Canada could have taken a maximum of 510 MT in 1994.

Bluefin occur in Canadian waters from July to October over the Scotian Shelf, in the Bay of Fundy, off Newfoundland and in the Gulf of St. Lawrence. The Canadian nominal landings of Atlantic bluefin tuna in 1994 were 391.6 MT (**Table 1**), leaving 118 MT allowed by the ICCAT regulatory recommendations uncaught. The major fishery (tended line) took place in the Hell Hole between Browns and Georges banks - 165 MT (42% of the Canadian catch). A significant catch was taken in the St. Margaret's Bay fish trap fishery (80 MT) and in the Gulf of St. Lawrence tended line fishery (61 MT). In the Bay of Fundy, 34 MT were taken by electric harpoon; 39 MT were taken by rod and reel off northeastern Nova Scotia. Only 5.2 MT were taken in the tended line fishery off Newfoundland due primarily to decreased effort in the groundfish fishery and less presence in the offshore fishing grounds. In early 1994, 3 MT were taken by longline by Canadian vessels fishing off Bermuda. The Canadian offshore longline fishery, which directs for tuna species other than bluefin within Canada's 200-mile fisheries zone, did not use any of its 25-MT bluefin bycatch limit (**Table 2**) in the 1994 season (1 April-31 December).

2.2 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 Canadian nominal landings of swordfish in 1994 were 1,675.7 MT (round), taken mainly by longline (99%), with smaller landings by the harpoon fishery (**Table 3**). The mean weight (round) of longlined and harpooned swordfish caught in the Canadian fishery was 63 kg and 120 kg, respectively (**Table 3**). Eleven percent of the Canadian landings by number in 1994 constituted small fish as defined by the ICCAT swordfish recommendations for regulatory measures (<25 kg round, **Table 3**).

2.3 Other tunas

The other tunas (albacore, bigeye and yellowfin) are at the northern edge of their range in Canada. They are found on Georges Bank, the Scotian Shelf and Grand Banks during summer months. Albacore, bigeye and yellowfin

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* Original report in English.

** Biological Station, Department of Fisheries and Oceans, St. Andrews, New Brunswick,

tuna were directed for by one Canadian offshore longline vessel (**Table 2**), as well as by the swordfish long- line fleet (**Table 1**). Landings remained low in 1994.

2.4 Sharks

Historically, blue shark, porbeagle and shortfin mako have been a bycatch of the Canadian swordfish and groundfish longline fisheries. The pelagic longline fishery also takes small amounts of other shark species. A directed porbeagle fishery by the Faeroese in Canadian waters was also permitted under a 1981 Fisheries Agreement. Since 1991, however, Canadian interest in sharks has increased. The 1994 reported landings are summarized by species in **Table 1**; the catch of sharks in Canadian waters is believed to be higher than is currently reported because of discarding and no previous requirement to identify as to species. These problems are being addressed through regulatory amendments announced in 1994.

3. Research Studies

3.1 Bluefin tuna

1) Preliminary estimates from the 1990-92 tagging experiment of population size, exploitation rates and migration patterns were presented at the American Fisheries Society (August). At the end of 1994, there were 26 of the 154 tags recovered: 15 from the Hell Hole fishery, 10 from the New England fishery, and one from a Moroccan trap in the east Atlantic.

2) Hail monitoring for all bluefin tuna landed in Nova Scotia, combined with partial observer coverage, resulted in more complete coverage of effort data, as well as dressed weights and dressed lengths.

3) Data entry undertaken by Statistics Branch for all tuna landed in Nova Scotia in 1994, to speed the availability of data to scientists.

4) Exploratory re-analysis of Gulf of St. Lawrence CPUE from log records was conducted. A more comprehensive approach involving additional data from the original log records, as well as from a more extensive geographical range, is required. Data entry will be conducted in 1995.

5) A feasibility study for an aerial survey of bluefin tuna was conducted; because the information gain is limited and the cost of designated air time is prohibitive, the recommendation is not to pursue this approach in Canada.

6) Initiated an Industry-Science cooperative tagging program with the Prince Edward Island Tuna Working Group.

3.2 Swordfish

1) Hail monitoring implemented for all swordfish landed in Nova Scotia. This resulted in 99% submission of log records and individual weights of fish. Data from Nova Scotia were provided in a computerized form to biologists in 1994.

2) Detailed editing and screening of the 1962-1993 CPUE data was conducted prior to the 1994 update of the biomass index.

3) An age-specific index of relative abundance was calculated for swordfish caught by longline in Canada (1988-93).

4) A juvenile swordfish (< 125 cm) mark-recapture study involving DFO Science and the swordfish Industry was initiated in 1994. A total of 170 swordfish were tagged between Georges Bank and the Grand Banks, with one recovery east of the Flemish Cap by a Spanish longline vessel.

5) At-sea boardings of swordfish longline vessels provided measurements of round fish.

3.3 Other tunas

Biological sampling of the other tunas (albacore, bigeye and yellowfin) has been conducted on the Canadian offshore and Japanese fisheries within the Canadian 200-mile fisheries zone. There was limited sampling of the domestic fleet (submission of tally sheets and logs, and observer coverage).

3.4 Sharks

1) Historical CPUE and at-sea sampling data collected by the Canadian Observer Program on Faeroese longline vessels directing for porbeagle sharks in the Canadian 200-mile fisheries zone was analyzed for comparison of data from Canadian vessels directing for porbeagle.

2) The logbook/tally sheet system used for Canadian swordfish vessels was modified to enable collection of CPUE and size composition data from Canadian vessels directing for pelagic sharks.

3) A shark tag and release program was initiated.

4. Management

The Canadian Atlantic statistical systems provide real time monitoring of catch and effort. At the completion of each fishing trip, data must be submitted by the Industry to a monitoring company which inputs the data into a central computer system. Data must be received from fishermen before they can proceed with their next fishing trip. This ensures 100% coverage of properly completed log records and individual fish weights.

While a computerized system was to have been established in 1994 to record the implementation of the ICCAT Bluefin Tuna Statistical Document Program, it was not operational until 1995. Prior to the ICCAT program, Canada already had a system of uniquely numbered tags to be attached to all bluefin tuna landed in Canada.

Details of management measures and their enforcement are provided in the Annex (1995 Management Plans).***

4.1 Bluefin tuna

In response to 1993 ICCAT regulatory recommendations, Canada implemented a 2-year (1994-95) Atlantic bluefin tuna fishery management plan. The bluefin tuna fishery on the Atlantic coast was subject to the following measures in 1994:

1) Quota: A 2-year quota of 817 MT was allocated among seven inshore management units and the offshore fishery (including trip limits). The 1994-95 quota was divided equally between the two years with uncaught 1994 quota to be added to the 1995 quota. A preliminary quota of 408 MT was put in place for 1994;

2) Minimum Size: No person shall have in possession any bluefin tuna that weighs less than 30 kg;

3) Consultation: Fishing seasons and quotas for each management area were made in consultation with industry and strictly monitored by DFO;

4) Limited Entry: The number of regular directed bluefin tuna licences was limited to 719, plus 38 restricted activity licences, 4 fish trap licences in St. Margaret's Bay (bycatch of bluefin), and one offshore licence (bycatch of 35 MT of bluefin);

5) Restrictions: Strict vessel replacement, management fishing areas and licence transfer requirements were enforced;

6) Gear: Gear restrictions were as follows: commercial fishery limited to rod and real and/or tended line (must be attached to vessel; maximum of two lines, each with one hook fished at one time); charter limited to rod and reel; pelagic longline in offshore fishery. Electric harpoons were permitted on an additional one-year experimental basis;

*** The Annex attached to the 1994-95 National Report of Canada is available at the ICCAT Secretariat for consultation.

7) Tags: As in previous years, all bluefin must be tagged, when caught, with a uniquely numbered identification tag. This was used in conjunction with logbooks for the purpose of catch monitoring.

In 1994, 304 licensed fishermen actually participated in the directed bluefin tuna fishery (**Table 4**). One offshore licence was issued for tunas other than bluefin with a bycatch of 25 MT of bluefin. Four fish trap licences in St. Margaret's Bay were re-issued, allowing a catch of bluefin (**Table 4**).

4.2 Swordfish

The 1994 Atlantic Swordfish Fishing Plan contained the following management measures:

1) Quota: A quota of 2000 MT was assigned for 1994.

2) Bycatch: (i) Longline vessels directing for swordfish were permitted to direct for tuna other than bluefin; (ii) A 30-MT (maximum) swordfish bycatch quota was provided for the offshore Canadian tuna fishery.

3) Area: A condition of licence appeared on all swordfish licences: "Valid for NAFO Convention Subareas 3, 4 and 5 only, excluding Fishing Zones 1 and 2 of Canada" (Gulf of St. Lawrence and Bay of Fundy).

4) Limited Entry: Swordfish longline licences and swordfish harpoon licences were available only to fishermen who held such licences in 1993.

5) Gear: Only swordfish longline and harpoon gear permitted.

6) Small Fish: A prohibition on the taking and landing of swordfish less than 25 kg (live weight) was continued. A length equivalent for this measure was 125 cm from the fork of the tail to the tip of the lower jaw. Vessels were limited to 15% tolerance of the number of fish per landing.

7) Opening Date: The opening date for swordfishing was 1 June for the 1994 season.

Seventy-four licensed swordfish longline fishermen (directed fishery) were active in the 1994 fishery on the edge of the Scotian Shelf and the Grand Banks of Newfoundland. Participation has increased since 1988 (**Table 3**) due to pressure from the closure of groundfish fisheries. Although a total of 1421 fishermen are eligible for harpoon licences, only 32 were active. In addition, one offshore licence was issued for tunas other than bluefin (bigeye, albacore, yellowfin) with a swordfish bycatch provision.

4.3 Other tunas

In 1994, there were no management plans for tunas other than bluefin.

4.4 Sharks

Regulatory amendments were made in May 1994 and a Fishery Management Plan for porbeagle, shortfin mako and blue sharks has been announced (see Annex). The Plan includes provisions for a limited entry exploratory fishery, gear restrictions, a prohibition of finning sharks, and the collection of fishing and biological data. Precautionary catch levels for a directed longline fishery for sharks were set as follows: 1500 MT for porbeagle, 250 MT for shortfin mako, and 250 MT for blue shark.

5. Preliminary Information for 1995

See Annex for 1995 Management Plans for Atlantic Bluefin Tuna, Atlantic Swordfish, Atlantic Porbeagle, Shortfin Mako and Blue Sharks.

5.1 Bluefin tuna

Details of the 1995 management plan are as follows (if different from the 1994 plan):

1) Quota: In adherence to the 1994 ICCAT agreement, the Canadian quota for the 1995 calendar year will be set at 654 MT. This Canadian quota is comprised of 535.6 MT allocation from ICCAT for the calendar year 1995

plus a carry-over of 118.4 MT. The carry-over is the difference between what Canada caught in 1994 (391.6 MT) and the level at which Canada could have set her quota (510 MT) in 1994.

2) A hook, tag and release fishery may be permitted when the commercial season is not operating, provided conditions with respect to tagging and training have been met.

To date (22 September 1995), 372 MT of bluefin have been caught in the inshore fishery. Over 60% of that was landed in southwestern Nova Scotia. The fish traps have caught 42 MT in 1995. About 13 MT of bluefin have been landed in northeastern Prince Edward Island; this was once a major bluefin fishing area, and the return of giants may indicate some optimism regarding the state of the stocks. Reported sightings of small, medium and giant tuna have been frequent during 1990-95; this may imply some improvement in the western bluefin stock as a result of the restrictive management measures in place since 1982.

The scientific research program at the Biological Station, St. Andrews was as follows:

1) Data entry of all bluefin tuna CPUE from log records from 1984-94 completed, and preliminary analysis of data initiated.

2) Dockside monitoring for all bluefin tuna landed in Canada, and data entry by Regional offices. This ensures more complete and timely availability of data to Science.

3) Participated in Miami Research Workshop for Atlantic Bluefin Tuna Tagging Studies. Initiated cooperative tagging with U.S. and Australian scientists and Canadian bluefin Industry to attach dummy archival tags to giant bluefin in impoundments in order to evaluate attachment methods.

5.2 Swordfish

In 1995, the quota for swordfish is 1,500 MT (directed fishery 1,340 MT, swordfish fleet bycatch (tunas) 150, and offshore vessel bycatch (tunas) 10 MT), with strict provisions to avoid quota overrun. To maximize the avoidance of bluefin bycatches, the Canadian season for longline vessels opened 1 June 1995, east of longitude 60°31'; the area west of this line opened 1 August 1995. Other aspects of the 1994 plan remain in effect.

The nominal Canadian landings as of 20 September 1995 were 932 MT and the fishery is still in progress. In June and July 1995, 180 MT were taken by harpoon. Fishermen reported that the "edge" (thermocline) had not yet developed and that fish were found close to the surface and suitable for harpooning (all along the edge of the Scotian Shelf).

The scientific research program at the Biological Station, St. Andrews, N.B. was as follows:

1) Updated 1961-94 biomass index and 1988-94 age specific index for swordfish caught by longline.

2) Hail and dockside monitoring implemented for all swordfish landed in Canada and data entry conducted by Regional offices. This ensures more complete and timely availability of data to Science.

3) Continuation and expansion of the juvenile swordfish cooperative tagging study with the Nova Scotia Swordfishermen's Association.

4) Initiated a cooperative study with the Nova Scotia Swordfishermen's Association to determine an appropriate conversion to dressed length for small fish in Canadian waters.

5.3 Other tunas

The other tuna fisheries are limited entry. The fishing activity for other tunas was increased in 1995, with swordfish longline vessels directing for yellowfin and bigeye early in the season.

The scientific program is restricted to collection of catch, effort and size information from the domestic fishery, as well as biological sampling from the International Observer Program.

5.4 Sharks

The 1995 Management Plan included provisions for area and season closures to assist in minimizing the bycatch of other species, particularly swordfish and tunas, and for dockside monitoring of all commercial shark landings and submission of detailed fishing logs and information on the species, sex and size composition of landings. The recreational fishery for sharks was restricted to hook and release only until criteria are developed which may allow retention of fish. Other aspects of the 1994 plan remain in effect.

The priorities of the scientific research program were as follows:

1) establish data collection from Canadian vessels directing for pelagic sharks; and

2) continue cooperative tag and release program for pelagic sharks involving both commercial and recreational fishermen.

Table 1. Summary of 1991-94 Canadian landings (MT round weight) of large pelagic fish species

Species	*Landings*			
	1991	*1992*	*1993*	*1994*
Swordfish	1026.5	1546.5	2233.7	1675.7
Bluefin tuna	481.7	443.5	458.6	391.6
Albacore	5.7	1.0	8.7	32.2
Bigeye tuna	27.1	67.5	124.1	110.5
Yellowfin tuna	28.0	25.5	71.5	52.3
Unspecified tuna	2.0	3.2	9.1	0.2
Blue shark	31.0	101.1	20.8	112.5
Shortfin mako	427.0*	115.8	152.2	157.2
Porbeagle		717.9	832.0	1544.9
Unspecified sharks	61.4	49.0	22.7	107.1

* Mackerel sharks.

Table 2. Catches (MT round weight) of the Canadian offshore longline fishery which directs for tunas other than bluefin, 1987-94*

	1987-88	*1988-89*	*1989-90*	*1990-91*	*1991-92*	*1992-93*	*1993-94*	*1994***
Albacore	21	47	22	21	+	+	6.7	2.5
Bigeye	144	95	31	15	0	+	11.1	10.3
Yellowfin	40	30	7	14	+	+	1.3	3.7
Bluefin**	33	104	53	28	13	1.2	21.3	0.0
Swordfish**	15	16	6	9	0	+	33.0	94.9

* Prior to 1994, this fishery was managed on a 1 April-31 March basis. Beginning in 1994, management is on a calendar year basis.

** Species regulated by Canadian quota regulations.

*** 1 April to 31 December 1994.

\+ <1 MT.

Table 3. Summary of 1988-94 active licences, swordfish landings (MT round weight), average weight of fish (kg round) and percentage of small fish*

	1988	*1989*	*1990*	*1991*	*1992*	*1993*	*1994*
Number of active licences							
Longline	39	52	50	53	46	75	74
Harpoon	+	+	+	61	72	72	32
Catch (MT)							
Longline	887	1097	819	953	1486	2206	1654
Harpoon	24	146	92	73	60	28	22
Total	911	1243	911	1026	1546	2234	1676
Average weight (kg)							
Longline	50	52	61	61	57	56	63
(# sampled)	(1315)	(3902)	(10280)	(8111)	(5904)	(19469)	(26279)
Harpoon	–	129	138	78	67	129	120
(# sampled)	(0)	(637)	(164)	(146)	(136)	(151)	(83)
% of catch small fish* (by number)	16	16	11	11	16	15	11
% of catch sampled	7	23	71	49	23	50	99

* <25 kg round weight.
\+ undetermined number, but <100.

Table 4. Distribution of bluefin tuna and swordfish fishing licences by region and species* in 1994

	Number of licences			
	Bluefin		*Swordfish longline*	
Region	*Total*	*Active*	*Total*	*Active*
Gulf	606	226	0	0
Newfoundland	55***	9	8	5
Scotia-Fundy	42	32	69	69
St. Margaret's Bay**	4	4	-	-
Quebec	54	33	0	0
	761	304	77	74

* Only bluefin tuna and swordfish are regulated by limited entry.
** Fish trap licences.
*** 38 of these licences are subject to a reduced level of fishing activity and restricted to NAFO Divisions 3LNO.

Note: Active fishermen are those that picked up their licences, licence conditions and tags, and may or may not have actually fished.

NATIONAL REPORT OF CAPE VERDE*

by

María Helena Santa Rita Vieira **

1. Introduction

Cape Verde fisheries resources are comprised of a wide variety of species, and the most important fisheries are those for large oceanic pelagic species, mainly tunas and small coastal pelagic species. However, demersal fish and red and coastal crayfish are also caught. Since 1992, and up to the first quarter of 1995, an experimental fishery has targeted pelagic sharks.

Thus, the commercial fishing vessels are polyvalent, which causes problems in calculating tuna fishing effort.

Responsibility for fisheries research and statistics is by the National Institute for Fisheries Development (INDP), based at Mindelo, San Vicente Island, with a delegation in Praia, on Santiago Island.

2. The catches

An overall estimate of catches for 1993 and 1994 is given in **Tables 1 and 6** for the industrial fishery and in **Tables 2 and 7** for the artisanal fishery.

As concerns the industrial fishery, catches of tunas has shown a declining trend. The reasons for this decline have not yet been sufficiently analyzed, but one reasons is that, since 1992, this fleet has also targeted small pelagic species; from 1981 to 1991 the large pelagics represented 82 to 94%, small pelagics from 5 to 15%; from 1992 to 1994 the large pelagic species represented from 43 to 33% of the catches, whereas small pelagics represented from 52 to 63% (Statistical Bulletin, No. 1, INDP).

The species targeted are yellowfin, skipjack, wahoo, frigate tuna, and Atlantic black skipjack. The average size of yellowfin tuna is about 94 cm, and that of wahoo is 125 cm. Billfishes are caught sporadically.

3. Statistics

In the statistics, two fleet types are distinguished:

- The "industrial" fleet, comprised of very diverse boats (7 to 32 m), many of which are old and in poor condition; since January, 1995, thirteen (13) polyvalent vessels with nets, measuring 11 m draft length, have started their activities. The industrial fleet is made up of 66 vessels.

- The artisanal fleet, comprised of about 1330 boats, 50% of which do not have motors (Statistical Bulletin, No. 1, INDP).

A team of 14 censors are in charge of the 16 main landing points (44% of the vessels), at the nine different islands. In total, for the archipelago, 87 landing points have been registered.

As concerns the artisanal fishery, six times per month and on dates chosen at random among the working days, the censor carries out an exhaustive sampling of the catches of tunas landed. The weights are calculated based on the

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* Original report in French.

** Biologist, Ministry of the Sea, National Institute for Fisheries Development (INDP).

measurements carried out, and these are then converted to weight. This weight is then extrapolated to the monthly total for each sampling location.

The monthly catches of each sampling location on each island are extrapolated to the monthly total of the fleet of the island concerned. The sum total of all the islands gives the national monthly total. This is done each month, thus obtaining the annual national total.

For the industrial fishery, fishing logbooks are completed for each trip, either by the vessel captain or by the censor, at the time of landing, if the vessel captain cannot do it. This statistical system, in effect since 1981, has been modified progressively as knowledge of the fishery has improved.

The statistics are published in the form of an Annual Bulletin since 1986. This Bulletin includes data on the catch and effort of the artisanal and industrial fisheries, as well as canning and export data.

The temporary absence of personnel from the statistical service, who were taking a training course on statistics, has delayed the publication of this Bulletin. Data corresponding to 1992 were published in early 1995. Notwithstanding, it is hoped that 1993 and 1994 data will be published towards the end of 1995.

Cape Verde has signed fishing agreements with the European Community, Senegal, Guinea, and Guinea Bissau. Boatowners that pertain to the European Community have to report their catches. The catches of other vessels are controlled by on-board observers.

4. Research

There is a tuna research project covering 1995 and 1996 to improve knowledge on the state of the large pelagic resources in the Cape Verde EEZ, particularly as concerns tunas, and to study the possibilities of developing new fishing methods as alternatives to those currently practiced.

The work currently being carried out within this program is as follows:

- Monitoring of the fisheries by means of data on catch and effort;
- Analysis of the size compositions of all the tuna species;
- Study on spawning, sex ratio and feeding regime of yellowfin, bigeye and wahoo; and
- Collection of size and weight data of wahoo, to determine the size/weight relation.

It is expected that during the third quarter an experimental deep longline cruise will take place longline targeting bigeye tuna.

Twelve fish aggregating devices (FADs) were anchored during 1995.

Since 1992, and up to February-March, 1995, some national boatowners have shown considerable interested in fishing for pelagic sharks, particularly those of the *Centrophorus* genus. To this effect, an experimental fishing has developed during this period, monitored by a technician from the Institute for the purpose of identifying the species, assessing catch and effort, studying geographic distribution, and analyzing the size frequencies.

5. Management

Efforts have been made, inasmuch as possible, to implement the management measures adopted by ICCAT. Moreover, since 1987, the fishing of yellowfin and bigeye tunas less than 55 cm/3.2 kg has been prohibited. This measure was published in the Official Journal No. 36 of September 5, 1987.

Table 1. Catches (MT) of the Cape Verde industrial fleet

	1988	*1989*	*1990*	*1991*	*1992*	*1993*	*1994*
Yellowfin tuna	471	885	502	660	224		
Skipjack tuna	1350	984	767	1809	727		
Bigeye tuna	6	1	8	64	3	not available	not available
At. black skipjack + frigate tuna	0	8	2	41	2		
Wahoo	13	81	78	20	12		
TOTAL	1840	1854	1352	2094	967	832[1]	896[1]
%					45	41	33
Effort (days at sea)	1246	1464	1397	1870	1034		
Pelagic sharks[2]					9		1

1 Preliminary estimate.
2 Experimental fishery.
Gear: baitboat and handline.

Table 2. Catches (MT) of the Cape Verde artisanal fishery

	1988	*1989*	*1990*	*1991*	*1992*	*1993*	*1994*
Yellowfin tuna	1997	1985	1634	1272	1202		
Skipjack tuna	106	37	25	14	26		
Bigeye tuna	111	99	44	87	102		
Atl. black skipjack+frigate tuna	1	15	63	33	3	not available	not available
Wahoo	327	600	380	331	332		
TOTAL	2542	2736	2146	1737	1665	2032[1]	
%					59	42	
Effort (days at sea)	108284	145392	132672	125313	105354		

1 Global estimate.
Gear: handline and trawl.

Table 3. Cape Verde industrial fishing, 1988-1992 (in MT)

	1988	*1989*	*1990*	*1991*	*1992*
Skipjack tuna				5	
Atl. black skipjack+frigate tuna		6		6	
TOTAL		6		11[1]	
Effort (trips)			8		

Table 4. Cape Verde artisanal fishery, 1988-1992 (in MT)

	1988	*1989*	*1990*	*1991*	*1992*
Skipjack tuna			14	5	111
Atl. black skipjack+frigate tuna	85	76	10	55	77
TOTAL	86	76	24	60	188
%					13.4
Effort (trips)		4063	7644	5271	7383

Gear: small revolving nets and beach seine.

Table 5. Cape Verde canning and derivatives, 1991-1992 (MT)

	1991	*1992*
Canning	121	281
Derivitives	152	56
TOTAL	**273**	**337**

Table 6. Development of the catches, by species groups, of the Cape Verde industrial fishery, 1981-1994

Year	*Tunas*	*%*	*Pelagics*	*%*	*Demersals*	*Crayfish*	*Others*	*Total catch*
1981	2735					20		2755
1982	2777	94	165	5		25		2967
1983	2627	93	161	5		39		2827
1984	2025	89	218	9		30		2273
1985	2777	98				60		2837
1986	2215	86	327	13		36		2578
1987	3007	91	216	7	33	51		3307
1988	1840	80	221	10	209	25		2295
1989	1860	84	210	9	121	30	2	2223
1990	1352	82	244	15	16	30	3	1644
1991	2105	84	309	12	2	70	8	2494
1992	967	43	1179	52	2	106	11	2265
1993*	832	41	1100	54	2	76	37	2047
1994*	896	33	1686	63	47	49	1**	2679

* Preliminary data.
** Sharks.

Table 7. Development of the catches, by species groups, of the Cape Verde artisanal fishery, 1982-1993

Year	*Tunas*	*%*	*Pelagics*	*%*	*Demersals*	*Others*	*Total catch*
1982	4281		937		880	1772	7870
1983	5048		4274		2277	294	11893
1984	3512		1940		688	715	6855
1985	1557		4641		747	175	7120
1986	2930		1024		619	191	4764
1987	2443		721		641	200	4005
1988	2627		540		741	184	4092
1989	2812	44	2045	32	1087	447	6391
1990	2170	43	1270	26	765	730	4935
1991	1796	41	1400	32	910	276	4382 **
1992	1853	43	1567	36	641	237	4308
1993*	2032	42	1817	38	629	305	4791

* Preliminary data.
** Sharks.

NATIONAL REPORT OF FRANCE *

1. Status of the Fishery

1.1 General overview

French catches of tunas in 1994 amounted to 96,800 MT, which is a moderate increase of 12.5% over that of 1993, and constitutes the new record level for the decade. This increase is due mainly to bluefin tuna whose catches doubled. For other species, there was a notable decline (-14%) for albacore, a minimal decline (-3%) in skipjack catches, an 11% increase in yellowfin and a 30% increase in bigeye catches **(Table 1)**.

1.2 Temperate tunas

-- Bluefin tuna

Bluefin tuna are caught mainly in the Mediterranean since the 1970s. The 1994 fishing season, carried out by 32 purse seiners, caught 11,803 MT, as compared to 4,730 MT in 1993 by 30 vessels. The estimated catch for 1995 is about 7,000 MT. The increase in catches between 1993 and 1994 is due to an excellent fishing season on large fish from May to July around the Balearic Islands, to very favorable meteorological conditions, and to the increased use of aerial detection. This large-fish fishery developed because of trade with Japan, with an increase in fishing effort on this species during the spawning period. During the remainder of the fishing season, fish weighing an average 20 kg were caught. The new vessels, because of their high profitability, can search for bluefin tuna in areas very far from their base ports. Of note is the return of favorable conditions (mainly as concerns feeding) in the provencal area, which contributed to the presence of tuna aged 1 to 4 in this sector in 1994; this situation has not occurred in the aforementioned sector since the mid-1980's. Notwithstanding, fishing effort was concentrated in the western part of the western Mediterranean basin.

East Atlantic bluefin tuna catches in 1994, which amounted to 335 MT, were below 764 MT taken in 1993. This is related to the considerable variability, from one year to another, in catches taken by paired pelagic trawlers (35 pairs in 1994). A constant decrease is noted in the catches of purse seiners operating in the Bay of Biscay between 1991 and 1994 (448 and 66 MT, respectively), without any significant change in the number of vessels (10). The two driftnet vessels that target bluefin tuna caught 20 MT in 1994.

-- Albacore

Albacore fishing in the Atlantic was carried out during the summer of 1994 by 64 driftnet vessels, which landed 3,967 MT, and by a fleet of 70 (35 pairs) pelagic trawl vessels that caught 1,967 MT. Following the very high catches of 1992 and 1993, the 1994 catches decreased slightly. The length of the nets used by the French fleet went from 5 km per vessel at the start of the fishing season to 2.5 km per vessel after July 27, 1994.

In the Mediterranean, albacore are caught incidentally by the purse seiners and are actively caught by sport fishermen from mid-August until the end of October. An estimate of the catches of the 30 purse seiners, whose target species is bluefin tuna, is 18.4 MT in 1994. The catch of the sport fishery is estimated at 5 MT. It is also noted that 140 MT of albacore were caught by French inter-tropical purse seiners in 1994.

1.3 Tropical tunas

-- The purse seine fleet

The catch of tropical tunas in 1994 by French tuna vessels (18 purse seiners) amounted to 71,402 MT, broken down as follows: 32,037 MT yellowfin, 28,635 MT skipjack and 10,730 MT of bigeye. As compared to 1993, there was a slight decline in 1994 in the proportion of skipjack, to the benefit of yellowfin and bigeye tunas. The important

* Original report in French.

increase of the catches and the proportion of bigeye tuna which was noted in 1993 was confirmed and reinforced in 1994. It was confirmed that the correction method of the species composition of the catches was error-free. However, it is noted that this method does not consider the school type (associated or unassociated with floating objects) as a parameter of stratification. Given the recent importance of fishing with floating objects in the eastern Atlantic purse seine fishery, studies are being carried out which take this parameter into account in the correction method for species composition.

It should be observed that the fishing pattern of the French fishery continued to differ in 1994 from the traditional scheme and was very similar to that of 1993. Thus, there was more fishing off the coastal areas and in the Gulf of Guinea, whereas there was less fishing in the Cape Lopez area and in the Senegalese area, as well as the equatorial areas. The change in the fishing grounds, combined with the more frequent use of fishing with artificial objects are, without a doubt, some of the factors which could explain the high skipjack catches, which have increased considerably in all the areas fished by the fleet. It is evident that the high bigeye catches, associated with almost constant effort, have resulted in very high nominal yields in 1993 and 1994, the highest of the historical series.

Finally, it can be noted that in 1994 the average weight of yellowfin was comparable to that of the historical period (20 kg), which in 1993, for no apparent reason, was abnormally low.

– The baitboat fleet

In 1994, there were seven French flag vessels based at Dakar, which remained unchanged from the previous year. French baitboats caught 7,323 MT. The 1994 catch is within the average of the decade for this fishery, both in terms of total catches as well as species composition (32% yellowfin, 36% skipjack and 32% bigeye).

The 1994 catches of all the species combined (5.7 MT/day fishing) is slightly below that of the last two years, which represented the highest CPUEs by this fishery for the historical period. It should be noted that the reported decline for this fishery since 1992 coincides with the arrival of Spanish and FIS purse seiners to the main purse seine fishing area, which is the Mauritanian EEZ.

2. Research

French research on tunas is carried out on the temperate species of the Atlantic and Mediterranean by IFREMER and on the tropical species in the Atlantic by ORSTOM.

2.1 Temperate tunas

– Bluefin tuna

Sampling of bluefin tuna landings from purse seiners that operate in the Mediterranean continued. In 1994, this sampling was carried out based on commercial data obtained from fish dealers, with a 30 to 90% coverage rate for the total catch, depending on the month of the year. The months for which the data are incomplete correspond to the period of fishing around the Balearic Islands, whose catches could have been sold directly to Spain. A program, sponsored by the European Union (EU), is under way to evaluate more precisely the French purse seine landings in Spain, which are not included in the French statistics. Another program, financed in part by the EU, involves various member states of the Mediterranean area. The objective of this program, which was initiated in 1992 and ended in 1995, has been to improve knowledge on the statistics and biology of this species. It will also contribute to the objectives of the ICCAT Bluefin Year Program (BYP).

– Albacore

For north Atlantic, albacore research was centered on the development of age determination methods on large fish, with a view towards improving the analytical stock assessments.

The program to monitor the by-catches of the driftnet fishery was carried out in 1992 and 1993. On-board observers were placed on 25% of the fleet. The data collected permitted carrying out an assessment of by-catches, particularly those of marine mammals (about 1,600 dolphins from two species) as well as the albacore catches by geographic strata. This program has now finalized and will not continue in 1994.

This year, there seems to have been compliance with the 2.5 km limit driftnet regulation since August 1, 1994, after the numerous incidents that occurred at sea. The French driftnet fleet was comprised of 70 driftnet vessels in 1994.

In the Mediterranean, France tagged more than 3,000 fish during five years of tagging cruises, between 1986 and 1991. Some of the tags recovered and validated in recent years confirm that Mediterranean albacore do not seem to cross the Strait of Gibraltar.

2.2 Tropical tunas

Fisheries statistics and research on tropical tunas is carried out in close collaboration with the scientific institutes of Côte d'Ivoire, Senegal, and Spain.

Detailed fishery statistics of the French inter-tropical fleets were submitted on a timely basis to ICCAT. Research carried out on tropical tunas involved the following subjects:

- analysis of the ethology and the dynamics of the association of schools with baitboats developed for the Dakar fleet; this fishery is the subject of a recently initiated, three-year research program.
- comparative analysis of the yellowfin and bigeye tuna fisheries and environmental conditions on a world-wide scale.
- a scientific, on-board observer program started in 1995 on purse seiners to analyze the tuna catches made by purse seiners in association with Cetaceans and particularly dolphins in the western Indian and east Atlantic Oceans. This research is carried out within the framework part of a three-year program initiated in 1994 and financed by the EU, ORSTOM and the Spanish Institute of Oceanography, in collaboration with Côte d'Ivoire.
- analysis of the Legeckis waves in the northern equatorial area (10-20°W) and of the rich food chain which these generate and which produce important catches of tunas in this area. This is the international "Picolo", to be carried out between 1994 and 1997, and which includes several cruises on various subjects, on board the "Antea", an ORSTOM oceanographic vessel.

Some of these research activities have been the subject of papers which were submitted to the 1994 SCRS by the French scientists.

Table 1. French catches (in 1,000 MT) of tunas in 1984-1994

Species	*1984*	*1985*	*1986*	*1987*	*1988*	*1989*	*1990*	*1991*	*1992*	*1993*	*1994*
Yellowfin	5.8	9.8	16.6	16.6	21.6	30.6	43.8	34.2	31.5	31.1	34.6
Skipjack	13.2	8.5	11.7	15.1	16.3	15.6	16.4	31.4	20.1	32.2	31.2
Bigeye	2.1	4.4	4.6	3.4	3.8	2.8	4.9	6.6	7.2	9.9	12.9
Albacore	2.9	2.2	1.2	2.0	2.8	3.7	3.4	4.2	6.1	7.0	6.0
Bluefin	4.2	5.6	3.8	4.9	6.2	4.9	5.2	5.1	6.9	5.8	12.1
TOTAL	**28.2**	**30.5**	**37.9**	**42.0**	**50.7**	**57.6**	**73.7**	**81.5**	**71.8**	**86.0**	**96.8**

* Albacore: 5,934 MT Atlantic, 18 MT Mediterranean purse seiners, 5 MT sport fisheries, 139 MT tropical purse seiners.

NATIONAL REPORT OF GABON*

1. The fishery

Tuna fishing in Gabon is carried out by several artisanal, industrial and sport fishing vessels. The fishing methods used by these vessels are as follows:

- lines with hooks
- lines without hooks
- drift gill nets

The main species which comprise the catches are: yellowfin, skipjack, bigeye, billfishes and small tunas.

There are three reported fishing periods each year, taking into account the migratory pattern of tunas which explains their seasonal character: from May to June, and July-August-September. The period between October and November shows high levels of abundance the Cape Lopez area.

2. The catches

The catches are shown in **Table 1.**

Table 1. Catches (MT) by Gabon, by species, in 1994

Species	*Catches*
Yellowfin tuna	88
Skipjack	11
Bigeye	87
Billfishes	10
Small tunas	174

* Original report in French.

NATIONAL REPORT OF GHANA*

1. General overview of the fishery

1.1 The fleet

The tuna resources within the Ghanaian EEZ were exploited mainly by baitboats during the year under review. Twenty-six (26) baitboats operated in 1994, as compared to twenty-five (25) in 1993. This shows an increase of 4% in the fleet number that operated over the period. This increase in the fleet number is due to rehabilitation of one of the broken down vessels. All the baitboats were Ghanaian flag vessels and their gross tonnage ranged between 250 and 500.

The baitboats used *Engraulis encrasicolus* (anchovy) as live bait for fishing. In addition, the use of bamboo rafts as fish aggregation devices by some baitboats has been observed in recent years. It was also observed that the vessels spent more time baiting during the year under review than in the previous year. The baitboats spent 1405 days baiting in 1994 as compared to 1248 days in 1993, which shows an increase of 12.6% in baiting time. This could be an indication of a decrease in abundance of the bait.

During the year under review, four tuna purse seiners flying the Côte d'Ivoire flag berthed at the port of Tema to discharge tuna to the Pioneer Food Cannery. Length measurements of samples of landings of skipjack, yellowfin and bigeye tunas were taken. These data, together with logbook information on the trips of the vessels, were sent to the "Centre de Recherches Océanographiques" in Abidjan for processing.

1.2 The tuna cannery

The Pioneer Food Cannery (now fully owned by Star Kist International) started operating in 1994 after undergoing rehabilitation. The cannery produced only tuna loins for export during the period under review.

1.3 Pre-investment study for the Ghana Fish Industries' Investment Programme

At the request of the Government of Ghana, the United Nations Industrial Development Organization (UNIDO) conducted a pre-investment study for the Ghana Fish Industries' Investment Programme. The report for the study proposed 14 investment projects with a combined capital cost estimated at US$ 57 million. The report identified the tuna fishery as the only segment of the marine fishing industry which has significant scope for expansion of production in relation to the estimated sustainable yield of the resources.

The 14 proposed projects included tuna processing through rehabilitation of tuna canneries and establishing of new ones, the manufacture of cans for the tuna canneries, rehabilitation and replacement of the tuna fleet and rehabilitation of the Tema Dry Dock Cooperation to service the fleet.

2. Tuna resources

Skipjack tuna is the main resource base of the Ghanaian tuna fishery. A total of 27,315 MT of this species was landed in 1994, as compared to 25,544 MT in 1993. This shows an increase of 7% in the landings of this species during the period under review. Present landings of skipjack are below the estimated maximum sustainable yield. Skipjack tuna accounted for about 74% of the total tuna landings by the baitboats in 1994. The species breakdown of tunas landed in 1994 is shown in **Table 1.**

* Original report in English.

The total tuna landed in 1994 amounted to 36,974 MT, compared to 36,850 MT in 1993, showing an increase of 0.3%. However, the CPUE decreased from 10.8 MT/day in 1993 to 9.2 MT/day in 1994, which indicates, among others, a decrease in abundance of the tuna resources.

2.1 Appearance of green skipjack tuna

Between October, 1993, and March, 1994, abnormal skipjack tuna, which were greenish in color, were observed in the tuna landings. Over 1000 individuals of this species of skipjack were encountered in Ghana's port sampling work.

Samples of the green skipjack tuna were sent to a chemical laboratory for analysis and these fish were found to be fit for human consumption.

3. Research and statistics

The Research and Utilization Branch of the Fisheries Department is the government agency responsible for tuna research and statistics in Ghana.

3.1 Research

Port sampling of skipjack, yellowfin and bigeye tunas for multi-species estimation, length frequency distribution and observation of biological parameters continued throughout 1994. Length measurements for the aforementioned three species were random and in conformity with the ICCAT port sampling scheme. Length measurements of these species were taken from all fish wells on board the vessel which discharging at port. Coverage of vessels for length measurements in 1994 was 100%.

A total of 16,200 skipjack, 7,177 yellowfin and 3,046 bigeye tunas were measured for length frequency distribution during the year. The size ranges of skipjack, yellowfin and bigeye tunas caught by the baitboats were between 30 and 71 cm, 33 and 91 cm and 34 and 65 cm, respectively, during the year. These data and other necessary information have already been submitted to ICCAT on the relevant forms.

3.2 Statistics

At the end of each month during the year under review, all tuna fishing companies submitted separate, completed catch return forms concerning the operation of each of their vessels for a particular month. Information on the forms included, among others, tuna landings by species and size, fishing time (in days) and baiting time (in days). Monthly landings of tuna, by species, were computed from the data provided on the forms.

Vessel captains are also expected to fill in the ICCAT logbook on the operation of the vessels trip by trip. The logbooks are collected by the officials of the Fisheries Department at the end of the trip while the boat is discharging at port. During the year under review, the logbook recovery rate was about 30%. This was due to a shortage of logbooks during the major part of the period under review.

4. ICCAT Enhanced Research Program for Billfish

On-shore sampling of swordfish, sailfish, blue marlin and white marlin landed by artisanal drift gillnet at four selected landing points continued throughout 1994. Lower jaw fork length measurements and sex of the species were recorded at these landing sites. The length measurements were then converted to weight using the respective length-weight relationships for the various species. The lack of funds hindered scheduled visits to the landing sites to supervise the work.

Monthly catch and effort data on sailfish by sector for the period 1983 to 1994 were compiled and forwarded to the Southeast Fisheries Science Center in Miami, U.S.A., as part of the stock assessment program on sailfish in the eastern Atlantic.

Table 1. Tuna landings by Ghana, by species - 1994

Species	*Landings (MT)* *
Skipjack tuna	27,315
Yellowfin tuna	8,465
Bigeye tuna	200
Atlantic black skipjack tuna	994
TOTAL	**36,974**

* Quantities are the adjusted values based on the multi-species sampling scheme.

NATIONAL REPORT OF JAPAN *

by

National Research Institute of Far Seas Fisheries

1. Fishing activities

Two types of fisheries, longline and purse seine, had been in operation by Japan in the Atlantic Ocean. However, the purse seine fishery ceased its activity and withdrew from the Atlantic Ocean in 1992. Hence, the longline catch accounted for 100% of the total Japanese catch in the Atlantic since 1993. The 1994 Japanese catch of tunas and tuna-like fishes in the Atlantic and in the Mediterranean is estimated to be 55,580 MT (**Table 1**).

1.1 The longline fishery

The number of Japanese longliners that operated in the total Atlantic in 1993 was about 260. This is slightly less than the number in the previous year, but is the second highest in the past six years (**Table 2**). The total longline catch in 1994 was estimated to be about 55,580 MT, which increased slightly (about 5%) from the 1993 catch (**Table 1**). Among the major species, bigeye, yellowfin and blue marlin catches increased about 3,600 MT, 1,600 MT and 560 MT, respectively. On the other hand, catches of bluefin, southern bluefin, and swordfish declined 560 MT, 1,200 MT and 600 MT, respectively. The catch of bigeye tuna accounted for 70% of the total longline catch (68% in 1993), and this predominance has remained unchanged for more than a decade. Among other species, there were important catches, in terms of weight, of swordfish and yellowfin, followed by bluefin.

Two major changes occurred in 1994. One was the introduction of new materials for longline gear, nylon monofilament for the main line, branch line and leader, and braided nylon and new synthetic material (which is known as "thinner line" among fishermen since it is finer than the conventional Kuralon line) for the main line. Among these materials, braided nylon has been extensively introduced followed by new high-tech material. In general, 70 to 80% of the total distant water fleet has introduced one of these. Although not enough information was obtained, the efficiency of these new gears seems to be better than that of the convention gears, but such efficiency tends to fluctuate and is sometimes less effective depending on the area, time and target species. It is reportedly noted that the introduction of these materials was aimed at better catches as well as reducing the work load of crew members since the new materials are lighter than the conventional ones. At the same time, since the hauling speed is slower, the number of hooks set per day decreased by about 20%. This means that costs can be reduced to some extent. On the other hand, there is a drawback, which is that the new materials are not as durable as the conventional ones. It is also said that as the catch with these new materials is not as large as expected, there are some boats that switched back to the conventional gears. It is expected that more detailed information will be collected and reported at the next SCRS meeting.

Another change has been the development of new fishing grounds for bluefin tuna in the south of Iceland (45°-58°N-15°-30°W), starting in the autumn of 1994. The geographical distribution of the 1994 bluefin catch is shown in **Figure 1**. The size of the fish is similar to that of fish caught in the so-called central area. Except for the above two points, the operational pattern of the longline fleet in 1994 was similar to that of the most recent past.

2. ICCAT regulations

Since the initiation of fishery regulations adopted by the International Commission for the conservation of Atlantic Tunas (ICCAT) for bluefin, yellowfin, bigeye tunas and swordfish, Japanese fishermen have been concurrently subject to national fisheries regulations. To comply with the bluefin tuna regulations, an area-time closure has been in effect as a domestic regulation both in the Gulf of Mexico (since 1982) and the Mediterranean Sea (since 1975). Since the 1993 fishing year, the period of the area closure in the Mediterranean Sea has been modified from May 21-June 30 to June 1-July 31. In recent years, the number of longliners allowed to fish in the northwestern Atlantic and

* Original report in English.

Mediterranean Sea has been limited domestically. Several ICCAT regulations on fisheries of relevance to Japan were well observed in 1994 or in the 1994-1995 fishing seasons. Those include the minimum size limits for yellowfin, bigeye, bluefin and swordfish, the by-catch limit for north Atlantic swordfish and the quota limits for western and central Atlantic bluefin. Bluefin and swordfish catches have been strictly monitored through radio-reporting in the Atlantic, including the Mediterranean Sea. To monitor the longline fleet closely, governmental patrol boats were dispatched to the Atlantic Ocean and the Mediterranean Sea.

3. Research activities

The National Research Institute of Far Seas Fisheries (NRIFSF) has been 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).

3.1 Fishery data

The NRIFSF submitted final 1993 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 1994 is in progress. The preliminary 1994 catch estimates are given in this report. The size data for swordfish and bluefin tuna in 1994 were presented. The quick reporting system of logbooks and size data by on-board sampling at a port of call has been continued since its inception in April, 1984. A new logbook format for longline was introduced at the beginning of 1993. There are several improvements in the new format, one of which is the separation of sailfish and spearfish. These species were combined on the old format. This is the first time that catches were provided separately for these two species.

3.2 Tuna biology and stock assessment

Biological and stock assessment studies carried out by the NRIFSF on Atlantic tunas and billfishes have continued. Among these, research related to the Bluefin Year Program is one of the major activities. During the recent fishing seasons (November 1992-January 1994), gonad, vertebra and tissue samples were collected from about 400 fishes caught by longliners that operated in the northwestern and central Atlantic. Bluefin sampling for genetic analysis was also carried out from the eastern Atlantic and Mediterranean area, and is still continuing, with the assistance of scientists in those areas. This year the NRIFSF conducted a research cruise for bluefin larvae both in the Gulf of Mexico and in the Mediterranean Sea during May to August in cooperation with U.S., Spanish and Italian scientists. Various analyses for the materials and data collected from this cruise is now under way. The preliminary report of this cruise was presented to this year's SCRS.

This year the NRIFSF participated in various ICCAT inter-sessional meetings, i.e., the Planning Session for the Bluefin Year Program (Genoa, Italy), and the Second Meeting of the Ad Hoc GFCM/ICCAT Joint Working Group on Stocks of Large Pelagic Fishes in the Mediterranean Sea (Bari, Italy).

4. Documents presented by Japan to the 1995 SCRS

The scientific documents presented by Japan to the 1995 SCRS are included in the List of SCRS Documents (**Appendix 3** to the 1995 SCRS Report) and/or published in the *"Collective Volume of Scientific Papers"* series.

Table 1. Japanese catches (MT) of tunas and tuna-like fishes, by type of fisheries, in the Atlantic Ocean and Mediterranean Sea, 1989-1994

Type of fishery	*1989*	*1990*	*1991*	*1992*	*1993*	*1994**
Longline (Home-based)	58,514	54,930	46,883	48,515	52,917	55,580
Purse seine	4,453	4,361	7,516	2,794	–	–
Total	**62,967**	**59,291**	**54,399**	**51,309**	**52,917**	**55,580**

*Preliminary.

Table 2. Annual number of Japanese tuna boats that operated in the Atlantic Ocean and Mediterranean Sea, 1989-1994

Type of fishery	*1989*	*1990*	*1991*	*1992*	*1993*	*1994**
Longline (Home-based)	239	235	242	248	307	261
Purse seine	1	1	2	2	0	0

*Preliminary.

Table 3. Catches (MT) of tunas and tuna-like fishes taken by the Japanese longline fishery, 1989-1994

	1989	*1990*	*1991*	*1992*	*1993*	*1994**
Atlantic						
Albacore	1,214	1,324	1,346	1,048	951	988
Bigeye tuna	39,419	35,024	29,487	34,128	35,053	38,655
Bluefin tuna	2,396	2,014	3,669	3,862	3,065	2,502
Southern bluefin	625	1,202	1,331	525	1,688	502
Yellowfin tuna	6,971	5,919	4,718	3,715	3,096	4,733
Swordfish	5,592	7,305	4,687	3,539	6,382	5,768
Blue marlin**	1,555	1,216	905	1,017	928	1,483
Black marlin***	–	–	–	–	–	11
White marlin	146	126	121	248	82	98
Sailfish****	78	88	88	43	60	51
Spearfish*****	–	–	–	–	–	37
Others	390	538	443	265	815	213
Atlantic Sub-total	58,386	54,756	46,795	48,390	52,120	55,041
Mediterranean						
Bluefin tuna	127	172	85	123	793	536
Swordfish	1	2	1	2	4	3
Bigeye tuna	–	–	2	–	–	–
Others	–	–	–	–	–	–
Mediterranean Sub-total	128	174	88	125	797	539
TOTAL	**58,514**	**54,930**	**46,883**	**48,515**	**52,917**	**55,580**

* Preliminary.
** Includes a minor amount of black marlin up to 1993.
*** Black marlin is separated from blue marlin in 1994.
**** Includes shortbill spearfish up to 1993.
***** Spearfish is separated from sailfish in 1994.

Table 4. Catches (MT) of tunas taken by the Japanese Atlantic purse seine fishery, 1989-1994

	1989	*1990*	*1991*	*1992*	*1993*	*1994*
Bigeye tuna	38	13	39	28	--	--
Yellowfin tuna	1,873	1,671	1,371	1,036	--	--
Skipjack tuna	2,542	2,677	5,752	1,731	--	--
Albacore	--	--	--	--	--	--
TOTAL	**4,453**	**4,361**	**7,162**	**2,794**	**--**	**--**

NATIONAL REPORT OF KOREA*

by

National Fisheries Research and Development Agency

1. The tuna fishery

Since 1977, there has been a decreasing trend in the annual catches of tunas and tuna-like fishes taken by the Korean tuna fisheries in the Atlantic Ocean (**Table 1**). This decline is attributed to the decrease in the number of vessels engaged in fishing activities. In recent years, four to nine longliners have been fishing annually in this ocean, which recorded the lowest catches for the Korean tuna fishery in the Atlantic. The total catch by longliners amounted to 1,805 MT in 1994, which represented a significant increase compared to the previous year. This increase was due to the increase in the number of fishing vessels in operation; the number of vessels increased from four in 1993 to eight in 1994. The species composition of the 1994 catch was quite different from that of previous year. Species contributing to the catch include bluefin, yellowfin and bigeye tunas, swordfish and other billfishes.

1.1 Bluefin tuna

Korean longliners caught mainly bigeye and yellowfin tunas. Thus, until recent years, no catches of bluefin tuna, except for a few tons of by-catch in some years, have been reported from fishing vessels. In 1994, however, bluefin tuna was the predominant species of the catch, with 684 MT, comprising about 38% of the total catch.

1.2 Yellowfin tuna

The catch of yellowfin tuna increased significantly from 180 MT in 1993 to 436 MT in 1994. The proportion of this species also increased compared to the previous year, but to a lesser degree than the catch. Yellowfin tuna is the second most important species, and comprised 34% of the total catch.

1.3 Bigeye tuna

Bigeye tuna has been the predominant species of the Korean tuna longline fishery since the early 1980s when the deep longline fishing technique was introduced. The 1994 catch of this species amounted to 386 MT, showing a slight decrease (2.4%) as compared to 1993. The proportion of this species, however, decreased markedly from 44% in 1993 to 21% in 1994, which represents the lowest level for the 1980-1994 period.

1.4 Swordfish, billfishes, and others

The remaining 17% of the total catch included swordfish, other billfishes and other tunas. As in 1993, the 1994 catches of swordfish and other billfishes were estimated from the catch of others (as appeared in the Korean Task I table) based on the Task II data of each species. The 1994 catch of others (see **Table 1**) might include albacore, since a few tons of albacore were reported from fishing vessels (see Task II data) in 1994.

2. Research activities

The National Fisheries Research & Development Agency (NFRDA) is responsible for tuna research and statistics in Korea. As in past years, the NFRDA collected tuna catch and fishing effort data from fishing vessels. After statistical analysis, those data (Task I and II) were submitted to the ICCAT Secretariat.

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* Original report in English.

3. Implementation of ICCAT tuna management measures

Domestic regulations have been introduced with a view to implementing the recommendations adopted by ICCAT. Those regulations cover the minimum size limit for yellowfin, bigeye, and bluefin tunas, and also the catch and size limit for swordfish. Regarding bluefin tuna in the Mediterranean, a domestic regulation was legislated in 1995 to protect the spawning stock of this species during the period from June 1 to July 31.

The ICCAT Bluefin Tuna Statistical Document Program has been implemented since October 1, 1993, for frozen bluefin tuna, and since June 1, 1994, for fresh bluefin tuna products.

Table 1. Nominal catches (MT) of tunas and tuna-like fishes taken by Korean fisheries in the Atlantic Ocean, 1977-1994

Year	*BFT*	*YFT*	*ALB*	*BET*	*SKJ*	*SWO*	*BUM*	*WHM*	*SAI*	*Other billfishes*	*Others*	*Total*
1977	3	16,347	9,345	7,610	9	1,240	164	202	141	449	3,339	38,849
1978	--	11,512	4,418	9,182	42	1,333	177	79	29	111	2,211	29,094
1979	2	6,997	3,875	7,305	2	606	95	13	20	96	1,058	20,069
1980	--	5,869	1,487	8,963	4	683	9	1	5	167	1,764	18,952
1981	--	6,650	1,620	11,682	47	447	81	13	11	171	1,584	22,306
1982	--	5,872	1,889	10,615	21	684	17	24	16	114	1,781	21,033
1983	3	3,405	1,077	9,383	530	462	65	20	4	51	1,224	16,224
1984	--	2,673	1,315	8,943	29	406	61	5	3	423	927	14,785
1985	77	3,239	901	10,691	20	344	54	1	105	729	1,293	17,454
1986	--	1,818	694	6,084	11	82	15	--	62	106	1,093	9,965
1987	--	1,457	401	4,438	6	75	17	--	--	183	1,048	7,625
1988	--	1,368	197	4,919	3	123	--	--	--	409	782	7,801
1989	--	2,535	107	7,896	6	162	--	--	--	857	944	12,507
1990	--	808	53	2,690	--	101	--	--	--	446	170	4,268
1991	--	260	32	801	--	150	--	--	--	624	9	1,876
1992	--	219	--	866	--	17	--	--	--	40	5	1,147
1993	--	180	(37)	377	--	(217)	(41)	(2)	(2)	--	(7)	863
1994	684	436	--	386	--	(180)	(30)	(50)	(12)	--	27	1,805

( ) = Estimated catch from others recorded in the Task I data, based on species composition of Task II data.
-- = No catch.

NATIONAL REPORT OF MOROCCO*

by

A. Lahlou** and A. Srour***

1. Description of the fishery

Fishing for tunas and tuna-like species is carried out off the Atlantic and Mediterranean coasts of Morocco. The migrations of these fish, which make the coasts of Morocco a privileged passageway for these species, explains the seasonal character of this fishery, thus justifying the maximum production recorded during the two periods of passage of the resource, in April-July and August-November.

1.1 Fishing gears

Currently, tuna fishing is carried out mainly by traps and coastal vessels using driftnets and longline, and also by purse seiners. Since July, 1994, a new artisanal fishery targeting large-sized bluefin tuna has developed to the north of Morocco and this fishery uses handline as the fishing gear.

1.2 Fishing grounds

The tuna fishing areas are located between El Hoceima and Saidia, in the area of the Straight of Gibraltar, and in the area between Essaouira and Tanger. The main landing ports are Mohamedia, Larache and Tanger in the Atlantic, and El Hoceima, Nador and Ras Kebdana in the Mediterranean.

1.3 Species caught

The main species exploited by Moroccan fishermen are bluefin tuna, swordfish and small tunas, such as Atlantic bonito, frigate tuna and skipjack.

2. The catches

2.1 Statistical data collection

Statistics on tunas and tuna-like species are collected by the Regional Delegations of the National Office of Fisheries based at the fishing ports of Morocco. These data are centralized at the main headquarters where they are compiled prior to the transmission to the different users, among them, ICCAT.

2.2 Total catches

The total catches of tunas and tuna-like species reported during 1994 amounted to 4,271 MT, as compared to 2,829 MT for the previous year, thus showing a net increase of more than 30%. Of this amount, 3,427 MT (80% of the total) were taken by the coastal fishery, and trap catches increased to 844 MT, or 20% of the total.

In the Moroccan Atlantic, 1,985 MT of tunas were caught. In the Mediterranean, catches amounted to 2,286 MT, thus being about 45% and 55%, respectively, for the two coasts.

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* Original report in French.

** Secretary General of the National Office of Fisheries.

*** Research of the Scientific Institute of Marine Fishes, Casablanca.

2.3 The bluefin tuna fishery

The bluefin tuna catch series showed a progressive increase in catches from 1986 until 1991, followed by a notable decline in 1992 and 1993, and then an increase in catches in 1994. The decrease in bluefin tuna catches in 1992 is due to the decline in the trap yields.

Fishing activity of the coastal fleet based at Atlantic ports, principally at Casablanca, El Jadida and Agadir, is the origin of practically all the landings effected at Moroccan ports.

Activity in the recent artisanal bluefin tuna fishery is not yet well defined. Notwithstanding, the provisional estimates situate the level of bluefin tuna catches at 300 MT for the period of July to December, 1994.

2.4 The swordfish fishery

A review of the Moroccan swordfish catch series for the period from 1986 to 1994 shows the following:

– Catches made in the Atlantic did not vary between 1986 and 1992, and have remained almost stable at the 200 MT level. In 1993 and 1994, these catches doubled to an average of 400 MT for the two years.

Almost all the catches (99%) are taken by longliners using driftnet and longline.

The national fishery for swordfish in the Mediterranean began in 1983. Catches reported since then have remained low at about 50 MT up to 1988. Since 1989, catches have increased notably and surpassed 700 MT in 1994.

2.5 The fishery for other small tunas

This group of species is comprised of small sized tunas (average weight less than 6 kg). Even though these species comprise an important segment of the tuna catches (52%), the commercial value is notably less important than that of large tunas. The main species in this group are Atlantic bonito, frigate tuna and skipjack.

The catches of these species increased considerably between 1986 and 1990, from 1,212 MT to 3,569 MT. Catches declined in 1991 and 1992 to 2,456 MT. In 1993 and 1994, catches were even lower, on the order of 1,400 and 1,900 MT, respectively, for the two years.

For the current year, there are exceptional skipjack catches, i.e. more than 3,000 MT were landed during the months of July and August, mainly at the port of Safi.

3. Regulations

Moroccan regulations have always taken into account the rational exploitation of fishery resources. As regards the tuna fishery, regulatory measures implemented up to now by Morocco include the establishment of minimum commercial sizes of certain species, limitation on the use of driftnets and a limitation on fishing zones by region.

4. Research

The National Office of Fisheries, through the Scientific Institute of Maritime Research, assures the collection of biostatistical data relative to tunas. Thus, biological sampling of swordfish has been carried out and in this context about 7,000 fish have been measured. In the same way, and in view of the important skipjack landings expected this year at the port of Safi, a population study of some samples has been undertaken.

Table 1. Catch series (in MT) for tunas and tuna-like fishes caught along the coasts of Morocco in 1987-94

		1987		*1988*		*1989*		*1990*		*1991*		*1992*		*1993*		*1994*	
		Trap	Coastal fleet	Trap	Coastal fleet	Trap	Coastal fleet	Trap	Coastal fleet	Trap	Coastal fleet	Trap	Coastal fleet	Trap	Coastal fleet	Trap	Coastal fleet
ATLANTIC																	
Bluefin tuna	BFT	101	255	235	202	304	147	228	75	759	36	84	328	254	22	339	163
Atlantic bonito	BON	18	223	2	587	3	563	8	356	1	575	1	761	1	878	4	411
Frigate tuna	FRI	11	303	3	191	113	486	238	497	347	516	91	150	76	109	58	38
Swordfish	SWO	5	192	1	195	3	219	26	177	10	182	13	339	3	454	8	327
Black skipjack	LTA	5	103	1	48	3	11	53	202	0	41	0	259	0	18	0	30
Skipjack tuna	SKJ	0	105	0	428	0	295	0	837	0	178	0	391	0	217	0	173
Plain bonito	BOP	0	487	0	1422	0	1058	0	263	0	348	0	272	0	253	0	434
Total Atlantic		140	1668	242	3073	426	2779	553	2407	1117	1876	189	2500	334	1951	409	1576
MEDITERRANEAN																	
Bluefin tuna	BFT	110	6	96	44	286	9	580	7	22	7	82	2	4	2	332	6
Atlantic bonito	BON	5	122	1	107	0	28	0	27	0	27	0	6	1	8	4	51
Frigate tuna	FRI	27	151	0	811	70	1107	185	1421	118	597	250	806	60	32	91	1069
Swordfish	SWO	0	40	0	62	0	97	0	289	0	478	0	683	0	436	8	725
Black skipjack	LTA	0	0	0	12	0	0	0	4	0	0	0	0	0	0	0	0
Skipjack tuna	SKJ	0	13	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Plain bonito	BOP	0	26	0	8	0	7	0	21	0	9	0	0	0	0	0	0
Total Medi.		142	358	97	1044	356	1248	765	1769	140	1118	332	1497	66	478	435	1851
ATLANTIC + MEDITERRANEAN																	
Bluefin tuna	BFT	211	261	331	246	590	156	808	82	781	43	166	330	258	24	671	169
Atlantic bonito	BON	23	345	3	694	3	591	8	383	1	602	1	767	2	886	8	452
Frigate tuna	FRI	38	454	3	1002	183	1593	423	1918	465	1113	1113	956	136	141	149	1107
Swordfish	SWO	5	232	1	257	3	316	26	466	10	660	13	1022	3	890	16	1052
Black skipjack	LTA	5	103	1	60	3	11	53	206	0	41	0	259	0	18	0	30
Skipjack tuna	SKJ	0	118	0	428	0	295	0	837	0	178	0	391	1	217	0	173
Plain bonito	BOP	0	513	0	1430	0	1065	0	284	0	357	0	272	0	253	0	434
TOTAL		282	2026	339	4117	782	4027	1318	4176	1257	2994	521	3997	400	2429	844	3427

NATIONAL REPORT OF RUSSIA *

by

G. A. Budylenko & V. Z. Gaikov **

1. The fishery

The 1994 tuna catch amounted to 3,668 MT, including 1,503 MT of yellowfin tuna *(Thunnus albacares)*, 1,471 MT of skipjack tuna *(Katsuwonus pelamis)*, 189 MT of Atlantic black skipjack *(Euthynnus alletteratus)*, 405 MT of frigate tuna *(Auxis thazard)*, and 100 MT of bullet tuna *(Auxis rochei)*. The purse fishery was comprised of six vessels. The catch distribution, by fishing grounds, was as follows: Sierra Leone zone: 3.097 MT (44.4% yellowfin tuna, 35.5% skipjack tuna, and 10.8% frigate tuna); the open area of the central east Atlantic: 571 MT (22.2% yellowfin tuna, 65.2% skipjack tuna, and 12.6% frigate tuna).

Data on the tuna fishery by Russian purse seiners in 1994 are presented in **Table 1**. Preliminary estimates for the first half of 1995 are given in **Table 2**.

2. Research

In 1994, analyses were carried out on the fishery and on the biology of tunas from the central east Atlantic in the 1990-1994 period. The compilation of a biological data base was carried out on species fished by longline (tunas, swordfish, sharks, etc.), including vessel type, date, catch location, species, size, sex, stage of gonad maturity, stomach contents of individual fish.

In October-December of the past year, biological materials for the major commercial tuna species were collected from Russian purse seiners that operated in the southwest-central east Atlantic (FAO Area 34). A total of 980 individuals were measured, 240 biological analyses carried out, and 100 first dorsal fin rays were collected to assess the age and growth rate of tunas. During the research period, post-spawning skipjack tuna measuring 33-65 cm in length predominated in the catches (up to 90%). The remainder of the catch (up to 10%) was represented by two groups: small tunas of 35-56 cm in length (up to 1%) and large tunas measuring 95-170 cm in length (up to 9%). Post-spawning fish predominated among the large tunas; feeding of both groups was poor. Digested fish parts were found in the stomach contents. All data on catch, effort and size composition of the tuna catches will be transmitted to the ICCAT Secretariat.

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* Original report in English.

** Atlantic Scientific Research Institute of Marine Fisheries & Oceanography (AtlantNIRO).

Table 1. Species composition of the tuna catches and fishing effort in the Atlantic Ocean in 1994, by areas and fishing periods

	Sierra Leone Area	*Open central east Atlantic*	
No. of vessels	6	4	
Fishing Period	February-May	February-March; October-December	
Effort (days at sea)	465	147	
Catches (MT)			
Yellowfin tuna (YFT)	1,376	127	1,503
Skipjack tuna (SKJ)	1,099	372	1,471
Atlantic black skipjack (LTA)	189	–	189
Frigate tuna (FRI)	333	72	405
Bullet tuna (BLT)	100	–	100
Total	**3,097**	571	**3,668**

Table 2. Russian catches (MT) of tunas taken by purse seine during the first half of 1995

Species	*Catch (MT)*
Yellowfin tuna (YFT)	2,248
Skipjack tuna (SKJ)	439
Atlantic black skipjack (LTA)	96
Frigate tuna (FRI)	404
Total	**3,187**

NATIONAL REPORT OF SOUTH AFRICA *

by

A. J. Penney **

1. Tuna fishery catch and effort trends

South African tuna catches are annually estimated by scaling logbook returns submitted by South African pole and line vessels (baitboats), to totals reported by tuna dealers and exporters, to correct for under-reporting of tuna catches in logbooks. In addition, data on landings by South African vessels permitted to fish in Namibia were obtained from the Namibian Fisheries authorities for 1993 and 1994. The combined estimates of total South African catches in South African and Namibian waters indicate a 22% decrease in total tuna catch, resulting almost entirely from a decrease in the catch of south Atlantic albacore (see **Table 1**). The proportion of albacore caught in Namibian waters also decreased compared to 1993, but still made up 28% of the total. Albacore continues to be the only species of importance to the South African tuna fishery, contributing 94% to the total catch in 1994. Catches of yellowfin and bigeye tunas taken as a by-catch to the pole fishery, decreased slightly to 256 MT and 50 MT, respectively. No tuna catches were made with longline or purse seine nets. The recently developed recreational fishery using rod and reel to fish for swordfish off Cape Point in the southwest Cape reported only 1 MT caught, although some swordfish were tagged and released and were not reported.

During 1994, permits were again issued to 90 Japanese and 30 Taiwanese vessels to longline for tuna and other species in South African waters. Data reporting requirements associated with these permits only require foreign vessels to report an annual total catch per species made in South African waters, so it is not possible to determine the proportion of catches made under these permits within the ICCAT area. It appears that much of this catch is made south of Cape Agulhas, and much of it may be east of the ICCAT Convention area. Reported total catches show that Japanese vessels are targeting bigeye tuna, yellowfin tuna and swordfish, with small catches of marlin and a minor reported catch of southern bluefin tuna. Taiwanese vessels are targeting albacore, with lesser catches of yellowfin tuna, bigeye tuna and marlin species (see **Table 2**).

2. Statistical data collection systems

South Africa implemented a logbook system to monitor the fishing efforts of her tuna fleet in 1985, as part of the development of the National Marine Linefish System. This system monitors all linefishing vessels, and not just tuna vessels, as most tuna vessels are also active in the squid jigging and finfish handline fisheries. Coverage of South African tuna catches using this system has gradually improved since 1985. However, comparisons with dealer return data have shown that logbooks currently only report 50% to 75% of the total tuna catch. Increased attention was devoted to investigating the extent and cause of this under-reporting during 1994 in cooperation with the recently formed SA Tuna Association. It was ascertained that up to 40% of the members of the SA Tuna Association have not submitted catch logs in recent years, despite the fact that this is compulsory. Some of the unreported catch was also made by small vessels which opportunistically enter the fishery at times of high albacore abundance in near shore waters. Dealer returns are therefore still used to monitor total catch levels, as recent comparisons indicate that logbook returns still substantially under-report the total tuna catch. Specific efforts are now being made by Fisheries Control Officers to monitor tuna landings by South African vessels.

Following the declaration of Namibian independence in 1990, South African vessels were excluded from the rich Tripp Seamount albacore fishing area, pending the negotiation of licenses to fish in Namibian waters. In 1993, tuna fishing rights in Namibian waters were issued to South African vessels operating under charter to Namibian companies

* Original report in English.

** Sea Fisheries Institute.

under joint-venture agreements. The number of South African vessels fishing off Namibia under such agreements declined from 25 in 1993 to 11 in 1994. Research cooperation negotiations have been negotiated between South Africa and Namibia to implement a cooperative catch monitoring system for albacore catches in both South African and Namibian waters.

To date, the monitoring of catches by Japanese and Taiwanese longline vessels fishing in South African waters has been relatively superficial, and permit holders are required only to provide six-monthly summaries of the total catch per species made in South African waters. Few inspections and no observer program are conducted on these vessels. In response to various requests for information on catches by such vessels, South Africa is currently investigating the possibility of improving the data provided by such foreign flag fishing operations. In particular, attention will be given to improved catch and effort logbook submissions, increased inspection of these vessels, and establishment of a fund to support a future on-board observer program.

3. Implementation of tuna management measures

As South Africa has no commercial fisheries for bluefin tuna or swordfish, most of the numerous ICCAT-recommended management measures for these species are not applicable to South Africa, and so have not been implemented in domestic legislation. Although the catches of yellowfin and bigeye tunas are also small, and the mean size of fish caught generally large, South Africa implemented the ICCAT recommended minimum weight limits for these species in 1973 and 1980, respectively. Most recently, South Africa implemented the minimum size (125 cm) and weight (25 kg) limits for swordfish in August, 1992. In addition, the sale of swordfish has been prohibited, except when caught as an incidental by-catch in trawl or longline fisheries, in which case the swordfish catch may not exceed 10% of the mass of the total catch. To date, there have been no reported or observed transgressions of these management measures.

Recreational fishermen in South Africa are currently prohibited from catching more than 10 tuna of any particular species per person in any one day. It is also prohibited for any vessel, including foreign vessels, to carry or use any gillnet in South African waters without a specific permit issued by the Chief Directorate, Sea Fisheries. With regard to foreign vessels permitted to fish in South African waters, only longline gear is permitted and all ICCAT weight limits and domestic legislation must also be adhered to.

In response to the 1994 ICCAT recommendation for implementation of a 10% reduction in catch of southern albacore by those countries targeting this species, South Africa has initiated steps to improve monitoring of her albacore catches. Current estimates indicate that South African catches in 1994 were below the recommended catch limit (based on the average catches from 1989-1993). However, investigations have shown that 40% of tuna vessels are not reporting their catches, making it difficult to implement and control a catch limitation. As initial steps, offloading of albacore has been restricted to certain ports only, increased inspection effort is being specifically directed at albacore fishermen, and consideration is being given to issuing specific permits for targeted albacore fishing. It is hoped that this improved monitoring will provide accurate records of total albacore catch and individual vessel performance, to facilitate the implementation of some form of Total Allowable Catch in the future.

4. Inspection of tuna landings

South Africa is currently a signatory to the ICCAT Port Inspection Scheme, and has annually appointed Inspectors to inspect tuna catches in South African harbors. However, the only foreign vessels transshipping tuna in these harbors are Japan and Taiwan, neither of which are signatories to the Scheme. Catches by these vessels have therefore not been inspected, and efforts have concentrated on South African baitboats. During 1994, 11 inspections were conducted in Cape Town harbor. These inspections were all conducted on South African vessels discharging mainly albacore caught on poles. All of these vessels fished only with pole and line, and the vessels inspected off-loaded approximately 12,250 tuna, consisting almost entirely of albacore. As there are no limits on albacore, only 10 to 25 fish were weighed from each discharge to determine average fish weights. A few bigeye and yellowfin tunas were weighed, and well all found to weigh in excess of 30 kg each.

Permits issued to foreign vessels to fish for tuna in South African waters specifically require that South African inspectors be allowed aboard at any time to inspect catches or ships' records. However, no inspections or observations are currently conducted on these vessels. Various options for improving both the monitoring and data provision by foreign vessels fishing for tuna in South African waters are currently being investigated.

5. Other research activities

5.1 Length-frequency sampling

South Africa is a signatory to the ICCAT Port Sampling Scheme and has, in the past, conducted length-frequency sampling of Taiwanese albacore catches transshipped in Cape Town harbor. Unfortunately, technical staff shortages prevented any sampling of Taiwanese catches in 1994, and the limited available staff concentrated on sampling of South African vessels.

Most length-frequency sampling effort was directed at South African pole boats off-loading catches of albacore in Cape Town and Hout Bay harbors, where a total of 2,123 albacore were measured. Most of the sampled fish were caught in the southwestern Cape region, with fewer samples being available from the western Cape. All fish caught by South African vessels operating in Namibia have to be off-loaded at Namibian ports, so no sampling of these catches could be done in South Africa.

As in past years, analysis of the length-frequency data (see **Figure 1**) shows that most albacore caught by South Africa in the southwestern Cape were 70 cm to 90 cm fork length. Interestingly, catches made in the western Cape in 1993 and 1994 included an additional cohort of sub-adult albacore from 60 cm to 70 cm fork length,. This is considered unusual for this area, as these smaller recruits are usually caught in the southern fishing areas.

5.2 Albacore stock assessment

From 1991 to 1993, South Africa has conducted annual assessments of the state of the southern Atlantic albacore stock. Initial dynamic production model assessments in 1991 indicated that the stock was exploited beyond an estimated MSY of 21,000 MT. During the ensuing years, substantial effort was devoted to determining the most suitable GLM standardization methods, resolving problems with the Japanese, Taiwanese and South African data series, generating a CPUE index for the South African baitboat fishery and incorporating bigeye targeting effects in longline indices. Throughout these procedures, assessments remained consistent.

As a result of the multi-species nature of South Africa's line fisheries, there are substantial problems associated with determining effective effort directed at any particular species group, and this is true for the tuna vessels. During the past two years, research effort has been directed at determining the effective effort associated with the reported albacore catches, while excluding effort directed at other species. During 1994, the South African albacore CPUE data series was standardized using General Linear Modelling techniques, and the standardized CPUE index for the South African fishery has been updated by the incorporation of data for 1994 (see **Figure 2**). Results suggest that South African catch rates are affected most by year and vessel size, but not significantly by area or month. South African CPUE indices appear to be more reflective of factors affecting albacore availability within the South African near shore tuna fishing areas, than of actual South Atlantic albacore abundance. As a result, incorporation of the South African index has little effect on production model assessments for southern albacore.

Revised CPUE indices developed at the 1994 SCRS meeting were used to re-assess the southern albacore stock using dynamic age-structured production modelling techniques. The Japanese and Taiwanese longline indices dominate this assessment, which indicates that the resource is depleted to slightly more than 20% of its unexploited level, and has an MSY of slightly less than 25,000 MT. Resource projections under various catch strategies suggest that current total annual catches of almost 29,000 MT need to be reduced to below 25,000 MT to stabilize the stock, and that further reductions may be necessary if the resource does not recover under this strategy.

Table 1. Total South African catches (in MT) of tuna species within the ICCAT Convention area during 1993 and 1994

Catch	*Albacore*		*Yellowfin*		*Bigeye*		*Skipjack*		*Swordfish*		*Total*	
Method	*1993*	*1994*	*1993*	*1994*	*1993*	*1994*	*1993*	*1994*	*1993*	*1994*	*1993*	*1994*
SA waters												
Pole	4500	3704	257	256	102	50	4	2	-	-	4863	4012
Longline	-	-	-	-	-	-	-	-	-	-	-	-
Purse seine	-	-	-	-	-	-	-	-	-	-	-	-
Rod & reel	35	48	4	7	-	-	1	1	2	1	42	57
Trawl	-	-	-	-	-	-	-	-	2	-	2	-
Namibian waters	2173	1518	1	-	113	27	-	1	-	-	2287	1546
Total	**6708**	**5270**	**262**	**263**	**215**	**77**	**5**	**4**	**4**	**1**	**7194**	**5615**

Table 2. Reported total longline catches (in MT) in South African waters by Japanese and Taiwanese longline vessels permitted to operate in South African waters

Species	*Japan*	*Taiwan*	*Total*
Southern bluefin tuna	1	-	1
Albacore	367	2603	2970
Bigeye tuna	2171	493	2664
Yellowfin tuna	1778	278	2056
Swordfish	680	-	680
Marlin	26	416	442
Sharks	87	-	87
Other	70	350	420
Total	**5180**	**4140**	**9320**

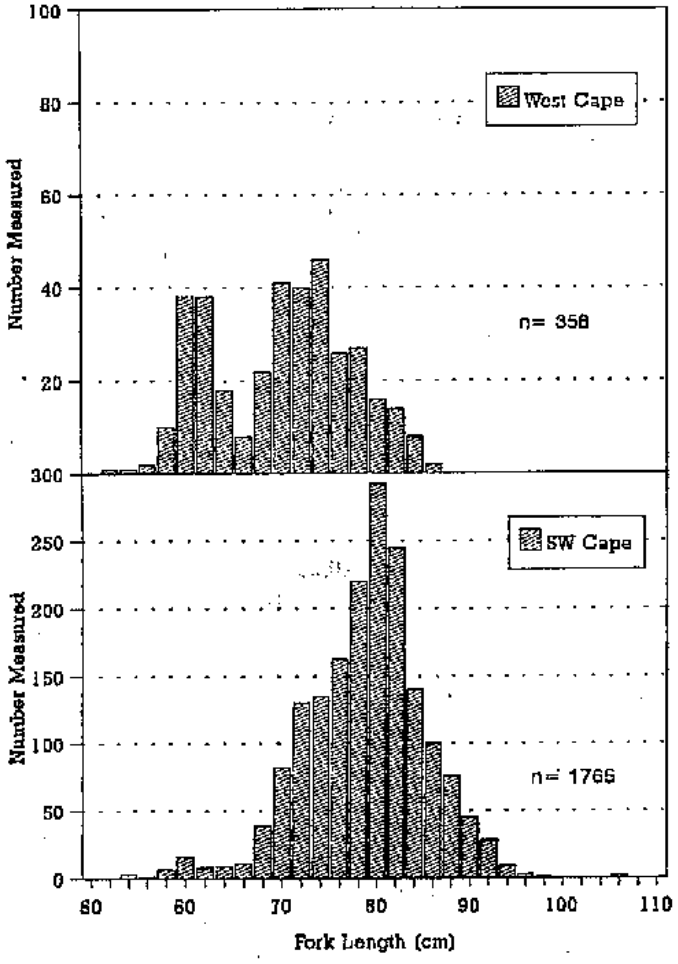

Figure 1. Length-frequency distribution of south Atlantic albacore caught during 1994 by the South African pole and line fishery fishing in the southwest and west Cape fishing grounds.

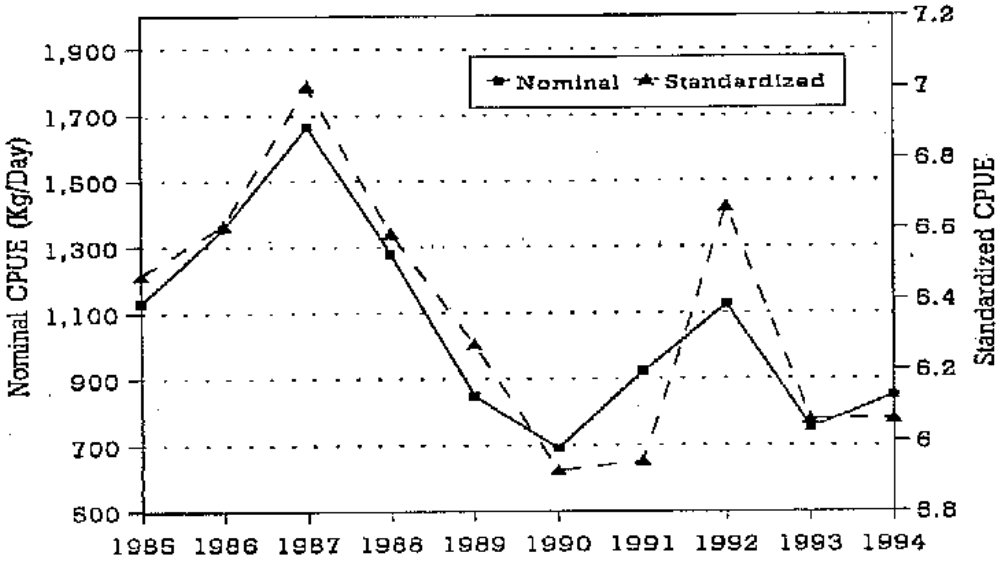

Figure 2. Nominal and GLM standardized CPUE abundance indices for the South African surface albacore fishery from 1985 to 1994.

NATIONAL REPORT OF SPAIN*

by

Spanish Institute of Oceanography (IEO)

1. State of the fisheries

Spanish catches of tunas and tuna-like species amounted to 164,071 MT in 1994, which represents a 5% decline with respect to the average catch in recent years (1990-1993) (**Table 1**).

Yellowfin catches continued to decline; bigeye catches increased slightly with respect to those of the last three years, and skipjack catches remained at the same level. Albacore catches, which continued a progressive decline that began in the early 1990s, are currently at one of the lowest levels of the historical series. Catches of bluefin tuna have remained stable, whereas swordfish catches have increased slightly. Catches of small tunas declined by 30%, as compared to values of the last four years.

2. Fisheries and research by areas

2.1 Temperate area

– Bluefin tuna

Although bluefin catches in the Bay of Biscay fishery in 1994 (1,294 MT) represented an important decrease relative to the previous year, when the highest value of the last 28 years was recorded, they were similar to the average value of the last five years. Fishing effort decreased slightly, since half of the fleet (comprising a total of 20-25 baitboats) started targeting albacore due to the lack of bluefin resources during the summer. On the contrary, during the fall season and due to exceptional environmental conditions, the fleet resumed bluefin tuna fishing when numerous schools of age 3-5 fish (110-150 cm FL) were detected. These schools were present in the Bay of Biscay until December. The abundance of age-class 2, which is used as an index in the assessments, was 35.4 fish/day, which is almost half the average value obtained since 1985 (61 fish/day).

In the Strait of Gibraltar area, the traps caught 1,136 MT, which represents a stable value for recent years and a slight decline with respect to the previous years (1,244 MT). Catches in the Mediterranean Sea in 1994 (2,725 MT) increased, mainly due to purse seine fishing which recorded 1,725 MT, and to the higher catches of bluefin tuna as a by-catch of the longline fishery directed at swordfish. There were no bluefin catches in the Mediterranean traps in 1994, which confirms the decline which started in 1991.

The average size of the tuna caught by baitboat in 1994 (45 kg, annual value) considerably surpassed that of other years (14-15 kg) due to an important catch of spawners in the months of May, June and July, whose average sizes were: 172 kg, 135 kg and 168 kg, respectively. There was rigorous monitoring of bluefin landed by third country fleets at Spanish Mediterranean ports for export to Japan.

During the fall, part of the baitboat fleet of northern Spain moved to the Mediterranean (ICCAT area 59) and the area of the Gulf of Cadiz (Area 58), where 662 MT of bluefin tuna were caught, of which only 14 MT were taken in the Mediterranean. The major part of the fish caught were juveniles of ages 1-4 (7-40 kg).

In the Mediterranean in 1994, on-board observations continued on tuna purse seiners during the fishing season to obtain information on the size distribution of the catches, data on catch and effort by 1°x1° time/area strata, indices of abundance, and environmental parameters.

* Original report in Spanish.

Through the development of research projects of the IEO, the DG XIV-UE and the ICCAT Bluefin Year Program, studies were finalized on fecundity by age class in the Mediterranean. Tagging cruises were carried out in which more than 1000 individuals (<50 cm) were released in the Bay of Biscay in the fall of 1994, and studies were also concluded on the validation of growth based on hard parts (fin ray spines). Spain also participated in research on stock structure by providing samples for genetic analysis. The tagging cruises have provided in recent years numerous recoveries which show species interaction not only with the Mediterranean fisheries, but with those of the eastern Atlantic as well.

A paper entitled "Preliminary observations on the catches of bluefin tuna *(Thunnus thynnus)* with seine gears in the western Mediterranean" was presented to the 1995 SCRS.

-- Albacore

The total Spanish catches of albacore in 1994 amounted to 17,928 MT, which is 8% less than in 1993. In the Cantabrian Sea and adjacent waters of the northeast Atlantic, 14,528 MT were caught in 1994, which represents a decline as compared to the previous year, and shows the continuing declining trend of recent years. The baitboat fleet caught 8,623 MT, and the troll fleet caught 5,905 MT, which represents a 3% and 6% decrease, respectively, as compared to 1993. Fishing effort decreased slightly: 10,834 baitboat fishing days and 6,608 troll fishing days.

In the Azores area and the southwest of the Iberian Peninsula, part of the baitboat fleet which shifts during the fall months caught 2,305 MT, which represents a slight decline from 1993. Fishing effort was 1,350 fishing days.

In the western Mediterranean fishery, 81 MT of albacore were caught by baitboat and 129 MT were taken by troll, thus maintaining the catch levels similar to previous years. Fishing effort of these two fleets was 120 and 343 fishing days, respectively.

Within the research projects developed by the IEO and the DG XIV-UE, studies on large pelagic fishes in the Mediterranean were concluded. As regards albacore, samples were collected from the Atlantic and Mediterranean fisheries to conduct genetic studies, for use in determining the structure of the Mediterranean and Atlantic stocks. The results of these studies are included in the final report presented.

In 1995, recoveries were made of fish injected with oxytetracycline and tagged in the 1991 IEO tagging cruise. The information obtained will be utilized in studies on the validation of growth of this species of the north Atlantic stock.

In 1995, and in collaboration with the Oceanographic Research Organization of the Basque Region (AZTI), collection of fishing logbooks continued from the coastal fishing fleet (baitboat and troll). Information was entered into the current data base in order to carry out studies on the yields of the fleet in relation to oceanographic parameters in the Cantabrian Sea area and the northeast Atlantic.

-- Swordfish

Surface longline catches of swordfish in the Atlantic (north and south) amounted to 13,964 MT. In the north Atlantic, 6,027 MT were caught, which represents a decline, which was even more marked as compared to the 1988 reference year; there is currently a 37% decline. In the south Atlantic, 7,937 MT were caught, which indicates that catches in that part of the ocean continue to increase. This increase is currently at 18%, with respect to the previous year.

The surface longline swordfish fishery in the western Mediterranean has remained stable, both in terms of average catches and fishing effort for recent years, with 1,401 MT caught with fishing effort similar to that of 1993.

Standardized indices of abundance were developed for swordfish caught by surface longline in the western Mediterranean, and knowledge was gained on biometric relationships through the development of a size/live weight relation (LJ-FL) for swordfish caught by longline.

The observer program on board longliners that catch swordfish in the Atlantic is currently on-going.

Within the development of IEO-DG XIV-EU research programs, studies were concluded on fecundity by swordfish size class. A paper on "Observations concerning sex ratio, sexual maturity and fecundity by size class of swordfish *(Xiphias gladius)* caught by surface longline in the western Mediterranean", was presented to the SCRS.

2.2 Canary Islands area

Baitboat catches in 1994 were the highest of the historical series, and amounted to 16,189 MT. The breakdown, by species, is as follows: 9848 MT of bigeye tuna, 4772 MT of skipjack tuna, 1328 MT of yellowfin tuna, 160 MT of albacore, 56 MT of bluefin tuna, and 25 MT of other species. The spectacular increase, more than double, in the catch of bigeye tuna is due to the new fishing methods used by the largest segment of the fleet and which consisted of fixing the school under the vessel for the duration of the entire fishing period, and advancing the school towards the most favorable fishing areas.

The total number of vessels that operated in the area during 1994 was 345. Of these, some had as a base a port in the Canary Islands (320 vessels), while the remainder of the fleet is based at peninsular ports (25 vessels), which remain in this area for a few months.

In 1994, the average weight of bigeye tuna caught by this fleet was 18 kg; the average weight of yellowfin tuna was 7 kg and that of skipjack tuna was 3 kg. The percentage, in number of bigeye tuna individuals below minimum size (3.2 kg) was 0.3; there were no yellowfin catches below this weight.

With a view towards conducting a study and monitoring the new fishing methods used in this area, which resulted in good yields in recent years, two landings were carried out whose results were presented to the corresponding species groups.

Papers presented to the 1995 SCRS included one on the "Statistical data of the Canary Islands tuna fishery", one on: "Yellowfin and bigeye tuna aggregations in oceanographic events occurring in mid-water layers in the Canary Islands area, as observed by infrared teledection", and another paper on the "Monitoring of the fishing method on tuna spots in the Canary Islands".

2.3 Tropical area

Among the tuna fisheries in the eastern inter-tropical Atlantic, the most important is that carried out by large purse seiners of diverse nations, with the Spanish fleet being one of the main fleets. This fishery is directed at yellowfin and skipjack tunas, and takes other species, such as bigeye tuna and small tunas, as by-catch.

The total catch of this fishery declined by 13% as compared to the previous year, to 97,121 MT. Of these, 44,681 MT were skipjack (an 18% decline with respect to 1993), 39,032 MT of yellowfin tuna (7% decline), 11,974 MT of bigeye tuna (12% decline), 725 MT of albacore, and 709 MT of frigate tuna.

The number of vessels (30) remained constant in 1994, with respect to the previous year. The vessel carrying capacity (calculated taking into account the time that each vessel spent at the fishing grounds) has declined slightly, from 18,715 MT to 18,538 MT. The number of vessels and the time spent by each at the fishing grounds is as follows: 16 vessels (12 months); 3 vessels (11 months); 4 vessels (10 months); 3 vessels (9 months); 1 vessel (8 months); 2 vessels (5 months); and 1 vessel (1 month).

Fishing effort, expressed in days fishing, was maintained at the same level of the last two years. The average size of yellowfin is much larger than that of last year (25 kg vs 11 kg), whereas bigeye and skipjack size remained the same, 4 kg and 2 kg, respectively.

Data collection on the Spanish fleet has recuperated the satisfactory level of the years prior to 1993, as concerns logbook coverage as well as sampling. Thus, in 1994, 1,176 samples were taken with a total of 38,189 fish measured, and fishing logbook coverage was more than 90%.

During the current year, special attention has been given to the study of the problems derived from the change in fishing strategy (massive use of artificial floating objects) and to the analysis of multi-species composition.

On the other hand, throughout the year, various observer cruises were carried out within the framework of a project financed by the European Union, whose objective is to study the species associated with the catch of tunas by purse seine.

Papers were presented to the SCRS on the "Spanish statistics of the tropical tuna fishery in the Atlantic Ocean", on the "Analysis of the species composition of the tropical tuna catches", and on "Tuna catches, by type of association and time/area strata of the Spanish purse seine fleet in the Atlantic Ocean".

Table 1. Spanish catches (MT) of tunas and swordfish, 1990-1994

Species	*1990*	*1991*	*1992*	*1993*	*1994*
Yellowfin tuna	68605	59773	51704	44226	43756
Skipjack tuna	47834	72642	51083	58420	56827
Bigeye tuna	10355	18537	17601	19418	21822
Albacore	25876	18166	20089	19510	17928
Bluefin tuna	5379	3664	4532	7096	5873
Swordfish	14075	13564	13145	14705	15644
Small tunas	6052	3664	2202	1339	2221
Total	**178156**	**190010**	**160356**	**164714**	**164071**

NATIONAL REPORT OF THE UNITED STATES *

by

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Marine Fisheries Service-Southeast Fisheries Science Center

1. Introduction

The total (preliminary) reported U.S. catch of tuna and tuna-like fishes (excluding billfishes) in 1994 was 29,267 MT (**Table 1**). This represents an increase of 2,268 MT (8% increase) from 1993.

2. Fisheries monitoring

2.1 Tropical tunas

Yellowfin tuna. Yellowfin is the principal species of tropical tuna landed by U.S. fisheries in the western north Atlantic. Total estimated landings increased to 8,094 MT in 1994, from 5,199 MT landed in 1993 (**Table 2**). The estimated 1994 value is considered provision and may change owing to the incorporation of late reports of commercial catches as they become available and to possible revisions in estimates of rod and reel catches made by recreational anglers. A high proportion of the landings were due to estimated rod and reel catches of recreational anglers in the northwest Atlantic (5,044 MT). These estimates are based on two statistical sampling surveys of the recreational fishing sector. Estimates of recreational rod and reed catches of yellowfin, back to 1987, were revised based on recommendations of a May, 1995, workshop held to evaluate yellowfin recreational catches. In contrast to previous years, only about 25% of the estimated 1994 U.S. yellowfin landings resulted from fish caught in the Gulf of Mexico, whereas between 1991 and 1993 longline catches from the Gulf of Mexico represented 47-64% of the estimated U.S. total. Nominal catch rate information from logbook reports (longline catch per 1000 hooks) for yellowfin, by general fishing area, is shown in **Figure 1**.

Skipjack tuna. Skipjack tuna are also caught by U.S. vessels in the western north Atlantic. Total reported skipjack landings (preliminary) declined from 342 MT in 1993 to 49 MT in 1994 (**Table 3**). Most of the catch is taken off the U.S. east coast (northwest Atlantic) between Cape Hatteras and Long Island. **Figure 2** presents nominal catch rate information (longline catch per 1000 hooks) based on fishing logbook reports.

Bigeye tuna. The other large tropical tuna reported in catches by U.S. vessels in the western north Atlantic is bigeye tuna. U.S. bigeye catches are nearly equal in both quantity and value to U.S. catches of bluefin tuna. The majority of U.S. landings of this species comes from the longline vessels fishing off the east coast of the U.S. in the area from Cape Hatteras, North Carolina, to Massachusetts, averaging 70% of the annual U.S. bigeye catch made between 1991 and 1994. Total reported catches (preliminary) for 1994 rose by 35% from 982 MT to 1,328 MT, with significant increases in the catches made by U.S. longline, pair trawl, and rod and reel gears in the northwest Atlantic (**Table 4**). Like yellowfin, the 1994 estimates of rod and reel catches are considered provisional. **Figure 3** presents nominal catch rate information (longline catch per 1000 hooks) based on fishing logbook reports.

2.2 Temperate tunas

Bluefin tuna. The U.S. bluefin tuna fishery continues to be regulated by quotas, limits on catches per trip, and size limits. To varying degrees, these regulations are designed to restrict total U.S. landings to preserve the monitoring nature of the fishery, and to direct effort at large bluefin (>195 cm SFL). Regulations governing the U.S. fishery

* Original report in English.

were updated in 1992 to be in conformity with the 1991 ICCAT agreements for additional conservation measures for this species.

During 1992, regulations were promulgated that: prohibited landing of bluefin tuna in excess of ICCAT recommendations; limited incidentally-caught bluefin in the southern longline fishery to one fish per trip, provided 2,500 lbs of other species were landed and sold (that regulation remained in effect in 1994 until April 14, when regulations were promulgated which limited landings to one fish per trip, provided 1,500 lbs of other species were landed on trips which landed before May 1, and 3,500 lbs of other species on trips which landed after April 30); reduced the rod and reel daily catch of small bluefin from four to two per person, with further reductions depending on vessel type (private, charter or party-boats); prohibited the sale of bluefin less than 178 cm (70 inches); and prohibited retention of bluefin tuna less than 66 cm (26 inches).

As of July 28, 1995, the rod and reel daily catch limit of small bluefin (< 144 cm SFL) was set at two per person regardless of vessel type, plus one fish 145-177 cm per vessel. Monthly quotas were enacted for bluefin > 178 cm. Additional landing restrictions included the scheduling of 26 days during June-September (selected based on international market availability) on which no bluefin > 178 cm could be retained.

These and other regulatory actions were necessary to improve management and monitoring of the U.S. Atlantic tuna fisheries, to conform more closely to the 1991 ICCAT recommendations, and to enhance collection of data to improve assessment of the environmental, economic, and social impacts of the fisheries and of fishery policy.

U.S. vessels fishing in the northwest Atlantic in 1994 landed an estimated 1,503 MT of bluefin tuna and discarded dead an estimated 92 MT (total 1,595 MT, see **Table 5**). Those estimated landings represented an increase of 265 MT from the estimated 1993 level, and the estimated dead discards were 62 MT higher. The 1994 landings, by gear, were: 301 MT by purse seine, 68 MT by harpoon, 228 MT by hand line, 102 MT by longline (of which 52 MT were from the Gulf of Mexico), 711 MT by rod and reel (of which 286 MT was the preliminary estimate of the catch of the small bluefin fishery off the northeast U.S.), and 3 MT were taken by other gears. In addition to landed catch, an estimated 555 bluefin tuna (about 77 MT) were discarded dead by U.S. longline vessels (28 MT were discarded dead in 1993). Of those discards, an estimated 12 fish (about 3 MT) were caught in the Gulf of Mexico (6 MT were discarded dead in 1993). An estimated 250 bluefin 115-144 cm (11 MT) were discarded dead in the rod and reel fishery.

In response to 1992 regulations limiting the allowable catch of small fish by U.S. fishermen, 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 by this fishery. This monitoring activity continued in 1994 and 1995. The analysis of survey data from the 1994 rod and reel fishery off the northeast U.S. in incomplete; therefore, the following estimates are preliminary. Uncertainty about the catch of bluefin less than 177 cm SFL taken by rod and reel in 1994 was estimated by incorporating variability in the samples from the fishery. A thousand independent bootstrap estimates of that total catch were made, the median of the estimates was 7,431 fish < 115 cm (of which 3,015 fish, or 15 MT, were < 66 cm), 3,949 fish 115-144 cm and 924 fish 145-177 cm (108, 178 and 75 MT, respectively). The empirical 90% confidence intervals about those estimates were 6,885-8,064, 3,582-4,357, and 808-1,064 fish, respectively. The estimated catch of small bluefin (< 145 cm SFL) was 286 MT and the estimated catch of bluefin 145-177 cm SFL was 75 MT.

In 1994, a catch and release fishery for large bluefin developed off the coast of North Carolina during the winter months, and it is thought that in 1995 the number of vessels participating in the fishery increased. Catch rates (primarily of medium and/or large bluefin) were extremely high (often in the 10's of fish per trip), when compared to catch rates off the New England coast (about one fish per nine trips). It is believed that during 1995 the level of fishing effort in the North Carolina fishery increased relative to 1994.

Albacore. Albacore are landed by U.S. vessels. However, this species contributes significantly less to the total U.S. tuna production than the other tunas. Historically, albacore has not been a target of any of the U.S. tuna fisheries operating in the north Atlantic. Total reported catches were very low prior to 1985, averaging only 22 MT. However, U.S. catches increased substantially with close to 97% of the production annually coming from the northeastern U.S. coast in most years. Reported catches of albacore were 672 MT in 1994, an increase from 1993 of 452 MT. The amount of albacore taken incidentally in the directed tuna fisheries has increased in recent years. Nominal catch rate information from U.S. longline logbook reports is shown in **Figure 4**. In 1986, the harvest by longline, handline, and gillnet boats was 24% of the total albacore harvest, while the proportion of the 1994 harvest was 34% (**Table 6**). Although albacore are not a major target of U.S. tuna fishermen, they are frequently sought by recreational fishermen

off the northeastern U.S. This seasonal fishery was provisionally estimated to have landed 293 MT (44% of the total annual yield) in 1994. Refinements to the estimation methods used for the recreational sector of the catch may result in revised estimates of albacore rod and reel catches for 1994. The other fisheries taking albacore are the commercial longline (targeting swordfish, yellowfin, bigeye), the gillnet (targeting swordfish), and the handline (targeting bluefin) fisheries, and recently beginning in 1993, the pair trawl fishery. The overall longline component of albacore landings has increased significantly since 1988. An experimental fishery (pair trawl) consisting of five vessel pairs began operating in the northeastern U.S. in 1992. Concern over by-catch of non-target species has resulted in efforts by fishermen to reduce by-catch through gear and fishing method modifications. This fishery accounted for 144 MT (21%) of the 1994 albacore yield, an increase from the level reported in 1993 of 67 MT (15%) for this fishery.

2.3 Swordfish

For 1994, the provisional estimate of U.S. vessel landings and dead discards of swordfish was 3,873 MT (Table 7). This estimate is 8% lower than the revised landing estimate of 4,191 MT for 1993. However, the 1994 estimate is expected to be revised upward to a level closer (but probably not exceeding) that for 1993, after late reports are incorporated into the estimate. The decline in U.S. landings of swordfish compared to the 1989-90 average level of about 5,000 MT per year was at least in part due to the U.S. implementing regulations in June, 1991, which set allowable catch levels of Atlantic swordfish by U.S. fishers. The regulations established a Total Allowable (landed) Catch (TAC) of 4,560 MT for 1991-1994 (in 1995 the TAC was adjusted downward through regulation to reflect 1994 ICCAT agreements). Regulations enacted in 1991 also established a minimum size for U.S. landed catch of swordfish of 25 kg whole weight or 78.7 cm (31 in.) carcass length, measured along the body contour from the cleithrum to the anterior portion of the caudal keel, with a 15% tolerance for undersized swordfish based on the total number of swordfish landed per trip in conformity with ICCAT recommendations. The landings by ICCAT area for 1994 (compared to 1993) were: 285 MT (556 MT) from the Gulf of Mexico (Area 91); 1,230 MT (1,444 MT) from the northwest Atlantic (Area 92); 1,034 MT (845 MT) from the Caribbean Sea (Area 93); and 816 MT (937 MT) from the north central Atlantic (Area 94A).

U.S. swordfish landings are monitored in-season from reports submitted by dealers, vessel owners and captains, NMFS port agents, and mandatory daily logbook reports submitted by U.S. vessels permitted to fish for swordfish. This fishery is also being monitored via a scientific observer sampling program, instituted in 1992. Approximately 5% of the longline fleet-wide fishing effort is randomly selected for observation during the fishing year. Higher proportions of fishing effort for driftnets and gillnets are sampled due to concern over potential by-catch of protected species (marine mammals and sea turtles). The observer sampling data, in combination with logbook reported effort levels, supports estimates of approximately 32,000 fish discarded dead in 1994, representing an estimated 508 MT of swordfish.

The total weight of swordfish sampled for sizing U.S. landings in 1993 by longline, gillnet, harpoon, otter trawl and pair trawl gears was 3,220 MT, 89 MT, 4 MT, 7 MT, and 19 MT in 1993, respectively, as compared to 3,252 MT, 88 MT, 2 MT, 14 MT, and 10 MT in 1994. In 1993, the weight of the sampled swordfish landings represented 88%, 94%, 100%, 100%, and 100% of the U.S. total reported annual landings for longline, gillnet, harpoon, otter trawl, and pair trawl gears, respectively, whereas 1994 sampled swordfish landings were 100% of the U.S. total reported annual landings of swordfish for all gears. Again, incorporation of late reports into the estimated 1994 landings figure will likely result in changes in the sampled fraction of the catch.

2.4 Billfishes

Blue marlin, white marlin, and sailfish are landed by recreational rod and reel fishermen and are a by-catch of the U.S. commercial tuna and swordfish fisheries. The U.S. Fisheries Management Plan for Atlantic Billfishes was implemented in October, 1988. The Plan allows that billfish caught by recreational gear (rod and reel) may only be landed if the fish is larger than the size limit specified for each species covered by the Plan. Recreational landings of each billfish species are estimated using: (a) the Large Pelagics Recreational Survey conducted by the Northeast Fisheries Science Center (NEFSC) and the Southeast Fisheries Science Center (SEFSC) that provides estimates of total billfish catch from waters along the northeastern U.S. (north of 35°N latitude); and (b) the SEFSC Recreational Billfish Survey which provides the number of billfish caught during tournaments held along the southeastern U.S. coast (south of 35°N latitude), in the Gulf of Mexico, and U.S. Caribbean Sea regions (i.e., U.S. Virgin Islands and Puerto Rico). Also included in 1994 were the Marine Recreational Fishery Statistics Survey estimates of non-tournament landings for regions not included in the Large Pelagics Survey .

In addition to restrictions on U.S. recreational harvest, the Management Plan also imposed regulations on commercial fisheries by prohibiting retention and sale of the marlins and sailfish at U.S. ports. For this reason, no official U.S. commercial landings were reported for any of the three Atlantic species. However, estimates of by-catch mortality in the U.S. longline fleet are made using the data from mandatory pelagic logbooks completed by U.S. captains and vessel owners. The numbers of billfish, by species, caught and kept or discarded dead (not those reported as discarded alive) are used in estimating this by-catch mortality.

The preliminary estimates of 1994 U.S. recreational catches for these billfish species, combining the geographical areas of the Gulf of Mexico (Area 91), the northwestern Atlantic west of 60°W longitude (Area 92), and the Caribbean Sea (Area 93) are: 87.0 MT for bluefin marlin, 11.1 MT for white marlin, and 128.4 MT for sailfish (Table 8). The estimates for 1993 were 76.3 MT, 13.0 MT, and 11.1 MT, respectively, for the three species. The sailfish estimate from 1994 mainly results from the U.S. Marine Recreational Fishing Statistics Survey (MRFSS), whereas the 1993 estimate mainly resulted from voluntary reports by fishermen. The voluntary report total for sailfish in 1994 was about 10% of the MRFSS estimate. The voluntary reports are likely minimal estimates of the recreational catch. It is uncertain if the MRFSS estimate is larger than the actual catch or if the more historical catches need adjustment. A review of the procedures to estimate billfish catch was held in September, 1995. These catch estimates will be more thoroughly examined during 1996 and revised estimated will be provided where appropriate. The 1994 estimates should be considered highly provisional.

The estimates of the U.S. recreational landed catch are made assuming that the recreational data base includes all billfish landed. The estimates do not encompass mortality due to capture of released fish. Sufficient information is not yet available to test the hypothesis that there is no substantial mortality of billfish released alive (or tagged and released alive) in the recreational fishery. Because it is unlikely that the assumptions are fully met, the recreational catches are considered to be conservative estimates (with the possible exception of the 1994 sailfish estimate, as mentioned above). A review of the procedures to estimate billfish catch was held in September, 1995. Several recommendations for improvements were made, which will be implemented.

Preliminary estimates of the billfish by-catch that was kept or discarded dead in the U.S. commercial longline fishery for 1994 were 52.7 MT for blue marlin, 16.7 MT for white marlin, and 19.0 MT for sailfish. The estimated 1993 U.S. commercial by-catch mortality of billfish was 143.8 MT, 23.3 MT, and 17.7 MT, respectively, for the three species.

2.5 Mackerels

U.S. catches of king and Spanish mackerel catches are mainly taken by gillnets and handlines. Substantial commercial and recreational fisheries exist throughout the range of both species, the timing of which is seasonal in nature. Commercial gillnet, rod and reel, and recreational rod and reel fisheries have taken place on both mackerel species since the early 1960s throughout their range. Current fisheries in the U.S for both species are regulated through federal quotas on commercial landings, minimum size restrictions, and recreational personal bag limits. It is believed that conservation actions in recent years regarding per trip vessel landing limits and geographical quotas have helped to stabilize harvests and improve overall stock condition. Management policies are set for federally designated migratory groups, the Atlantic and Gulf of Mexico resource groups, that have been placed under a rigid re-building plan since 1985 when age-based stock assessments indicated that over-fishing was occurring on three of the four stocks exploited. Because these species occur in both federal and state territorial zones of the U.S., successful management has required participation by both federal and state management agencies. Currently, the Atlantic Spanish mackerel and the Gulf of Mexico king mackerel stocks are considered over-fished.

Harvest of both species has stabilized in recent years, although large fluctuations in recreational catches in some years have occurred and commercial catches which have exceeded TAC also 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 factors contributing to fluctuations in annual recreational harvests include difficulties of enforcement of differential bag limits imposed in individual states, large inter-annual variability in recreational harvest estimates, and regulations that permit the sale of king mackerel from recreational charter boats after the closure of commercial fisheries.

King mackerel yields have ranged from 4,595 MT to 7,883 MT between 1983 and 1993, with an average production of 6,197 MT since 1989. Removals of Spanish mackerel have ranged from 4,197 MT to 6,277 MT between 1983 and 1993, and since 1989 have averaged 4,942 MT. Landings for 1994 are preliminary and are not included in these averages and ranges.

2.6 Sharks

The 1994 total U.S. commercial landings for sharks were 7,436 MT, up from 6,957 MT in 1993. The commercial landings for Atlantic sharks (not including dogfish) were 4,095 MT. The U.S. Atlantic fishery is primarily a southeastern fishery from Virginia to Texas, with these southeastern states contributing 3,679 MT to the total. The recreational catch is estimated at some 400 MT a year. Landings are monitored through logbook reporting systems, landing reports from fish dealers, and statistically based surveys of the recreational fish sector. However, species-specific information is generally lacking since most species have not been identified in the historical landings statistics. Steps are being taken to provide bases for estimating species-specific catch levels.

The shark fishery is regulated by the Fishery Management Plan for Sharks of the Atlantic Ocean, which was implemented in early 1993. The plan divides shark species into "large coastal species", "small coastal species" and "pelagic species", and sets TACs for each group. The 1994 semi-annual TAC for the large coastal sharks was 1,285 MT dressed weight, and for the pelagic sharks it was 290 MT dressed weight. A Shark Operations Team, established by the Fishery Management Plan and the 1994 Shark Evaluation Workshop, have both recommended that the 1995 TAC be kept at the 1994 levels.

3. Research activities

3.1 Bluefin tuna research

As part of its commitment to the Bluefin Year Program, research supported by the U.S. has concentrated on icthyoplankton sampling, reproductive biology, development of fishery-independent survey methods, evaluation of robust methods for estimating stock abundance patterns from catch and effort data, tagging study design considerations to evaluate hypotheses about spawning area fidelity and movement rates, and stock structure investigations.

Ichthyoplankton surveys in the Gulf of Mexico were continued in 1994 and 1995. Data resulting from these surveys, which began in 1976, are used to develop a fishery-independent abundance index of the abundance of spawning west Atlantic bluefin tuna. This index has continued to provide one measure of bluefin abundance that is used in SCRS assessments of the status of the resource and is updated through 1994 in a document submitted to the SCRS.

U.S. and Japanese scientists conducted a joint survey of bluefin ichthyoplankton in the Gulf of Mexico in 1994 during the course of the annual U.S. survey. Results from the stations sampled during the normal survey are included in a revision of the index of abundance presented this year to the SCRS. Further analyses of the joint survey data await international comparison of larval identification and should (1) permit comparison of catch rates between the different fishing methods used by the two nations; (2) permit comparison of Gulf of Mexico catch rates with catch rates from other bluefin spawning areas sampled by the Japanese; and (3) provide samples for genetic studies.

The research on reproductive biology is centered at the New England Aquarium's Edgerton Research Laboratory and is a component of the Aquarium's federally funded study of basic biology and productivity of bluefin tuna. Sampling for studies of maturation and fecundity continued in 1994 and 1995.

Studies related to genetic evaluations of stock structure of Atlantic bluefin are being coordinated by the NMFS laboratory in Charleston, South Carolina, in collaboration with researchers at FISHTEC. Research is concentrating on regions in the mtDNA or genomic DNA that contain a sufficient amount of genetic variation to be informative in stock structure analyses. Limited sampling of landings of bluefin tuna and other large pelagic species occurred in 1994 and more extensive sampling took place in 1995. A report outlining this research into Atlantic bluefin genetics is presented.

Aerial surveys of bluefin tuna off the northeast U.S. continued in 1994 and 1995. During 1995, a survey in the Florida Straits/Bahamas Banks are was conducted to determine the feasibility of conducting scientifically designed surveys in the future. The aerial survey conducted by commercial spotter pilots and the New England Aquarium since 1993 continued in 1995 and 1995. During 1994 and 1995, the NMFS conducted systematic aerial surveys in the Gulf of Maine to determine the feasibility of conducting statistically designed surveys of bluefin in the future. Progress reports from each of these surveys are presented.

As previously described, in 1994, a catch and release fishery for large bluefin developed off the coast of North Carolina during the winter months. A large fraction of the fish caught off North Carolina were tagged, especially in 1995 when about 750 tagged bluefin were released. To date, at least 10 of those releases have been recaptured off northern North America. This fishery also provided opportunity for conducting research on stress related to capture in the hook and line fishery as well as a source of biological specimen materials for reproductive research. Scientists from the New England Aquarium and Massachusetts Division of Marine Fisheries collected samples from fish taken in this fishery for these purposes. Reports on these activities will be presented at future SCRS meetings.

In July, 1995, the University of Miami and the SEFSC hosted an international workshop on research planning for bluefin tagging studies. The workshop focussed on methods that could be applied for testing hypotheses about spawning area fidelity, movement rates between eastern Atlantic and Mediterranean and western Atlantic fisheries, and mixing proportions on the fishing grounds. The workshop report and recommendations of the workshop were presented to SCRS.

Research on monitoring and catch estimation methods from the Large Pelagic Survey were continued in 1994-95. In response to new (1992) regulations limiting the allowable catch of small fish by U.S. fishermen, 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 by this fishery. This monitoring activity continued in 1994 and 1995. Research into methods for modelling the distribution of catch and CPUE data collected from this survey was also conducted and detailed in several manuscripts submitted to SCRS. Improvements in the methods applied for estimating the catch of small fish were also made.

In preparation for the 1995 SCRS meeting, numerous evaluations of the methods and assumptions applied in the 1994 assessment of west Atlantic bluefin were conducted by the U.S. scientific delegation (NMFS and non-governmental scientists). Manuscripts were prepared on assessment methods and tools, robust approaches to estimating abundance and objective methods for detecting statistical outliers, the potential effects of movements on bluefin assessments and research prioritization, bluefin biology, larval catch rates and on model error assumptions for indices of abundance for west Atlantic bluefin.

3.2. Swordfish research

In response to ICCAT recommendations, randomized observer sampling in the U.S. large pelagic fleet was continued into 1994 and 1995. Using the fishing vessel performance information provided through the submission of mandatory pelagic logbooks by owners and operators, a list of randomly selected vessels was used to derive a sampling fraction of 5% (about 800 observer days per year) of the pelagic longline fleet in the Gulf of Mexico, Caribbean, and Atlantic Ocean since 1992. Coverage by the Southeast and Northeast Fisheries Science Centers (SEFSC and NEFSC) successfully deployed observers aboard 44 longline vessels during 1992 (281 observed sets), 110 longline sets during 1993 (855 observed sets), and 95 longline vessels during 1994 (748 observed sets). In addition, during the first six months of 1995, the SEFSC program covered 33 vessels observing 271 sets. Observer sampling on the U.S. large pelagic pair trawl and drift gillnet fleets is also carried out. Although the number of fishing days observed is lower than in the longline fleet, the sampling fraction is higher (40% or more; fewer vessels are involved and seasons are limited) in this fleets due to concern over by-catch of protected species.

The data from observer samples were compared against self-reported information from the U.S. large pelagic mandatory logbook system and estimates of the amount of discard mortality of swordfish in the U.S. fleet were developed from the analysis for the 1995 SCRS. Furthermore, estimates of by-catch of other species in the longline and gillnet fleets for 1993 were estimated based on the observer data and logbook reports of fishing effort. These estimates were provided to ICCAT in response to its questionnaire on by-catches in Atlantic tuna fisheries.

Sex ratio-at-size data on Atlantic swordfish have been collected since 1989 by the SEFSC in collaboration with volunteer captains in the U.S. longline fleet. These data continue to be collected in response to ICCAT recommendations, and may provide a basis for stratifying swordfish landings by sex, as well as by size. Utilizing observer coverage by the Miami Laboratory observer program, working through the assistance of the observer program at Louisiana State University, the NEFSC observer program, and cooperative vessel captains and crews, biological material for swordfish reproduction analysis, as well as other forms of biological analyses (i.e., age and growth, stock identification, etc.) has been collected. Morphometric (length and weight) and biological data have primarily been collected within the range of U.S. vessels operating in the western Atlantic Ocean, the Gulf of Mexico, and the Caribbean Sea, since 1990. Additionally, swordfish data collected by the ICCAT-sponsored Venezuelan observer program aboard Venezuelan longline vessels fishing the lower Caribbean Sea has continued since 1991.

Sex ratio information has been collected from over 14,500 Atlantic swordfish specimens sampled during 1990 through June, 1995. Since the beginning of the reproductive study, about 4,200 paired ovaries are available for assessment of sexual maturity. Assessment of ovarian development, maturity stages, and fecundity estimates for female swordfish based on microscopic examination of whole oocytes were reported to ICCAT in a manuscript submitted to the 1995 Swordfish Species Group.

The available sex-ratio-at-size information was used to estimate the catch at age separately for female and male swordfish in the U.S. catch. This work was presented in a manuscript submitted to the 1995 SCRS. Previous catch-at-age analyses of swordfish conducted by the SCRS for the purpose of providing management advice were based on growth models developed for pooled sexes. This approach may provide a basis for improved stock status evaluations, especially for evaluations of the female spawning biomass component of the stock.

Direct ageing of swordfish in the U.S. catch using anal spines has been undertaken through a cooperative agreement with the University of Miami's Cooperative Unit for Fisheries Education and Research (CUFER). Over 4,000 swordfish finrays have been obtained since 1990 through the observer programs and through voluntary sample submission by the swordfish longline fleet, of which about 1,700 have been cross-sectioned and analyzed for age determination. Sampling of finrays during all months and over an extensive range by size and sex (60-295 cm lower jaw fork length) was most comprehensive during 1991 and early 1992. A manuscript detailing this research was submitted to the 1995 SCRS.

Analysis of catch rate data, used for tuning the various stock assessment models was also continued. Age-specific CPUE analyses were conducted and reported upon in manuscripts prepared for the 1995 SCRS. In addition, robust statistical methods are being investigated for use with catch rate analyses to see if alternative methods might be less sensitive to outliers and to alternative error distributions. Manuscripts dealing with these topics were prepared for the 1995 SCRS.

Research into the genetic diversity of swordfish is continuing through cooperative work undertaken by FISHTEC, a research consortium involving the SEFSC Charleston Laboratory, and several university research laboratories. A manuscript detailing the results of a genetic study using swordfish specimen material from the western and eastern north Atlantic, the south Atlantic, the Mediterranean, and the Pacific Ocean was presented to the 1994 Swordfish Species Group. The manuscript presented at the 1994 SCRS meeting was revised and submitted for publication in the scientific literature.

Several methods were investigated and documented in a manuscript provided to the Swordfish Species Group for estimating the number of swordfish which were discarded dead by the U.S. fleet after implementation of minimum size regulations mid-way through 1991. All methods made use of the observer sampling data. The method recommended by the 1994 SCRS was applied to the 1994 observer and logbook records to estimate the magnitude of dead discarded swordfish by the U.S. fleet in 1994.

A research cruise was conducted in the region of the Atlantic were spawning-sized female swordfish with high GSI values are common in the U.S. catch. The objective of this cruise, among others, was to obtain quantitative measures of larval swordfish abundance in January-February 1995 to compare with larval swordfish densities measured elsewhere in the Gulf of Mexico and the Atlantic. Samples of larval swordfish were also sought for the purpose of further evaluation of the genetic diversity of swordfish in the Atlantic. Ichthyoplankton samples are presently undergoing analysis and results of the cruise are expected to be available for the 1996 SCRS.

The number of tagged swordfish, released by U.S. longline vessels has substantially increased since the U.S. implemented minimum size regulations in 1991, in conformity with ICCAT recommendations. Most of these fish were smaller than the minimum size at time of release. Since 1991, annual releases have averaged about 1,200 fish, whereas the annual releases of tagged swordfish for 1988-1990 averaged about 350 fish. Reported recoveries of tagged swordfish have likewise increased since implementation of the minimum size. Since 1991, the annual number of swordfish tag recoveries has averaged more than 22 fish (in 1994 a total of 54 tagged swordfish were reported recaptured), while the annual average number reported from the period 1988-1990 was about 10. A manuscript describing the most recent tag returns for various species was presented at the 1995 SCRS.

3.3 Albacore research

Biological samples of albacore were obtained during the 1994 U.S. pair trawl fishery in the northeast U.S. Hearts, livers, and gonads were obtained for genetic analyses and pectoral fins and heads were collected for age

determinations from 117 individual fish. During 1995, the genetic samples from this project were identified, separated from ageing samples, and are being processed by the NMFS, Charleston Laboratory. Hard parts for ageing (spines and otoliths) were extracted from about 25% of the sample set during 1995; this research will continue into 1996.

3.4 Mackerels and small tunas

U.S. small tuna research is directed mainly on king and Spanish mackerel stocks as the amount landed of other small tunas, such as cero, by U.S. fishermen is very low. The focus of research is collection of primary fishery catch statistics, and biostatistical sample data, fishery age samples, and abundance indices. Because assessment and management are by necessity by geographical units, continued research on migration of king mackerel in particular is important.

Four important manuscripts prepared for the annual Mackerel Stock Assessment Workshop reviewed the current status of the resource and updated information on Gulf migratory group king mackerel mixing proportions during the winter off the Florida east coast. The Mackerel Stock Assessment Panel adopted a new recommendation of the Spawning Potential Ratio (SPR) Management Strategy Committee relative to the adoption of new definitions of over-fishing for mackerels, i.e. that the threshold of over-fishing by specified at the fishing mortality which would lead to a 20% SPR.

The most pressing research questions of concern continue to be: (1) uncertainty in the abundance of juvenile fish of all stocks; (2) lack of adequate abundance indices for adult fish for Spanish mackerel throughout the range; (3) low precision Spanish mackerel biostatistical sampling; (4) inaccuracy in predicting recreational harvests; (5) imprecise data on the present degree of mixing between different geographical units of king mackerel; and (6) inaccurate estimates of shrimp by-catch in the Atlantic for all mackerels.

3.5 Shark research

Shark research was conducted in support of the Fishery Management Plan for Sharks. Field guides for identification of the shark species caught in the commercial fisheries were distributed to fishermen and fishery personnel to help them identify their catches and thus provide species-specific information in logbook reports of catch and effort. Studies delineating shark nursery areas are being conducted to investigate methods to conserve gravid females and young sharks. Research on nursery ground distributions and requirements was conducted in collaboration with the Mote Marine Laboratory in Sarasota, Florida.

Additionally, a fishing independent longline survey of the Gulf of Mexico and U.S. Atlantic coast was conducted in August, 1995, to collect catch rate information needed for monitoring stock response to fishery management measures. These data may provide a basis for evaluating change in stock abundance since 1986, when the next most recent fishery independent survey was conducted. However, additional research on gear and sampling strategy effects on catch rate will be required to develop methods for analytically treating these potential effects on catch rates before quantitative estimates of relative abundance and species compositions can be derived from these surveys.

3.6 Billfish research

Sampling of recreational billfish tournaments continued to be conducted along the U.S. east coast, Gulf of Mexico, Bahamas, and Caribbean Sea. A total of 111 billfish tournaments were sampled in 1994, representing 81,262 hours of fishing effort, an increase of approximately 2,500 hours over the 1993 level. This represented 389 billfish boated (264 blue marlin, 84 white marlin, and 41 sailfish); 1,855 released, and 1,434 tagged (and released). Morphometric measurements of sexed billfish landings were also taken in conjunction with the ICCAT Enhanced Research Program for Billfish.

A review of the procedures by which billfish catches are estimated was conducted in September, 1995. Representatives of various research and constituency groups provided guidance in developing recommendations to improve estimates of commercial and recreational catches, by-catch mortality, and on tournament/non-tournament sampling.

Additionally, the SEFSC has been working with the Mote Marine Laboratory and the Virginia Institute of Marine Science in facilitating their efforts on by-catch mortality estimation for billfish and on marlin stock identification through genetics studies, respectively.

The NMFS SEFSC again played a substantial role in the ICCAT Enhanced Research Program for Billfish in 1994, with SEFSC scientists acting as general coordinator and coordinator for the western Atlantic Ocean. Major accomplishments in 1994 included the following: (1) completion of over 30 at-sea observer trips; (2) continuation of the swordfish observer program and biological sampling in Venezuela (over 900 swordfish sampled); (3) continuation of work on shore-based sampling (in some cases billfish tournament sampling) in Barbados, St. Maarten, Grenada, Jamaica, Senegal, Côte d'Ivoire and Venezuela; (4) conducted pilot study sailfish tagging cruise with CARICOM and St. Vincent Division of Fisheries on a small longline vessel using live bait; (5) continued efforts to retrieve tag-recaptured billfish (particularly successful in the southeast Caribbean where 60 recaptures were reported in 1994); and (6) age and growth sampling of billfish continued with several important samples obtained during 1994.

3.7 Tagging

Participants in the Southeast Fisheries Center's Cooperative Tagging Program (CTC) tagged and released 4,799 billfishes (including swordfish, see swordfish section) and 1,791 tunas in 1994. This represents a decrease of 34% from 1993 levels for billfish and a decrease of 6.7% for tunas. However, due to NMFS budgetary constraints for purchasing of tagging materials in 1994, many NMFS tagging participants used tags on highly migratory species issued by The Billfish Foundation,(TBF). This situation resulted in greatly increased tagging activities by TBF, and if TBF releases for 1994 were added to NMFS releases, this would have resulted in an overall increase in the number of billfish tagged and released in the Atlantic for 1994. Among CTC billfish releases, there were 1,124 blue marlin, 817 white marlin, 1,816 sailfish, 29 spearfish, and 994 swordfish (13 black marlin and 6 striped marlin were also tagged in the Pacific in 1994). For tunas, there were 354 bluefin tuna, 1,222 yellowfin tuna, and 215 releases of other tuna species.

There were 171 billfish recaptures reported in 1994, representing a decrease of 1% over 1993. Again, if TBF recaptures were added to this total, this would have resulted in an overall increase in tag recapture information for 1994. Among the CTC recaptures there were 15 blue marlins, 28 white marlins, 74 sailfish, and 54 swordfish. The ICCAT Enhanced Research Program for Billfish in the western Atlantic Ocean has continued to improve the amount of tag recapture reports, particularly from Venezuela, Barbados, and Grenada. A total of 81 tunas were recaptured in 1994 (25 bluefin tuna, 48 yellowfin tuna, 8 other). There was a 17% increase in the amount of recapture data for all species of tuna.

There were several remarkable billfish recaptures during 1994. The longest reported sailfish movement (i.e. minimum distance traveled) was 1,503 nautical miles (nmi), released off Cozumel, Mexico (21.00°N-86.00°W) and recaptured off Grenada in the southeast Caribbean (12.17°N-61.5°W) after 236 days. A blue marlin was released off Ft. Pierce, Florida (27°N-78°W) and recaptured 189 days later off St. Lucia (14.42°N-61.73°W), after moving a minimum distance of about 465.5 nmi. A white marlin, released off Ocean City, Maryland (38.17°N-73.83°W) was recaptured off La Guaira, Venezuela (11°N-65°W) 2,482 nmi away after 931 days. The longest swordfish movement was 1,867 nmi, from a fish released in the central north Atlantic (43.85°N-46.35°W) and recaptured off Canaveral, Florida (28.5°N-80.33°W) after 591 days.

For bluefin tuna, the longest movement during 1994 was from a fish released off Long Island, New York (40.68°N-70.92°W), and recovered in the Mediterranean off Barcelona, Spain (41.12°N-1.25°E), a minimum distance of about 3,172 nmi. There were also several transatlantic movements of yellowfin tuna, the longest movement from a fish released off Cape Hatteras, North Carolina (35.09°N-75.17°W) and recaptured off West Africa (1.5°N-12.77°W) after 707 days.

All CTC release and recapture data for 1994 were made available to ICCAT to supplement its data base. Internet access was established for communication between the CTC data base and other agencies or countries. This facilitates high speed transfer of tagging data to and from other tagging programs, with the intent to use CTC as the central depository for Atlantic release and recapture information.

Additionally, as mentioned in the bluefin tuna research section, the SEFSC and the University of Miami hosted an international workshop on research planning for bluefin tagging studies. The report this workshop was submitted to the SCRS.

The annual newsletter for the CTC, which provides more detailed information on 1994 tagging activities, will be distributed to program participants in late 1995.

3.8 Fishery observer deployments

Domestic fishery observers. The SEFSC Miami Laboratory initiated the Pelagic Longline Observer Program, has completed over three years of observer coverage. A total of 202 vessel trips (1,337 sets) were observed from May, 1992, to June, 1995. During this period, over 38,000 fish (primarily swordfish, tunas, and sharks), marine mammals and sea turtles were observed by SEFSC personnel. The NMFS, Northeast Fisheries Science Center (NEFSC, Woods Hole, Massachusetts) conducted contracted observer coverage aboard 27 different domestic longline fishing vessels targeting swordfish, tuna and sharks in calendar year 1994. Twenty-seven observer trips, totaling 401 days, were made on these vessels during January-November. By-catch from the longline fishery for 1993 was reported to ICCAT.

Drift gillnet fishery observer coverage. The Northeast Fisheries Science Center (NEFSC) placed observers aboard ten different domestic drift gillnet vessels targeting swordfish, tuna and sharks in calendar year 1994. Since the Atlantic swordfish, tuna and shark drift gillnet fishery is classified as Category I under the U.S. Marine Mammal Protection Act, the NEFSC selected vessels for mandatory observer placement. Twenty-eight observer trips, totaling 253 days, were conducted on these vessels during January-July. By-catch from this fishery, which targets swordfish, included albacore, bigeye, yellowfin, bonito, little tunny, bluefin and skipjack tuna as well as numerous species; by-catch for this fishery in 1993 was documented in the report to ICCAT on by-catches prepared for the 1995 SCRS. Personnel for observer coverage of this fishery were provided through deployment of NEFSC staff, direct contracting with individual observers by NEFSC, and through the NEFSC contractor. By-catch from the driftnet fishery for 1993 was reported to ICCAT.

Pelagic pair trawl fishery observer coverage. The NEFSC placed observers aboard 11 different domestic pelagic pair trawl vessels targeting tuna, predominantly bigeye, in calendar year 1994. Twenty-eight observer trips, totaling 247 days, were conducted on these vessels during August-November. By-catch from this fishery included yellowfin, bluefin, albacore, bigeye, skipjack, yellowjack and swordfish. Personnel for observer coverage of this fishery were provided through the NEFSC contractor.

Foreign fishery observers. There was no foreign fishing activity in the U.S. Exclusive Economic Zone (EEZ) off the east coast during 1994.

Table 1. Catches and landings rounded to the nearest metric ton of Atlantic tunas and tuna-like fishes, excluding billfishes, by U.S. fishermen, 1967-1994 [1]

Year	*BFT* [2]	*YFT* [3,4]	*ALB*	*BET* [3]	*LTA*	*SKJ* [3]	*BON*	*SWO* [5]	*SSM* [6]	*KGM* [6]	*OTH* [7]	*TOTAL*
1967	2,320	1,136	0	0	7	493	22	474	3,577	2,767	10	10,806
1968	807	5,941	0	18	6	3,314	43	274	5,342	2,813	2	18,560
1969	1,226	18,791	0	148	7	4,849	98	171	4,952	2,814	1	33,057
1970	3,327	9,029	0	195	158	11,752	83	287	5,506	3,050	0	33,387
1971	3,169	3,764	0	544	5	16,224	90	35	4,713	2,571	50	31,165
1972	2,138	12,342	10	212	212	12,290	24	246	4,863	2,213	0	34,550
1973	1,294	3,590	0	113	20	21,246	261	406	4,437	2,710	0	34,077
1974	3,638	5,621	13	865	51	19,973	92	1,125	4,990	4,747	1	41,116
1975	2,823	14,335	1	67	67	7,567	117	1,700	5,288	3,095	19	35,079
1976	1,931	2,252	0	28	5	2,285	23	1,429	6,385	4,053	30	18,421
1977	1,956	7,208	2	331	53	6,179	268	912	5,453	3,837	71	26,270
1978	1,848	9,747	9	248	113	8,492	224	3,684	3,310	2,507	31	30,213
1979	2,297	3,182	11	212	12	3,102	502	4,618	2,926	6,293	11	23,166
1980	1,505	2,118	21	202	88	3,589	195	5,624	5,429	10,726	513	30,010
1981	1,530	1,866	54	152	97	5,373	333	4,529	2,748	12,565	200	29,447
1982	812	883	126	377	87	731	209	5,410	3,747	9,863	962	23,207
1983	1,394	226	18	255	107	589	253	4,820	2,784	7,069	453	17,968
1984	1,317	1,252	25	408	41	817	217	4,749	3,904	7,445	883	21,058
1985	1,423	6,259	17	353	74	1,786	109	4,705	3,984	6,010	247	24,967
1986	1,655	5,775	162	747	103	1,004	83	5,210	5,957	5,682	336	26,714
1987	1,543	9,056	269	1,008	118	650	130	5,247	5,071	5,628	385	29,105
1988	1,505	10,268	115	919	204	36	88	6,171	5,097	5,809	410	30,622
1989	1,732	8,350	260	762	128	56	278	6,411	4,443	4,363	335	27,118
1990	1,769	5,406	386	650	173	240	298	5,519	4,272	5,936	390	25,039
1991	1,781	6,856	485	962	227	787	468	4,525	5,802	6,427	367	28,687
1992	1,128	7,158	377	752	595	524	497	4,236	5,538	6,707	545	28,057
1993	1,268	5,199	452	982	1,286	342	171	4,191	4,668	6,923	1,517	26,999
1994[1]	1,503	8,094	672	1,328	1,142	49	129	3,873	4,668	6,923	886	29,267

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. Estimates of recreational catches have been revised for 1986-1992.

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 Swordfish landings revised for 1993.

6 Does not include recreationally-caught Spanish (1967-83) and king (1967-78) mackerels. 1994 landings are set equal to 1993, since 1994 data are still preliminary. King and Spanish mackerel (1991-93) have been revised.

7 This category includes blackfin and wahoo as well as the Task I category other tunas.

8 1994 data are preliminary.

Table 2. U.S. annual landings (MT) of yellowfin tuna from 1991 to 1994

Area	*Gear*	*1991*	*1992*	*1993*	*1994*
NW Atlantic	Longline	993.4	879.5	601.0	714.1
	Rod and reel	1237.3	809.6	1180.4	5044.0
	Troll	186.9	103.4	112.7	16.4
	Purse seine	996.0	376.0	208.4	24.6
	Gillnet	1.4	3.1	0.4	1.4
	Pair trawl	32.4	13.1	41.9	34.3
	Trawl	0.4	1.7	1.2	0.7
	Harpoon	0.0	0.2	0.0	0.1
	Handline	82.7	66.7	14.3	13.5
	Trap	0.0	0.1	0.0	0.1
	Haul seine	0.0	13.3	0.0	0.0
	Uncl.	0.2	13.5	0.9	0.0
Gulf of Mexico	Longline	3241.2	4576.9	2649.5	1993.9
	Rod and reel	37.5	140.0	230.6	59.5
	Handline	4.5	9.9	56.9	0.0
Caribbean	Longline	42.4	151.4	101.1	191.1
All gears		**6856.3**	**7158.4**	**5199.3**	**8093.7**

Table 3. U.S. landings (MT) of skipjack tuna from 1991 to 1994

	Gear	*1991*	*1992*	*1993*	*1994*
NW Atlantic	Longline	0.9	1.3	0.4	**
	Rod and reel	20.4	15.0	30.1	18.7
	Troll	0.1	**	**	**
	Purse seine	749.0	495.8	274.4	20.3
	Gillnet	13.4	9.3	1.3	4.5
	Trawl	**	0.0	**	**
	Handline	1.4	1.4	1.5	**
	Trap	0	0	1.5	1.3
	Pound	0.5	0.1	2.5	0.2
Gulf of Mexico	Longline	1.2	0.8	30.8	3.8
All gears		**786.9**	**523.7**	**342.5**	**48.8**

** <= 0.05 MT.

Table 4. U.S. landings (MT) of bigeye tuna from 1991 to 1994

	Gear	*1991*	*1992*	*1993*	*1994*
NW Atlantic	Longline	777.4	483.3	684.4	752.2
	Rod and reel	72.6	57.9	75.8	273.0
	Troll	4.7	16.0	8.5	1.7
	Gillnet	0.5	0.9	7.9	0.6
	Handline	21.2	17.9	2.9	4.1
	Pair trawl	4.9	50.4	90.6	135.0
	Trawl	0.1	0.0	0.4	1.0
	Harpoon	0.9	**	0.0	0.0
	Haul seine	0.0	31.4	0.0	0.0
	Uncl	0.0	0.0	**	0.0
Gulf of Mexico	Longline	53.8	59.9	39.3	24.7
	Rod and reel	0.0	0.0	33.1	0.0
	Handline	0.0	0.0	**	**
Caribbean	Longline	25.6	34.5	39.6	63.0
NC Area 94A	Longline	0.0	0.0	0.0	72.5
All gears		**961.7**	**752.2**	**982.5**	**1327.8**

** <= 0.05 MT.

Table 5. U.S. catches and landings (MT) of bluefin tuna from 1991 to 1994

	Gear	*1991*	*1992*	*1993*	*1994*
NW Atlantic	Longline	12.0	23.9	34.9	49.7
	LL discards	188.0	25.7	22.6	66.3
	Gillnet	0.0	0.3	0.0	0.2
	Handline	341.0	218.1	224.2	227.7
	Purse seine	237.0	300.0	295.4	300.7
	Harpoon	129.0	105.4	88.1	68.0
	R&R (>145 cm LJFL)	213.0	208.1	330.9	425.1
	R&R (<145 cm LJFL)	483.0	116.0	209.5	286.1
	R/R discarded				11.3
	Uncl	2.0	0.7	1.5	2.3
Gulf of Mexico	Longline	165.0	111.7	53.6	51.6
	LL discards	11.0	18.2	5.8	2.9
	Rod and reel	0.0	0.3	0.0	0.0
Caribbean	Longline	0.0	0.0	0.0	0.3
	LL discards			1.6	11.1
All gears		**1781.0**	**1128.4**	**1268.1**	**1503.3**

Table 6. U.S. landings (MT) of albacore from 1991 to 1994

	Gear	*1991*	*1992*	*1993*	*1994*
NW Atlantic	Longline	191.3	128.8	150.6	190.1
	Gillnet	6.7	6.2	2.5	4.2
	Handline	9.1	4.0	2.5	8.1
	Trawl	0.0	0.0	0.4	0.2
	Troll	3.9	1.4	14.5	2.8
	Rod and reel	254.4	102.7	193.2	293.4
	Pair trawl	4.6	109.1	67.1	144.2
	Other	4.9	8.1	**	0.6
Gulf of Mexico	Longline	5.4	7.7	7.6	8.2
Caribbean	Longline	4.8	9.3	13.5	20.0
All gears		**485.1**	**377.3**	**451.9**	**671.8**

** < = 0.05 MT.

Table 7. U.S. catches and landings (MT) of swordfish from 1991 to 1994

	Gear	*1991*	*1992*	*1993*	*1994*
NW Atlantic	Longline	1680.0	1490.0	1336.1	1117.3
	LL discards	143.1	251.5	272.4	334.5
	Gillnet	82.0	86.0	91.8	87.9
	Pair trawl	32.0	13.0	11.9	9.8
	Handline	0.0	0.0	0.4	0.0
	Trawl	10.0	11.0	4.0	13.6
	Harpoon	2.0	0.8	0.2	1.6
	Rod and reel	0.0	0.0	0.0	0.0
Gulf of Mexico	Longline	701.0	632.0	518.0	285.5
	LL discards	27.3	61.1	49.7	68.9
	Handline			38.3	
Caribbean	Longline	798.0	646.0	844.7	1034.2
	LL discards	11.0	25.1	44.4	52.7
NC Atlantic	Longline	1005.0	973.0	936.6	815.5
	LL discards	33.6	46.0	42.4	52.2
All gears		**4525.0**	**4235.5**	**4190.9**	**3873.7**

Table 8. U.S. catches and landings (MT) of blue marlin, white marlin and sailfish from 1992 to 1994

		Blue marlin			*White marlin*			*Sailfish*		
Area	*Gear*	*1992*	*1993*	*1994*	*1992*	*1993*	*1994*	*1992*	*1993*	*1994*
NW Atlantic	LL discards	39.4	61.6	13.6	14.2	12.9	9.5	14.2	7.6	6.1
	Rod and reel	24.1	43.5	58.7	6.6	12.2	9.7	6.6	7.4	105.2
Gulf of Mexico	LL discards	85.2	80.2	21.8	8.4	10.3	5.1	8.4	10.1	11.2
	Rod and reel	14.8	9.1	15.1	1.3	0.7	1.3	1.3	0.3	15.8
Caribbean	LL discards	2.6	1.96	6.6	0.3	0.1	0.3	0.3	0.0	0.2
	Rod and reel	10.3	23.7	12.3	0.2	0.1	0.0	0.2	3.4	0.0
Unknown	Longline	0.0	0.0	10.7	0.0	0.0	1.8	0.0	0.0	1.6
All gears		**176.4**	**220.1**	**138.8**	**31.0**	**36.3**	**27.7**	**31.0**	**28.8**	**140.1**

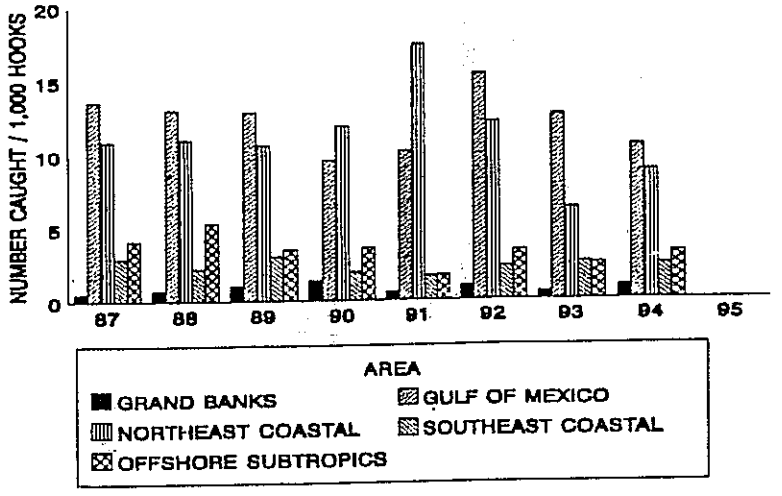

Fig. 1. Nominal catch rates for yellowfin tuna in U.S. longline logbook reports.

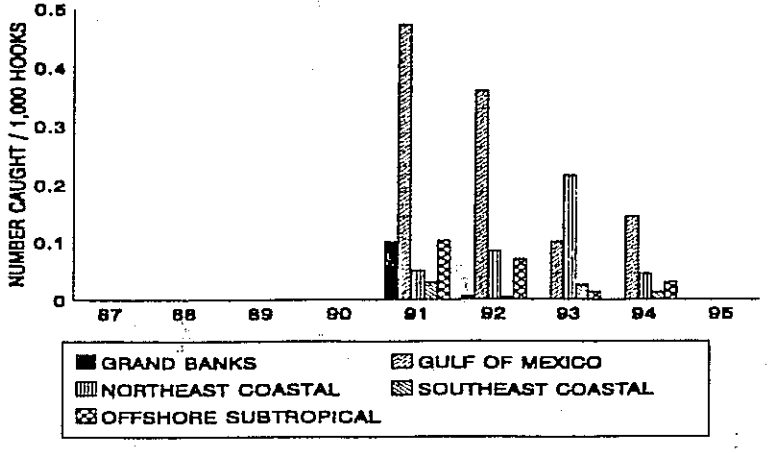

Fig. 2. Nominal catch rates for skipjack tuna in U.S. longline logbook reports.

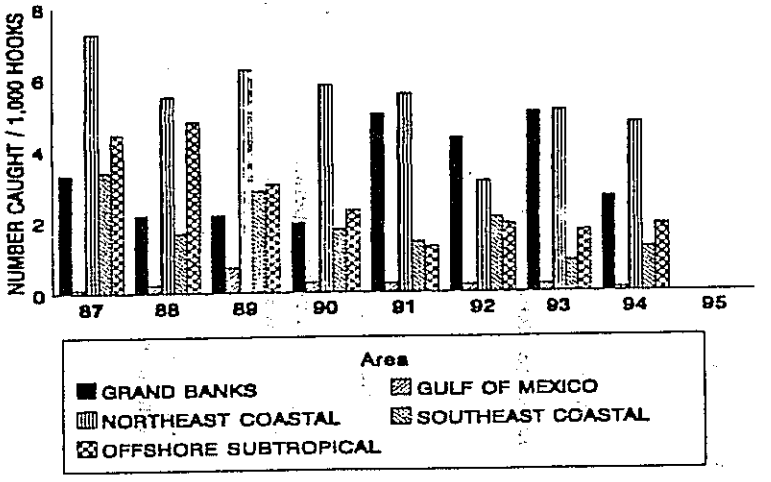

Fig. 3 Nominal catch rates for bigeye tuna in U.S. longline logbook reports.

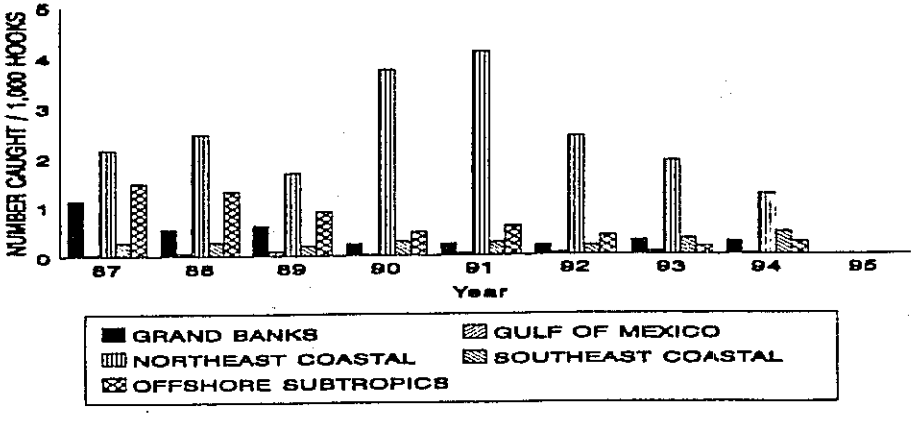

Fig. 4. Nominal catch rates for albacore in U.S. longline logbook reports.

NATIONAL REPORT OF VENEZUELA *

by

National Fund for Agricultural Research (FONAIAP)
and
Autonomous Service for Fishery & Marine Resources (SARPA)

1. Introduction

The National Fund for Agricultural Research (FONAIAP), through the Agricultural Research Center of the State of Sucre (CIAPES), and jointly with the Autonomous Service for Fishery and Marine Resources (SARPA) of the Ministry of Agriculture and Cattle Breeding, the French Institute of Scientific Research and Cooperation (ORSTOM), and the International Commission for the Conservation of Atlantic Tunas (ICCAT) develop research activities aimed at the study of the biology and fishery for large pelagic fishes: tunas and billfishes.

Activities are currently being carried out which include the analysis of catch and effort data of the industrial and artisanal fisheries, and the analysis of biological information on some of the main species.

2. The fisheries

The industrial fisheries for tunas and billfishes carried out by the Venezuelan fleet uses three fishing types: purse seine, baitboat and longline. The fleet is comprised of 45 purse seiners (of which 12 fish in the Atlantic Ocean and 33 in the Pacific Ocean), 18 baitboats and 28 longliners.

On the other hand, the artisanal fishery for billfishes of the *Istiophoridae* family is carried out by 42 longline vessels operating off the east coast of the country. In the central area there is a fleet comprised of 23 artisanal vessels that operate using hanging nets or trammel nets.

3. The catches

Catches of tunas and billfishes in 1994, by fishing gear (purse seine, baitboat and longline) are shown in Tables 1 to 3. For all the fishing methods, yellowfin tuna *(Thunnus albacares)* is the most important species, with total landings of 22,466 MT, which represents an average of 63% of the purse seine fishery, 92% of the baitboat fishery, and 64% of the tuna longliners. Skipjack tuna *Katsuwonus pelamis)* comprise the second most important species in terms of landings, and represented 15% of the landings of the purse seine fishery and 3% of baitboat fishery.

Currently, a segment of the longline fleet conducts a fishery which specifically targets swordfish *(Xiphias gladius)*, and is comprised of five vessels whose 1994 catches amounted to 45 MT. (Table 4).

Landings by the Venezuelan purse seine that operated in the eastern Pacific Ocean in 1994 totaled 47,986 MT, which is equivalent to 62.3% of the total landings in the country, whereas the total catches of tunas and billfishes in the Atlantic Ocean amounted 29,023 MT, which represented 37.7%. In this body of water, the highest percentage of catches corresponded to the purse seine fishery (79%).

4. Biological sampling

In 1994, size sampling was carried out on 14,768 tunas and billfishes. This sampling was effected on purse seine, baitboat and longline vessels that fish in the Caribbean Sea and the eastern Atlantic Ocean. The major percentages

* Original report in Spanish.

corresponded to yellowfin tuna (43%) and skipjack tuna (38%) (**Table 7**). Size sampling was carried out in the artisanal billfish fishery (longline and driftnet) on 4,150 fish, among which sailfish *(Istiophorus albicans)* and white marlin *(Tetrapturus albidus)* represented 42 and 24%, respectively (**Table 8**).

The seven major sport fishery tournaments carried out in Venezuela were sampled. Since it is obligatory to release the billfishes caught in the central region of the country where the CPUE of these fish is higher, only 23 individuals could be measured (19 sailfish, 3 blue marlins, and 1 white marlin). Data continued to be collected on catch and effort of the Playa Grande sport fishing club, close to Guaira, from which data have been collected over the last 30 years.

Table 1. Catches (MT) taken by the Venezuelan purse seine fleet (PS) which operated in the Atlantic Ocean in 1994

Species	*QUARTER*				*Total*	*%*
	I	*II*	*III*	*IV*		
Yellowfin tuna (YFT)	1047	2543	2868	11194	17672	78.08
Skipjack tuna (SKJ)	285	465	1287	1380	3417	15.10
Frigate tuna (FRI)	60	31	201	65	357	1.58
Albacore (ALB)	34	58	11	69	172	0.76
Bigeye tuna (BET)	22	35	103		160	0.71
Blackfin tuna (BLF)	36	66	125	628	855	3.78
TOTAL	**1484**	**3198**	**4615**	**13336**	**22623**	**100.00**

Table 2. Catches (MT) taken by the Venezuelan baitboat fleet (BB) which operated in the Atlantic Ocean in 1994

Species	*QUARTER*				*Total*	*%*
	I	*II*	*III*	*IV*		
Yellowfin tuna (YFT)	519	722	1044	2065	4350	92.47
Skipjack tuna (SKJ)	67	24	24	10	125	2.66
Frigate tuna (FRI)						
Albacore (ALB)						
Bigeye tuna (BET)	26	10	10	17	63	1.34
Blackfin tuna (BLF)	34		13	119	166	3.53
TOTAL	**646**	**756**	**1091**	**2211**	**4704**	**100.00**

Table 3. Catches (MT) taken by the Venezuelan longline (LL) fleet which operated in the Atlantic Ocean in 1994

Species	QUARTER				Total	%
	I	II	III	IV		
Yellowfin tuna (YFT)	56.5	92.0	97.0	271.0	516.7	64.05
Albacore (ALB)	3.8	5.9	3.2	27.8	40.7	5.05
Bigeye tuna (BET)	0.8	4.8	0.8	38.0	44.4	5.50
Spearfish (SPF)	0.1	0.2			0.3	0.04
Swordfish (SWO)	4.9	1.5	0.9	7.9	15.2	1.88
Blue marlin (BUM)	4.5	3.2	4.4	14.7	26.8	3.32
White marlin (WHM)	2.5	5.0	5.5	14.7	27.7	3.43
Sailfish (SAI)	21.2	1.7	6.6	8.4	37.9	4.70
Sharks (SHK)	0.5	44.9	14.8	26.8	87.0	10.78
Dolphin fish (DOL)	0.4	4.4	0.1		4.9	0.61
Wahoo (WAH)		1.4	1.2	2.0	4.6	0.57
TOTAL	**95.2**	**165.2**	**134.5**	**411.3**	**806.2**	**99.90**

Table 4. Catches (MT) taken by the Venezuelan industrial longline fleet which caught swordfish in the Atlantic Ocean in 1994

Species	QUARTER				Total	%
	I	II	III	IV		
Yellowfin tuna (YFT)	6.1	6.9	3.2	2.0	18.2	18.22
Albacore (ALB)	1.1	0.6	0.1		1.8	1.80
Bigeye tuna (BET)	5.2	4.5	0.9		10.6	10.61
Spearfish (SPF)		0.1	0.1		0.2	0.20
Swordfish (SWO)	17.4	13.2	14.4	0.2	45.2	45.25
Blue marlin (BUM)	0.5	0.4	0.5	0.4	1.8	1.80
White marlin (WHM)	0.1	0.1	0.1		0.3	0.30
Sailfish (SAI)	0.4	0.4	0.3		1.1	1.10
Sharks (SHK)	3.9	7.1	8.0	0.4	19.4	19.42
Dolphin fish (DOL)	0.4	0.4	0.1		0.9	0.90
Wahoo (WAH)	0.3		0.1		0.4	0.40
TOTAL	**35.4**	**33.7**	**27.8**	**3.0**	**99.9**	**100.00**

Table 5. Catches (MT) taken by the artisanal fleet which caught billfishes using driftnets off the central coast of Venezuela in 1994

Species	*QUARTER*				*Total*	*%*
	I	*II*	*III*	*IV*		
Sailfish (SAI)	2.7	19.5	21.0	22.0	65.2	28.38
Blue marlin (BUM)	56.7	29.1	5.6	8.1	99.5	43.32
White marlin (WHM)	0.7	1.4	4.4	5.3	11.8	5.14
Swordfish (SWO)	2.6	2.8	2.2	1.8	9.4	4.09
Yellowfin tuna (YFT)	0.5	0.7	0.3	0.4	1.9	0.83
Dolphin fish (DOL)	0.9	1.5	2.3	0.5	5.2	2.26
Sharks (SHK)	3.1	3.4	3.1	1.5	11.1	4.83
Atl. black skipjack (LTA)	7.6	0.1	0.7	2.7	11.1	4.83
Frigate tuna (FRI)	9.8	0.1	1.8	1.2	12.9	5.40
Atlantic bonito (BON)	1.4	0.4	0.2	0.1	2.1	0.91
TOTAL	**85.5**	**59.0**	**41.6**	**43.6**	**229.7**	**100.00**

Table 6. Catches (MT) taken by the artisanal longline fleet which caught billfishes off the eastern coast of Venezuela in 1994

Species	*QUARTER*				*Total*	*%*
	I	*II*	*III*	*IV*		
Sailfish (SAI)	15.1	2.3	3.2	19.6	40.2	20.51
White marlin (WHM)	6.7	2.3	4.6	32.5	46.1	23.52
Blue marlin (BUM)				0.6	0.6	0.01
Yellowfin tuna (YFT)	22.2	3.1	3.8	6.1	35.2	17.96
Dolphin fish (DOL)	12.0	12.4	32.1	9.4	65.9	33.62
Blackfin tuna (BLF)	0.5	2.4	3.1	2.3	87.3	4.23
Albacore (ALB)	0.2		0.1		0.3	0.15
TOTAL	**56.7**	**22.5**	**46.9**	**70.5**	**196.2**	**100.00**

Table 7. Biological sampling of tunas and billfishes from the Venezuelan industrial tuna fleet in 1994

	Gear			
Species	*PS*	*BB*	*LL*	*TOTAL*
Yellowfin tuna (YFT)	4298	1447	638	6883
Skipjack tuna (SKJ)	5346	232		5578
Frigate tuna (FRI)	1027			1027
Albacore (ALB)	52		46	98
Bigeye tuna (BET)	306	56	105	467
Blackfin tuna (BLF)	535	99		634
White marlin (WHM)			21	21
Sailfish (SAI)			70	70
Spearfish (SPF)			28	28
Blue marlin (BUM			42	42
Swordfish (SWO)			420	420
TOTAL	**11564**	**1834**	**1370**	**14768**

Table 8. Biological sampling of tunas and billfishes of the eastern artisanal fleet (Juangriego) and the central coastal fleet (Playa Verde) of Venezuela in 1994

Species	*Juangriego*	*Playa Verde*	*Total*
Blue marlin (BUM)	145	713	838
White marlin (WHM)	319	486	1005
Sailfish (SAI)	368	1377	1745
Swordfish (SWO)		273	273
Spearfish (SPF)	7		7
Dolphin fish (DOL)		262	262
TOTAL	**1039**	**3111**	**4150**