INTERNATIONAL COMMISSION
for the
CONSERVATION of ATLANTIC TUNAS

R E P O R T
for biennial period, 1990-91
PART I (1990)
English version

MADRID, SPAIN 1991

INTERNATIONAL COMMISSION FOR THE CONSERVATION OF ATLANTIC TUNAS

Contracting Parties (as of December 31, 1990)

Angola, Benin, Brazil, Canada, Cape Verde, Cuba, Equatorial Guinea, France, Gabon, Ghana, Côte d'Ivoire, Japan, Korea, Morocco, Portugal, Sao Tomé & Principe, South Africa, Spain, U.S.A., Uruguay, U.S.S.R., Venezuela.

Chairman of Commission

Mr. S. MAKIADI J. LOPES, Angola
(from November 23, 1987)

First Vice-Chairman of Commission

Mr. A. RIBEIRO LIMA, Portugal
(from November 23, 1987)

Second Vice-Chairman of Commission

Mr. K. SHIMA, Japan
(from November 17, 1989)

Panel Membership (as of December 31, 1989)

Panel	Contracting Parties	Chairman
1	Angola, Brazil, Cape Verde, Cuba, France, Gabon, Ghana, Côte d'Ivoire, Japan, Korea, Morocco, Portugal, Sao Tomé & Principe, Spain, U.S.A., U.S.S.R., Venezuela.	Côte d'Ivoire
2	Canada, France, Japan, Korea, Morocco, Portugal, Spain, U.S.A.	France
3	Brazil, Japan, South Africa, Spain, U.S.A.	U.S.A.
4	Angola, Canada, France, Japan, Korea, Portugal, Spain, U.S.A., U.S.S.R., Venezuela.	U.S.S.R.

Council

No election was conducted for the 1990-91 biennial period.

Standing Committees

Standing Committees:	**Chairman**
Committee on Finance and Administration (STACFAD)	Ms. P. GARCÍA DOÑORO, Spain (from November 18, 1985)
Committee on Research and Statistics (SCRS)	Dr. J. L. CORT, Spain (from November 1, 1989)

Secretariat
Príncipe de Vergara, 17, 28001 Madrid (Spain)
Executive Secretary: O. RODRÍGUEZ-MARTÍN
Assistant Executive Secretary: Dr. PETER M. MIYAKE

LETTER OF TRANSMITTAL

The Chairman of the International Commission for the Conservation of Atlantic Tunas presents his compliments to the Contracting Parties to the International Convention for the Conservation of Atlantic Tunas (signed in Rio de Janeiro, May 14, 1966), and to the Delegates and Advisers representing said Contracting Parties, and has the honor to transmit the ***"Report for the Biennial Period, 1990-91, Part I (1990)"***, which describes the activities of the Commission during the first half of said biennial period.

This volume contains the reports of the Seventh Special Meeting of the Commission, held in Madrid, in November, 1990, as well as those of all its associated meetings of the Standing Committees and Sub-Committees. It also contains a summary of the activities of the Secretariat and the National Reports on scientific activities related to tuna fisheries as carried out by the various countries.

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

Commission Chairman

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CHAPTER I
SECRETARIAT REPORTS

ADMINISTRATIVE REPORT 1990
COM/90/8 (Revised)[1]

1. Member countries of the Commission

The Commission is currently comprised of twenty-two (22) member countries: Angola, Benin, Brazil, Canada, Cape Verde, Côte d'Ivoire, Cuba, Equatorial Guinea, France, Gabon, Ghana, Japan, Republic of Korea, Morocco, Portugal, Sao Tomé & Principe, South Africa, Spain, Uruguay, U.S.A., U.S.S.R., and Venezuela.

There were no changes in Commission membership in 1990.

2. Ratification of the Protocol to the Convention

In 1990, the People's Republic of Angola deposited an instrument of ratification to the Protocol to the Convention, approved at the Conference of Plenipotentiaries (Paris, July, 1984), for accession of the European Economic Community to the Convention. The following list shows the countries which have ratified and the date of said ratification:

France	October 23, 1984
Sao Tomé & Principe	November 1, 1984
Republic of Korea	December 7, 1984
South Africa	March 28, 1985
Uruguay	May 10, 1985
Japan	June 13, 1985
Senegal[2]	June 14, 1985
Cape Verde	March 13, 1986
U.S.S.R.	June 9, 1986
U.S.A.	November 10, 1986
Spain	November 21, 1986
Equatorial Guinea	November 7, 1987
Portugal	April 7, 1988
Brazil	October 5, 1988
Ghana	December 12, 1988

[1]The Administrative Report presented at the Commission Meeting was revised.
[2]Senegal's withdrawal from the Commission was effective on December 31, 1988.

Cuba	January 11, 1989
Venezuela	March 7, 1989
Angola	August 29, 1990

3. Working Group on the Calculation of Member Country Contributions

The Working Group held its first meeting during the 1989 Commission meeting. During the intersessional period, the Secretariat carried out the mandate given to it by the Working Group, which was as follows: solicit legal advice from FAO as to whether or not a change in the calculations scheme would require an amendment to the ICCAT Convention, request the European Economic Community for the tuna catch and canning figures of its Member States in order to carry out hypothetical calculations of contributions; inform Senegal and Mauritania of the Group's work and include tables of hypothetical member contributions which include Senegal, confirm --through the United Nations-- the economic classification of the ICCAT member countries.

The Report of the 1990 Meeting of the Working Group is included herewith as Annex 8 to the 1990 Proceedings.

4. ICCAT Regulations / Port Inspection

Every year the Secretariat officially transmits to the member countries the recommendations approved by the Commission and reminds them of the regulatory measures already in effect and the importance of abiding by them. The Secretariat also communicates this information to the non-member countries and solicits their collaboration.

As regards port inspection, the Infractions Committee has compiled pertinent information. For more details, please refer to the 1990 Report of the Committee, included herewith as Annex 7 to the 1990 Proceedings.

5. Meetings organized by ICCAT

5.1 GFCM/ICCAT Expert Consultation on Evaluation of Stocks of Large Pelagic Fishes in the Mediterranean Area

In accordance with the Commission's decision to accept and collaborate with the General Fisheries Council of the Mediterranean (1989 SCRS Report), the meeting was organized jointly by the ICCAT Secretariat and the GFCM Secretary (FAO). An invitation was received from the University of Bari, Italy, and the meeting was held there from June 21 to 27, 1999.

The ICCAT Secretariat was responsible for all the technical aspects of the meeting, such as data collection, preparation of the data base, creation of the catch-at-size table, processing and analyzing data, etc., before, during and after the meeting.

Eleven countries, representing the members of one or both of the two organizing agencies, and the EEC participated in the meeting. Three members of the Secretariat staff (Assistant Executive Secretary, Systems Analyst and Programmer) participated in the meeting. Travel expenses for the Programmer were borne by the host, the University of Bari.

A summary of the Joint GFCM/ICCAT Meeting report can be found in the "Secretariat Report on Statistics and Coordination of Research". The report in its entirety is published in the "Collective Volume of Scientific Papers, Vol. XXXIII".

5.2 Albacore Workshop

The ICCAT Albacore Workshop was held at the ICCAT Headquarters in Madrid on October 3-9, 1990. The meeting was attended by scientists from two member countries and two non-member countries, and was convened by Dr. F. X. Bard.

The report is published in the "Collective Volume of Scientific Papers, Vol. XXXIV".

5.3 Swordfish Stock Assessment Session

The Swordfish Stock Assessment Session was held from September 12 to 19, 1990, at the ICCAT Headquarters. Scientists from four member countries, one non-member country and the EEC participated in the meeting, which was convened by Mr. Z. Suzuki (Japan). The Group drafted the swordfish stock assessment section of the 1990 SCRS Report and decided that this draft would be presented directly to the SCRS Plenary Session. The Draft Report and Appendix (Documentation) were edited, translated and printed, and a few days later, were distributed to all the Head Delegates of ICCAT member countries for their review.

5.4 Yellowfin Year Program Editorial Meeting

The Editorial Committee, comprised of three members, met at the Secretariat in March, 1990, to finalize the Yellowfin Year Program Report. The Secretariat helped with this work during and after the meeting.

The final draft report was presented at the November 1990 meting. The final report, including all the scientific papers presented, will be published in 1991.

5.5 Working Group on Western Atlantic Tropical Tunas

The SCRS proposed holding an intersessional meeting on this subject in the Fall of 1990 in a western Atlantic coastal city. Due to some minor problems in selecting the meeting venue, and to the full 1990 meeting schedule, the SCRS Chairman decided to postpone the working group meeting until the Spring of 1991.

6. Meetings at which ICCAT was represented

6.1 Coordinating Working Party on Atlantic Fisheries Statistics (CWP)

The CWP held its Fourteenth Session, at the OECD Headquarters in Paris, on February 5-9, 1990. In accordance with a Commission decision, ICCAT was represented by the Assistant Executive Secretary.

The Secretariat Report on Statistics and Coordination of Research includes a summary of the CWP meeting. (The entire CWP report was presented to the Commission as document COM/90/11.)

6.2 World Bluefin Meeting

This meeting was sponsored by the Inter-American Tropical Tuna Commission (IATTC) and the Australian Government and was held on May 25-31, 1990, at La Jolla, California (USA). The Assistant Executive Secretary participated in the meeting at the invitation of the IATTC, who paid for his round trip air fare. Several ICCAT scientists jointly presented a review paper on Atlantic bluefin tuna at the session.

The draft report of this meeting was presented to the Commission as document COM/90/12, by special permission of IATTC, who intends to publish the definitive report later. A summary is included in the Secretariat's Report on Statistics and Coordination of Research.

6.3 Lake Arrowhead Tuna Conference

Immediately prior to the World Bluefin Meeting, the Tuna Conference was held at Lake Arrowhead, California, for a three-day period. The Assistant Executive Secretary represented ICCAT at this meeting.

6.4 Committee for the Management of Tuna in the Indian Ocean

Ms. C. Soto (Spain) represented ICCAT at this meeting and her summarized report was presented to the Commission as document COM/90/23.

7. Coordination of Research

The Secretariat Report on Statistics and Coordination of Research summarizes all activities relating to coordination of research and biostatistics. This was an especially busy year for the Secretariat, who hosted four intersessional meetings, actively participated in the World Bluefin Meeting, achieved major improvements in Mediterranean statistics, and also engaged in many other activities.

Besides, throughout the year the Secretariat has assisted in many SCRS subsidiary bodies, such as:

- YYP Editorial Committee
- Working Group on SCRS Organization

- Working Group on Environment
- Billfish Enhanced Research Program
- Albacore Research Program

This increase in scientific and coordination work is reflected in additional administrative work, such as editing, translating into three languages, printing and distributing all these meeting reports, etc.

As regards biostatistical work, special thanks are expressed to the Institute of Oceanography of Spain (IEO), for their having sent two experts to Morocco (at IEO expense) to assist in establishing a biological sampling system along the Moroccan coast. Moroccan scientists had requested this assistance at the 1989 SCRS Meeting.

8. Collaboration with other organizations

8.1 Collaboration with FAO

As in other years, a close working relationship was maintained with various departments of FAO, which --as depository of the ICCAT Convention, has assisted the Commission in many administrative aspects, as well as in collection of statistics, etc.

8.2 General Fisheries Council for the Mediterranean (GFCM)

See Section 5.1 of this report.

8.3 Other organizations and non-member countries

The Commission has also maintained contact with various other international organizations and non-member countries regarding administrative and scientific matters.

9. Publications

The following publications were issued in 1990:

-- Report for Biennial Period, 1988-89 (Part II), 1990.
(published in the three official languages of the Commission in May-June).

-- Statistical Bulletin, Vol. 19 (Final)
(published in May).

-- Collective Volume of Scientific Papers, Vol. XXXI, which contains the Report of the 1989 Albacore Meetings
(published in February).

- Collective Volume of Scientific Papers, Vol. XXXII (1) and (2), which contains the papers presented at the 1989 SCRS Meeting
(published in March).

- Collective Volume of Scientific Papers, Vol. XXXIII, which contains the Joint GFCM/ICCAT Expert Consultation on Evaluation of Stocks of Large Pelagic Fishes in the Mediterranean Area
(published in September).

- Data Record, Vol. 31, which contains a catalog and summary of data received up to December 1989
(published in March).

- Field Manual for Statistics and Sampling of Tunas and Tuna-like Fishes, Third Edition
(English version published in October; French and Spanish versions published in December).

In response to a suggestion from FAO and a recommendation by the SCRS, the Secretariat has translated into Spanish the FAO publication, "Resources, Fishing and Biology of Tropical Tunas of the Central East Atlantic". This volume will be published by the Secretariat in 1991.

In order to cut costs, all of the publications issued so far in 1990 were prepared at the Secretariat, except for the covers and binding. The distribution of the "Data Record" and "Collective Volume" series has been limited to scientists and libraries directly involved in tuna research.

Also, for reasons of economy, almost all the ICCAT publications have been reduced in number and are shipped by surface mail, except for a few occasions when urgent distribution was essential.

10. Secretariat and Administration

There were no changes in the Secretariat staff in 1990. The current Secretariat staff consists of the Executive Secretary, Assistant Executive Secretary, and Systems Analyst in the U.N. Professional Category, six multi-lingual secretaries, a programmer, a statistical secretary and a clerk in the U.N. General Services Category and four locally contracted staff.

O. Rodríguez Martín
Executive Secretary

1990 FINANCIAL REPORT
COM/90/9 (Revised)[1]

FISCAL YEAR 1989

1. Auditor's Report

The Auditor examined the books and accounts of the Commission up to December 31, 1989. In accordance with Articles 9-3 and 12-7 of the Financial Regulations, and following a recommendation of the Council at its Second Regular Meeting, the Secretariat distributed a copy of the Auditor's Report to all the member countries in May, 1990. An extract of this Report is included in the "Report for Biennial Period, 1988-89, Part II".

2. Financial status at the end of second half of the Biennial Budget-1989

Statement 1 shows the status of Cash and Bank at the end of Fiscal year 1989. At the end of this Fiscal Year, there was a cash balance of US$ 355,938.49, including $1,507 in contributions paid in advance. There were also extrabudgetary funds in Cash and Bank which amounted to US$ 8,832.39, corresponding to the Yellowfin Year Program.

At the end of Fiscal Year 1989, there were contributions pending payment which totaled US$ 437,011.09 (including $75,860.88 corresponding to Senegal, whose withdrawal from the Commission was effective on December 31, 1988.)

FISCAL YEAR 1990

I. REGULAR BUDGET 1990

The 1990 Regular Budget approved by the Commission at its Eleventh Regular Meeting (Madeira, November 1989), amounted to US$ 900,000 (Appendix 2 to Annex 7 of the 1989 STACFAD Report).

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[1] Updated to the end of the Fiscal Year. Changes agreed upon by the Commission have been introduced.

1. General comments concerning Fiscal Year 1990

1.1 Currency fluctuation

The strong downward fluctuation of the U.S. dollar in 1990 adversely affected the Commission's expenditures.

The 1990 Budget approved by the Commission was based on an exchange rate of 120 Ptas/US$. Since the average exchange rate in 1990 was 102.5, the value of the budget declined by 15%

The decline in the US dollar/Peseta exchange rate had a particularly negative effect on the salaries of staff in the Professional and General Services categories, since these salaries were fixed in dollars. In order to compensate these staff for part of their extreme loss in purchasing power, the Commission authorized that emergency measures be put into effect, whereby funds derived from 1990 extrabudgetary income (i.e., bank interest, Value Added Tax return, etc.) totaling a maximum of US$ 40,000 could be used to adjust these salaries.

1.2 Pending contributions

Another factor which adversely affected Commission finances in 1990 was the accumulated debt from unpaid contributions (including Senegal's pending debt).

In 1990 the Executive Secretary sent three reminders to the countries in arrears to the Commission. In the majority of the cases, these reminders were ignored. The problem of the past-due contributions has been discussed year after year at the Commission meetings. As no solution has yet been found, we must continue to dwell on this matter, as the situation becomes progressively worse, and the accumulated debt owed to the Commission increases.

1.3 Office equipment acquired in Fiscal Year 1990

An offset machine (US$ 10,741) and a photocopier (US$ 16,464) were purchased in 1990 to replace copy equipment that was beyond repair.

Also purchased in 1990 were seven personal computers (IBM compatible) at a cost of US$ 18,991. The previous word processors, which were not compatible, had to be replaced due to numerous breakdowns and because parts were becoming increasingly difficult to replace.

1.4 Travel

Travel was reduced to a minimum in Fiscal Year 1990. The following expenses were charged: the Assistant Executive Secretary's travel and per diem expenses to attend the CWP meeting (Paris, France), the Assistant Executive Secretary's per diem expenses for the World Bluefin Meeting (La Jolla, California, USA) (his flight was paid by IATTC), and travel and per diem for the Assistant Executive Secretary and the Systems Analyst to attend the Joint ICCAT/GFCM Meeting (Bari, Italy). The University of Bari, who hosted the GFCM meeting, agreed to pay the travel and per diem expenses for one additional member of the ICCAT statistics department to attend the Bari meeting in June. (As of the end of Fiscal Year 1990, we had not yet been reimbursed for these expenses.)

1.5 Publications

All the Commission publications (three language versions of the Provisional Proceedings, three language versions of the Biennial Report, three volumes of the Collective Volume of Scientific Papers, the Statistical Bulletin, and the Data Record) were done by and at the Secretariat, except for binding.

In addition to the above, the third edition of the Field Manual (English and Spanish versions) has also been done by the Secretariat. (The French version will be charged to the 1991 Budget.)

1.6 Communications network

A computer communications network has been set up at the Secretariat. Expenses for the Commission were minor in 1990. Installation and "mail box" maintenance expenses for the first year will be incurred by "IRIS", the Spanish organization which is promoting its computer network for scientific purposes. (See details in the Administrative Report.)

1.7 Tagging lottery

Two US$ 500 tagging lottery prizes --one for temperate tunas and another for tropical tunas-- have been charged to the 1990 Commission Budget. (The US$ 500 lottery prize for billfish was paid from Billfish Program funds.)

2. Financial status at the end of the first half of the Biennial Budget-1990

Statement 2 shows the status of the contributions of the ICCAT member countries to the end of the Fiscal Year.

Of the total US$ 900,000 budget approved for this Fiscal Year, US$ 703,287.54 have been received towards the payment of 1990 contributions. (US$ 1,507 were received from Angola prior to this Fiscal Year, applicable to their 1990 contribution). Consequently, the total income corresponding to 1990 contributions amounted to US$ 704,794.54. Of the total budget for 1990, twenty-two (22%) is still pending payment.

Eight member countries have not paid their 1990 contributions. Of these, six countries also have outstanding debts corresponding to other years. Consequently, the total accumulated debt owed to the Commission amounts to US$ 606,492.31, which represents an increase of 39% in the outstanding debt since the end of Fiscal Year 1989.

Statement 3 shows the Budget as well as a breakdown, by budget chapter, of the expenditures incurred to the end of Fiscal Year 1990.

As indicated earlier in this Report, the 1990 Budget approved by the Commission lost part of its value as a result of the decline in the U.S. dollar. In spite of all efforts to reduce costs, expenditures to the end of 1990 exceeded the Budget by US$ 19,188.22.

Statement 4 shows the balance at the start of 1990 (US$ 355,938.49) and the contributions received towards the 1990 Budget (US$ 703,287.54). It also shows a breakdown of expenses by budget chapter (US$ 919,188.22) and the balance at the end of the Fiscal Year (US$ 140,037.81).

Statement 4-A shows the income and expenditures during Fiscal Year 1990, corresponding to extrabudgetary funds, such as:

i) The balance at the start of 1990 in the Yellowfin Year Program fund (US$ 8,832.39).
ii) Contributions received corresponding to other years (US$ 25,724.24).
iii) Other income includes bank interest, return of Value Added Tax, reimbursement for publications, observer fees, and the difference due to currency exchange. However, of the total extrabudgetary income received, US$ 39,997 was applied towards the staff salary adjustment, as authorized by the Commission. Consequently, the balance from other income amounted to US$ 11,676.56.
iv) Special contract with FAO (US$ 2,500).
v) The contribution from Gabon paid in advance (US$ 456.38).
vi) The balance of the US$ 50,000 Albacore Program Budget, allocated in the 1990 Budget but which was not used (US$ 15,052.51).

Extrabudgetary expenses were minimal in 1990; thus, the balance of extrabudgetary funds amounted to US$ 63,772.08.

Statement 5 shows the status of the Working Capital Fund. There was a balance of US$ 354,431.49 at the start of Fiscal Year 1990. Deposits to the Fund amounted to US$ 37,400.80. Therefore, the Fund should show a balance of US$ 391,832.49. However, US$ 214,393.68 were allocated to cover the difference between the contributions received towards the 1990 Budget and the total expenditures charged to this Budget.

As a result, the balance in the Working Capital Fund at the end of the Fiscal Year amounted to US$ 177,438.61.

Statement 6 shows the status of Cash and Bank (US$ 203,809.89) and the accumulated debt owed to the Commission (US$ 606,492.31) at the end of the Fiscal Year.

II. ALBACORE RESEARCH PROGRAM FUNDS

This Program had an allotment of US$ 50,000 for 1990. It was agreed between the parties involved that, of this amount, US$ 30,000 would be applied to pay the Spanish observers on board fishing vessels who carried out sampling operations for the Albacore Program. It was also agreed that US$ 20,000 would be applied towards the French intensive sampling program. Ms. V. Ortiz (Spain) and Mr. L. Antoine (France) have collaborated with the Secretariat in administering these funds.

Albacore sampling expenses incurred by the Spanish Institute of Oceanography (I.E.O.) amounted to US$ 26,975.92. Expenses incurred for albacore sampling in 1990 by the French Institute for the Exploration of the Sea (IFREMER) totaled US$ 7,971.57. Consequently, Albacore Research Program funds showed a balance of US$ 15,052.51 at the end of Fiscal Year 1990. For bookkeeping purposes, these funds were considered separately from regular Commission accounts.

III. YELLOWFIN YEAR PROGRAM (YYP) FUNDS

At its Ninth Regular Meeting (November, 1985) the Commission approved this Program with a total budget of US$ 175,000, financed by the Working Capital Fund.

Although the Program has ended, it was decided to maintain a balance to assume the costs of the YYP publication. At the start of 1990, the balance amounted to US$ 8,832.39. There were no expenditures charged to the YYP in 1990.

IV. PROGRAM OF ENHANCED RESEARCH FOR BILLFISH

The special account to administer Billfish Program funds was opened in 1987. The status of this account is currently as follows:

-- Balance at end of FY 1989	$ 9,729.93	
-- Deposits to fund in 1990	$30,500.00	
		$40,229.93
-- Expenses in 1990		$26,804.16
Balance (at end of FY 1990)		$13,425.77

V. GENERAL BALANCE SHEET AT THE END OF FISCAL YEAR 1990

Statement 7 shows the General Balance Sheet at the end of Fiscal Year 1990, with the assets and liabilities of the Regular Commission Budget and for the Yellowfin, Albacore and Billfish Programs. This statement also shows the contributions pending payment, as well as the fixed assets and acquired holdings.

O. Rodríguez Martín
Executive Secretary

STATEMENT 1

Status of Cash and Bank at end of Fiscal Year 1989 ($USA)

SUMMARY		*BREAKDOWN*		
Cash and Bank (Regular Budget).....	355,938.49	Available in Working Capital Fund.........	354,431.49	
Cash and Bank (Extrabudgetary).....	8,832.39	Yellowfin Year Program	8,832.39	
		Advance on 1989 Budget (Angola)...........	1,507.00	
	364,770.88			364,770.88
Accumulated pending contributions..	437,011.09	Contributions pending payment........................		437,011.09
		a) from 1984 and before................	41,062.58	
		b) from 1985...........................	19,022.27	
		c) from 1986...........................	53,156.00	
		d) from 1987...........................	90,228.00	
		e) from 1988...........................	120,102.00	
		f) from 1989...........................	113,440.24	

Status of Member Country Contributions - Regular Budget (US$) (at end of Fiscal Year 1990)

Country	*Past Due at Beginning of FY 1990*	*Contributions for 1990 Budget*	*Contributions Paid Towards the 1990 Budget*	*Contributions Paid Towards Previous Budgets*[4]	*Balance Due at end of FY 1990*
Angola[1]	0.00	20,314.00	0.00	0.00	20,314.00
Benin[2]	45,329.70	5,612.00	0.00	0.00	50,941.70
Brasil	0.00	37,109.00	0.00	0.00	37,109.00
Canada	0.00	18,359.00	18,359.00	0.00	0.00
Cap Vert	25,903.00	16,902.00	0.00	12,831.00	29,974.00
Côte d'Ivoire	42,362.00	11,011.00	0.00	0.00	53,373.00
Cuba	60,861.00	21,436.00	0.00	0.00	82,297.00
España	0.00	235,543.00	235,543.00	0.00	0.00
France	0.00	100,154.00	100,154.00	0.00	0.00
Gabon	6,638.88	11,011.00	11,011.00	6,638.88	0.00
Ghana	164,218.27	47,786.00	0.00	0.00	212,004.27
Guinea Ecuatorial	9,583.00	5,945.00	0.00	0.00	15,528.00
Japan	0.00	65,410.00	65,410.00	0.00	0.00
Korea	0.00	30,401.00	30,401.00	0.00	0.00
Maroc	0.00	22,274.00	22,274.00	0.00	0.00
Portugal	0.00	42,796.00	42,796.00	0.00	0.00
Sao Tomé & Principe	40.00	11,434.00	11,434.00	40.00	0.00
South Africa	0.00	17,501.00	17,501.00	0.00	0.00
Uruguay	0.00	6,825.00	6,825.00	0.00	0.00
U.S.A.	0.00	93,957.00	93,957.00	0.00	0.00
U.S.S.R.	0.00	26,228.00	26,228.00	0.00	0.00
Venezuela	6,214.36	51,992.00	21,394.54	6,214.36	30,597.46
Sub-Total	361,150.21	900,000.00	703,287.54	25,724.24	532,138.43
			1,507.00[1]		-1,507.00[1]
Sénégal[3]	75,860.88	0.00	0.00	0.00	+75,860.88
TOTAL	437,011.09	900,000.00	704,794.54	25,724.24	606,492.31

[1]Overpayment by Angola of $1,507.00 received and accounted for in Fiscal Year 1986, to be credited to the 1990 contribution.
[2]Includes Benin's pending contribution to the Skipjack Budget ($3,044.70).
[3]Senegal's withdrawl from the Commission was officially effective on December 31, 1988.
[4]To the Working Capital Fund.

Liquidation of Regular Budget
Breakdown of Regular Expenditures by Budget Chapter (US$) (at the end of Fiscal Year 1990)

CHAPTERS	*BUDGET*	*EXPENDITURES*		
Chap. 1 Salaries:	*440,000*			
P-GS Staff		334,257.00		
P-GS Pension		58,652.28		
Locally Contracted Staff		31,190.98		
Social Security-Local Staff		18,721.23	442,821.49	
Chap. 2 Travel	*6,000*		1,763.20	
Chap. 3 Commission Meeting	*37,000*		40,122.30	
Chap. 4 Publications	*23,000*		24,676.06	
Chap. 5 Office Equipment	*5,000*		4,851.19	
Chap. 6 Operating Expenses:	*75,000*			
6.1 Office Material		5,963.55		
6.2 Reproduction		10,460.32		
6.3 Mailing		20,216.16		
6.4 Telephone		7,261.93		
6.5 Fax, Telex		11,100.11		
6.6 Maintenance		19,748.88		
6.7 Honorarium - Auditor		3,341.71		
6.8 Electricity		4,811.03		
6.9 Office cleaning		7,493.95		
6.10 Other Operating Expenses		1,272.05	91,669.69	
Chap. 7 Miscellaneous	*5,000*		4,642.58	
Sub-total Chapters 1-7	*591,000*			610,546.51
Chap. 8 Statistics and Research:				
8A Salaries	*126,000*			
P-GS Staff		96,173.00		
P-GS Pension		15,645.00		
Locally Contracted Staff		13,504.85		
Social Security-Local Staff		3,222.84	128,545.69	
8B Travel	*8,000*	4,092.41		
8C Port Sampling	*18,000*	10,983.60		
8D Biostatistical Work	*10,000*	8,354.54		
8E Electronic Equipment	*16,000*	18,110.54		
8F Data Processing	*35,000*	38,243.77		
8G Scientific Meetings	*42,000*	46,311.16		
8H Albacore Research Program	*50,000*	34,947.49		
Bal. ALB Research Program		15,052.51*		
8I Miscellaneous	*4,000*	4,000.00	180,096.02	
Sub-Total Chapter 8	*309,000*			308,641.71
TOTAL CHAPTERS 1-8	*900,000*			919,188.22

*At the end of 1990, this amount was removed from Regular Budget funds and placed in a special fund for future use by the Albacore Research Program.

Assets, Liabilities and Balance of Regular Budget Funds in Fiscal Year 1990 (US$) (at end of Fiscal Year 1990)

ASSETS			*LIABILITIES*		
Cash and Bank (at beginning of FY 1990)	354,431.49		Expenditures:		
Advance on 1990 contribution (Angola)	1,507.00*	355,938.49	Chapter 1	442,821.49	
			Chapter 2	1,763.20	
Contributions received in 1990 towards the 1990 Budget:			Chapter 3	40,122.30	
			Chapter 4	24,676.06	
			Chapter 5	4,851.19	
			Chapter 6	91,669.69	
			Chapter 7	4,642.58	
Canada	18,359.00		Chapter 8	308,641.71	919,188.22
Japan	65,410.00				
Sao Tomé and Principe	11,434.00				
United States	93,957.00				
Spain	235,543.00		Cash and Bank		140,037.81
U.S.S.R.	26,228.00				
South Africa	17,501.00				
France	100,154.00				
Korea	30,401.00				
Gabon	11,011.00				
Uruguay	6,825.00				
Portugal	42,796.00				
Venezuela	21,394.54				
Morocco	22,274.00	703,287.54			
TOTAL		1,059,226.03	TOTAL		1,059,226.03

*Received and accounted for in previous Fiscal Year.

Assets, Liabilities and Balance of Extrabudgetary Funds in Fiscal Year 1990 (US$) (at end of Fiscal Year 1990)

ASSETS			*LIABILITIES*	
Cash and Bank (at beginning of FY 1990):			Expenditures:	
Yellowfin Year Program.................		8,832.39	Yellowfin Year Program..............	0.00
Contributions received towards previous budgets:			Expenses of FAO Contract............	470.00
Sao Tomé & Principe............	40.00			
Cabo Verde.....................	12,831.00			
Gabon..........................	6,638.88			
Venezuela......................	6,214.36	25,724.24*		
Other Income Received:				
Bank Interest..................	28,347.19			
Refund from VAT................	13,794.19			
Reimbursement for books........	504.00			
Observer fees at 1990 Meeting..	7,000.00		Cash and Bank.......................	63,772.08
Less Salary adjustment.........	(39,997.00)**			
Difference in exchange rate....	2,028.18	11,676.56*		
Special contract with FAO for processing Taiwanese data.......		2,500.00		
Advance on 1991 Contribution (Gabon).......................		456.38		
Balance of Albacore Research Program.......................		15,052.51***		
TOTAL..........................		64,242.08	TOTAL...............................	64,242.08

*To the Working Capital Fund.
**This amount was taken from extrabudgetary income to cover the salary adjustment (see text).
***This amount was removed from Regular Budget funds and placed in a special fund for future use by the Albacore Research Program.

Composition and Balance of Working Capital Fund (US$) (at end of Fiscal Year 1990)

Balance at start of Fiscal Year 1990		354,431.49
Deposits:		
Contributions réceived toward previous budgets	25,724.24	
Extrabudgetary Income	11,676.56*	37,400.80
Less:		
Amount to cover the difference between contributions received towards 1990 Budget ($704,794.54**) and total expenditures for 1990 (919,188.22)		214,393.68
Balance of Working Capital Fund at end of Fiscal Year 1990		177,438.61

*Total Extrabudgetary Income less Salary Adjustment (see text).
**Includes $703,287.54 from contributions received in 1990 and $1,507.00 received in a previous Fiscal Year from Angola.

Status of Cash and Bank at end of Fiscal Year 1990 ($USA)

SUMMARY		*BREAKDOWN*		
Cash and Bank (Regular Budget)....	140,037.81	Available in Working Capital Fund......	177,438.61	
Cash and Bank (Extrabudgetary)....	63,772.08	Advance on 1991 Budget (Gabon).........	456.38	
		Yellowfin Year Program.................	8,832.39	
		Albacore Research Program..............	15,052.51	
		FAO Contract...........................	2,030.00	
	203,809.89			203,809.89
Accumulated pending contributions..	606,492.31	Contributions pending payment......................		606,492.31
		a) from 1985 and before................	60,084.85	
		b) from 1986...........................	53,156.00	
		c) from 1987...........................	90,228.00	
		d) from 1988...........................	107,271.00	
		e) from 1989...........................	100,547.00	
		f) from 1990...........................	195,205.46	

General Balance Sheet at end of Fiscal Year 1990 (US$)

ASSETS

Available: (Banco Exterior de España):		
Acct. 84-31279-Z (time deposit)		152,862.75
Acct. 82-31279-Q (US$)		29,629.37
Acct. 30-17672-A (Pt)	1,985,876 Pt	
Acct. 30-17329-F (Conv. Pt)	3,206 Pt	
Cash on hand (Pt)	36,106 Pt	
Exchange rate 1US$ = 95 Pt	2,025,188	21,317.77
		203,809.89
Available in Billfish Trust Fund:		
Acct. 82-31555-N		13,425.77
Receivables:		
Angola	18,807.00	
Benin	50,941.70	
Brazil	37,109.00	
Cape Verde	29,974.00	
Côte d'Ivoire	53,373.00	
Cuba	82,297.00	
Ghana	212,004.27	
Guinea Ecuatorial	15,528.00	
Senegal	75,860.88	
Venezuela	30,597.46	606,492.31
Fixed Assets:		
Acquired before 1990	330,431.46	
Acquired during 1990	45,134.16	
Retired during 1990	(7,202.00)	
Total Fixed Assets, in use.	368,363.62	
Accumulated amortization	(219,531.62)	148,832.00
Guaranty deposit		815.64
TOTAL ASSETS		973,375.61
Furniture ceded by Undersecretariat of Merchant Marine of Spain		$3,365.38

LIABILITIES

Acquired holdings (gross)	368,363.62	
Less: Amortization of Fixed Assets	(219,531.62)	
Acquired holdings (net)		148,832.00
Guaranty deposit		815.64
Available in the Working Capital Fund		177,438.61
FAO Contract		2,030.00
Avance from Gabon		456.38
Yellowfin Year Program		8,832.39
Albacore Research Program		15,052.51
Available in Billfish Trust Fund:		
1989 Balance	9,729.93	
Received	30,500.00	
Spent	26,804.16	13,425.77
Contributions pending payment		606,492.31
TOTAL LIABILITIES		973,375.61
Undersecretariat of Merchant Marine of Spain		$3,365.38

SECRETARIAT REPORT ON STATISTICS AND COORDINATION OF RESEARCH
COM-SCRS/90/10 (Amended)[1]

I. DATA COLLECTION AND SAMPLING

1. Collection of 1989 statistics through national offices

Table 1 of the Report of the Sub-Committee on Statistics (Appendix 8 to Annex 10) shows the progress made by the national offices and by the Secretariat in the collection of 1989 statistics. As of October 22, 1990, data from the following major tuna fishing countries had not yet been received by the Secretariat:

Task I data (total nominal catches):

Cape Verde, Italy, Japan (LL), and Senegal.

Task II catch and effort data:

Angola, Brazil, Cape Verde, FIS, Ghana, Japan (LL), U.S.S.R., Uruguay, Venezuela.

Task II size data:

Angola, Brazil, Cape Verde, Chi-Taiwan (except ALB), Cuba, FIS, Ghana, Morocco, Japan (LL, except SWO and western BFT).

2. Improvements and remaining difficulties

a) Delay in submission of Task I data

Since several stock assessment meetings were held from June through October, we were able to obtain data from more countries than in other years. However, as many as five reminders were sent out to obtain these data. Therefore, increased collaboration from at least the member countries must be assured.

[1]The Secretariat Report on Statistics and Coordination of Research presented at the Commission Meeting was amended.

b) Mediterranean statistics

Significant improvements were made in the reporting of data for the years up to and including 1988. The Joint GFCM/ICCAT meeting particularly contributed to this improvement (see section III). However, major problems still exist in obtaining 1989 data from major non-member countries.

c) Submission of catch-at-size data

The SCRS decided that catch-at-size data should be sent to the Secretariat at least two weeks before the stock assessment sessions. Unfortunately, the submission of catch-at-size by the major fishing countries (particularly for BFT, SWO and ALB) was considerably delayed this year. In spite of the many reminders sent by the Secretariat by FAX, etc., most of the data did not become available until the time of the meetings. Consequently, there was no time for the Secretariat to prepare data substitutions and raising; and thus, the work of the meetings was delayed.

d) Criteria to be followed for statistics

Each year, the Secretariat sends out requests for statistics with specific criteria to be followed. Also, detailed statistical requirements are published in the "Field Manual". However, difficulties are encountered because many countries do not meet these requirements. For example:

- The condition of fish in which weight is recorded (e.g., gilled and gutted, round, head off) is not clear.
- The flag of the vessels is not specified.
- The area of catches is not clear (even Pacific catches have been included).
- Local names are provided for species, which makes species identification difficult.
- The reporting unit is not specified (pounds, kg or MT).
- The measurements used in size data are not specified (fork-length, lower-jaw fork length, or eye-fork).
- Non-conventional measurements do not include conversion to fork length.
- Class intervals are not expressed (upper limit, lower limit, or mid-point). ICCAT requires lower limit.
- The file format or an explanation of non-ICCAT codes are not included when computer files are presented.
- Computer files are in the form of tables or in word processing files, instead of ASCII files as required.

Some of these points are minor, but they cause delays in the Secretariat's work, as further inquiries then have to be made, or the format, data, etc. have to be converted. As the Secretariat receives more and more requests that are increasingly complex, and human and computer resources are limited, the cooperation of the national offices would be greatly appreciated.

3. Port sampling by the Secretariat

a) The longline fleet

Routine port sampling from longliners at various transshipment ports was carried out as usual by ICCAT, but the sampling rate was very low at the Canary Islands and at St. Maarten for the following reasons:

1) Many Oriental and Cuban longliners have left the Atlantic or have been converted to extremely low temperature freezer vessels, and are no longer unloading at Atlantic ports.

2) Due to the lack of supervision through direct contacts with the samplers at ports, it is difficult to control the quality of the sampling.

b) The Ghana-based fleet

The contract between the CRO-Abidjan and ICCAT, signed in early 1986 to finance biological sampling from the Ghanaian surface fleet unloading at Abidjan, was extended to 1990. The Secretariat received 1989 size sampling results from these landings. However, the landing of Ghanaian boats at Abidjan was curtailed in 1989 and it seems that presently no more sampling is being carried out.

There have been no catch and effort data for the Ghanaian fleet, either from Abidjan or from Ghana.

II. SECRETARIAT DATA PROCESSING AND BIOSTATISTICAL WORK

1. Facilities

The purchase of a PC (386 series), with two diskette drives (5-1/4 and 3-1/2 inches), and a laser printer (purchased after the 1989 SCRS meeting) was reported in the Secretariat Report on Statistics and Coordination of Research included in the Biennial Report, 1988-89 (Part II). This additional PC proved very useful during the scientific meetings. The laser printer is also essential for graphics, page setting of publications, etc. Towards the end of the year, and following a suggestion made by the SCRS, the Secretariat purchased seven PCs (286 series) with 50 MB hard disks to replace the out-dated word processors; three laser printers and a dot matrix printer, charged in part to the 1990 budget, were also purchased. Some minor equipment needed for the electronic mail system was also purchased (see SCRS/90/19).

2. Data processing and biostatistical work

a) Extra statistical work and data processing

The Secretariat had to prepare the data bases for three intersessional meetings held in 1990 and for the SCRS, provide computer support for these meetings, and carry out considerable data processing before, during and after each meeting. This represented a substantial increase in the computer work load during 1990.

This work involved:

- preparing catch tables
- preparing data catalogues
- updating and preparing data bases
- creating catch-at-size bases by substitutions and raising
- aging catches
- preparing catch and effort indices
- preparing all the graphics and tables for the meeting reports
- checking the analyses during the meeting sessions, and editing the reports

These special meetings held during the intersessional period were:

- Expert Consultation on Evaluation of Stocks of Large Pelagic Fishes in the Mediterranean Area (GFCM/ICCAT Joint Meeting) - held in Bari, Italy, in June, 1990.

- Swordfish Stock Assessment Session of the SCRS - held at the Commission Headquarters in September, 1990.

- Albacore Workshop - held at the Commission Headquarters in October, 1990.

b) Reorganization of the data base

The reorganized data bases have been mostly updated. The reorganization of the size data has been successfully completed. Reorganization of the tagging file is urgently needed, but while some progress has been made, this work is far from complete, due to the complexity of the task and the shortage of time.

c) Routine work

The volume of routine work has been increasing as the volume of data increases. Routine work includes entering, verifying and processing all the catch, catch and effort and biological data, updating the data catalogue and tagging file for recent years, and making copies of data files for scientists who request certain data. Also, data processing for statistical publications is also done.

d) Coordination of the Program of Enhanced Research for Billfish and of the Albacore Research Program

The Secretariat has been involved in coordinating and administering the Program activities in collaboration with the Program Coordinators. Detailed reports are presented in SCRS/90/14 and SCRS/90/16.

e) The 1990 tuna tagging lottery (for tag recoveries reported in 1989)

The Tuna Tagging Lottery was held at the ICCAT Headquarters on October 8, 1990, during the Albacore Workshop. All the Atlantic tuna tag recoveries reported during 1989 were eligible for the lottery. Three US$ 500 prizes were awarded: one for billfishes (a special drawing for the Program of Enhanced Research for Billfish), one for tropical tunas and one for temperate tunas.

f) Field Manual

After waiting until the end of 1989 for further comments on the draft, as suggested by the 1989 SCRS, the Field Manual was finalized. The English version was published in October and the French and Spanish versions were published in December, 1990. All the page setting and printing work, except for binding, was done by the Secretariat, since the costs of printing by outside contract is prohibitive.

g) Establishment of an electronic mail network

The Secretariat has been incorporated into the IRIS network. Details are reported in SCRS/90/19.

h) Development of a new program for data substitution and raising

Following an SCRS recommendation, a new program has been developed to substitute and raise size data to the catch. This work used to be done in two steps, but can done in one, and sample sizes can be documented when this information is available in the original file. The new program simplified substitution and raising work considerably. The program was also converted for use in PCs and was used at the Bari meeting.

III. IMPROVEMENT OF MEDITERRANEAN FISHERIES STATISTICS

As agreed by the SCRS and the Commission at the 1989 meeting, the Secretariat has maintained close contact with the Secretary of the General Fisheries Council of the Mediterranean (GFCM) and jointly held the Expert Consultation on Evaluation of Stocks of Large Pelagic Fishes in the Mediterranean Area (GFCM/ICCAT Joint Meeting). The GFCM Secretary (FAO) was in charge of the administrative preparations and ICCAT was responsible for the technical preparations.

The meeting was held in Bari, Italy, on June 21-27, 1990, at the invitation of the University of Bari. The meeting site and computer facilities were provided by the host.

Due to the extensive work done before the meeting, and due to the contributions of many non-member scientists attending the meeting, many new data on catch, size and biological parameters on Mediterranean bluefin, swordfish and albacore became available. In particular, the ICCAT bluefin data base for the east stock very much improved up to 1988. The Consultation expressed its satisfaction for the progress made and asked ICCAT and the GFCM to continue this type of collaboration in the future. The Report is included in the "Collective Volume of Scientific Papers, XXXIII", and will also be printed by FAO in its Fisheries Report Series.

After the meeting, there was still considerable statistical work to be done as regards updating the bluefin catch at size, etc. The Secretariat spent about two months to complete this work.

IV. MEETINGS AND COLLABORATION WITH OTHER INTERNATIONAL ORGANIZATIONS

1. World Bluefin Meeting

The World Bluefin Meeting, sponsored by the Inter-American Tropical Tuna Commission (IATTC) and the Australian Government, was held in May, 1990, at La Jolla, California, immediately after the Lake Arrowhead Tuna Conference. Many scientists involved in ICCAT bluefin stock assessment work jointly presented a comprehensive review paper on the Atlantic bluefin stock assessments (edited by Dr. D. Clay) and actively participated in the meeting.

The Report, in draft form, was distributed as SCRS/90/12, by special permission of the IATTC. The formal version will be issued by IATTC in the near future.

The procedures of collecting, treating and maintaining the data base, biological parameters, methodology used in stock assessments, etc. were compared for Pacific bluefin, Atlantic bluefin and southern bluefin. The meeting was extremely useful for all the scientists, from the standpoint of obtaining a much wider scope in bluefin studies. The Group established a permanent working group, subsidiary groups, and a steering committee, and agreed that such a meeting would be held again in the future.

2. GFCM

Please refer to Section III of this report.

3. Coordinating Working Group on Atlantic Fisheries Statistics (CWP)

The CWP meeting was held at OECD Headquarters in Paris in February, 1990. ICCAT was represented by the Assistant Executive Secretary. The meeting report was presented as SCRS/90/11. Major discussions relating to ICCAT included: making the statistics consistent among the agencies, how to include sport and subsistent fisheries in the statistics, and electronic mail communications.

V. *PUBLICATIONS*

For details on the ICCAT publications issued in 1990, please refer to the Administrative Report.

CHAPTER II
RECORDS OF MEETINGS

PROCEEDINGS
OF THE SEVENTH SPECIAL MEETING
OF THE COMMISSION

Madrid, November 12-16, 1990

TABLE OF CONTENTS

FIRST PLENARY SESSION
November 12, 1990

Item 1. OPENING OF THE MEETING

1.1 The Seventh Special Meeting of the Commission was held in Madrid, Spain, at the Hotel Pintor, and was chaired by Mr. S. Makiadi J. Lopes (Angola). He introduced the people seated at the head table: Dr. J. Loira (Secretary General of Maritime Fisheries of Spain), Dr. A. Ribeiro Lima (First Vice-Chairman of the Commission), Mr. K. Shima

(Second Vice-Chairman of the Commission), Ms. P. García Doñoro (STACFAD Chairman), Dr. J. L. Cort (SCRS Chairman), Dr. O. Rodríguez Martín (ICCAT Executive Secretary) and Dr. P. M. Miyake (ICCAT Assistant Executive Secretary).

1.2 Mr. Loira welcomed the participants to Madrid and wished them success in their discussions. His opening address is attached as Annex 4.

1.3 The meeting was formally opened by Mr. Makiadi, the Commission Chairman, who reviewed the progress made by the Commission as well as the problems it now faces. His address is also included in Annex 4.

Item 2. ADOPTION OF AGENDA, ARRANGEMENTS FOR THE MEETING AND APPOINTMENT OF SUBSIDIARY BODIES

2.1 The Commission reviewed the Tentative Agenda. The Delegate of Spain asked that an additional item be placed on the agenda, i.e., "Review of the Financial Status of the Albacore Research Program". The Executive Secretary explained that this had not been listed as a separate item because it is included in the Regular Budget. However, due to the importance of this Program, it was decided to include this topic as Item 11.7 of the Agenda.

2.2 The Delegate of France requested that the word "large-scale" be added to Item 13, to read: "Possible effects of large-scale driftnet fishing on tuna stocks." The Delegate of Spain questioned the purpose of adding this word. France replied that the U.N. Resolution on driftnet fishing included this term and therefore the Commission must include it. Spain, while agreeing to the addition of "large-scale", reserved the right to question the definition of this term when this Agenda item is discussed.

2.3 The Agenda was adopted as amended and is attached as Annex 1. The List of Documents presented to the Commission is attached as Annex 3.

Item 3. ADMISSION OF OBSERVERS

3.1 After the head Commissioner of each member country introduced his respective delegation, the observers --representing several countries and international organizations-- introduced themselves. All the observers were admitted and welcomed by the Chairman. The List of Participants is attached as Annex 2.

Item 4. REVIEW OF COMMISSION MEMBERSHIP

4.1 The membership of the Commission was reviewed. It was noted that there are currently twenty-two member countries.

Item 5. STATUS OF THE RATIFICATION OF THE PROTOCOL OF AMENDMENT TO THE CONVENTION

5.1 The Commission Chairman noted that 16 member countries had ratified the Protocol for adherence of the European Economic Community to the Commission.

5.2 The Delegate of Angola stated that his country has ratified the Protocol and has deposited the pertinent documents with the Food and Agriculture Organization of the United Nations (FAO) in July, 1990, although the FAO has not yet confirmed this to the Commission. The Delegate of Angola offered to provide copies of this documentation to the Commission. Later, during the course of the Commission Meeting, an announcement was made that the formal notice by FAO of ratification of the Protocol by Angola had been received at the Secretariat. The five countries which have not yet ratified the 1984 Protocol are Benin, Canada, Côte d'Ivoire, Gabon, and Morocco.

5.3 The Delegate of Canada stated that the issue was being studied by the authorities of his country. He said he would try to provide more information about his country's final decision at least by the next Commission meeting.

5.4 The Delegate of Côte d'Ivoire stated that the ratification procedures were being reactivated and that the ministry was taking a new interest in the matter. He indicated that perhaps the ratification would be complete by the end of the year.

5.5 The Delegate of Gabon reported that the National Assembly of Gabon had ratified the Protocol, but the instrument had not yet been deposited with FAO, and noted that this would be done soon.

5.6 In accordance with the pertinent dispositions of the International Law of the Sea Convention, the European Economic Community must reiterate the absolute priority that it accords to the rational exploitation of marine fishery resources. In this regard, it considers that the conservation of highly migratory species and the management of their stocks should be done through an international regulation adopted within the competent regional organizations.

5.7 In this context, the European Economic Community has for many years expressed a strong desire to adhere, as a full member, to the International Convention for the Conservation of Atlantic Tunas. A Final Act, which is annexed to the Protocol amending the Convention, was signed in this sense in 1984 by all the member coauntries of this Convention.

5.8 As of now, six years after this signature, the necessary ratification of that document by all the member countries and the necessary deposit of an instrument of ratification with the FAO headquarters has not yet been completed.

5.9 In thanking the countries which have already taken this step, particularly Angola and Gabon that ratified in 1990, the European Economic Community would like, once again to reiterate its wish to adhere to the Convention as well as its willingness to collaborate fully in matters of a scientific nature

5.10 Taking into account its observer status, the European Economic Community cannot currently consider any other way to comply with the Convention, particularly as it concerns a contribution of a financial nature.

SECOND PLENARY SESSION
November 11, 1990

Item 6. REPORT OF THE STANDING COMMITTEE ON RESEARCH AND STATISTICS (SCRS)

6.1 Dr. J. L. Cort, SCRS Chairman, presented his Committee's Report to the Second Plenary Session of the Commission and summarized the scientific findings.

6.2 He referred to the Albacore Workshop held in October, 1990, and to the progress made by the Albacore Research Program. He informed the Commission that the Program had gone well and that no immediate funding was required. He also referred to the GFCM/ICCAT Joint Consultation on the Stock Assessment of the Large Pelagic Fish in the Mediterranean and the World Bluefin Meeting.

6.3 The SCRS Chairman further reported on the results of the evaluations made by the Committee on the stocks of yellowfin, bigeye, skipjack, albacore, bluefin, billfishes, swordfish, southern bluefin tuna and small tunas (Item 10 of the SCRS Report). He referred to the recommendations sections for each species and called the attention of the Commission, in particular, to the management recommendation for swordfish, since the SCRS is recommending that measures to be taken for the management of this stock.

6.4 He reported that a Sub-Committee on Environment had been established by the SCRS and that Mr. J. Pereira (Portugal) was nominated Convener.

6.5 The Committee studied species interaction and the association of fish with flotsam. Also, the Committee studied large pelagic monofilament driftnets in relation to the U.N. Resolution made by the 1989 General Assembly. The Committee also formulated a resolution concerning this issue, which appears in the SCRS Report under Agenda Item 12.

6.6 The Committee studied the progress made by the Billfish Program and agreed upon the Program Plan for 1991, which will be carried out through private contributions to this Program. The Report of the Sub-Committee on Statistics was reviewed presented together with various recommendations. The Commission's statistical publications were reviewed, as was the Field Manual, recently published in English. The SCRS Chairman also commented on other publications, such as the Yellowfin Year Program Report and the translation into Spanish of one of the FAO scientific publications.

6.7 The Committee decided that the Working Group on Western Atlantic Tropical Tunas would meet in Miami, Florida (U.S.A.) in April, 1991. The Committee also decided to hold a stock assessment session for swordfish in September, 1991, for which an invitation to hold the meeting at the Biological Station, St. Andrews, New Brunswick, Canada, was received. The attention of the Commission was drawn to the requests from Sao Tomé & Principe and Gabon for technical assistance to develop a research and statistical system in their countries.

6.8 The Chairman of the Commission commended the results of the hard work as shown in the report by the scientists, led by an able SCRS Chairman. The SCRS Report was adopted and is attached as Annex 10.

FINAL PLENARY SESSION

November 16, 1990

Item 7. REPORTS OF PANELS 1 TO 4

7.1 The Chairmen of Panels 1, 2, 3 and 4 (Côte d'Ivoire, France, U.S.A. and U.S.S.R., respectively) presented the Reports of their respective Panels to the Commission.

7.2 At the time the Reports of the Panels were presented to the Plenary Session, it was recognized that these reports were adopted as a whole, at each Panel, with the understanding that the Secretariat would edit the reports and mail them to all the delegates for final revision. The Panel members were informed that they could correct, by correspondence, any significant errors in their respective interventions and/or statements. However, Panel members were informed that they could not make changes which alter the substance of the Panel reports, nor could they change the wording of the recommendations for management measures made by the Panels. This procedure was followed due to the lack of time to review the draft reports at the Panels.

7.3 Many delegates expressed their reservations to amend some parts of the Panel reports, relating to their own interventions, so that the reports would reflect more precisely what has been stated during the Panel meetings.

7.4 After reviewing the reports of the Panels, the Delegate of the United States questioned the status of the recommendation forwarded to the Commission by Panel 4 concerning regulatory measures on swordfish. In order to clarify the situation, he moved that the Commission formally adopt the recommendation.

7.5 An open vote was taken around the table. Thirteen member countries were present at the time of voting. Of these, eleven countries (Angola, Canada, France, Ghana, Japan, Republic of Korea, Portugal, South Africa, United States, U.S.S.R. and Venezuela, voted in favor of the regulation; two countries (Morocco and Spain) abstained. Sao Tomé & Principe, Gabon and Côte d'Ivoire, who participated in this year's meeting, were absent at the time of voting.

7.6 Spain questioned whether the thirteen member countries constituted a quorum, in accordance with Article III, paragraph 3, of the ICCAT Convention. It was noted that with a total Commission membership of 22 member countries, 15 countries would constitute a quorum. However, it was pointed out that according to Article VIII, paragraph 1.b(ii) of the Convention, when a recommendation is proposed by an appropriate Panel, a decision can be taken by a majority of the Contracting Parties.

7.7 The Delegate of the United States requested that the recommendation for the management of swordfish also be sent to all the countries that were absent to solicit their vote. It was decided that the Secretariat would seek a mail vote on the recommendation from the countries that were absent, in accordance with Rule 9, paragraph 8, of the Commission's Rules of Procedure.

7.8 No other new regulatory measures were considered by the Commission.

Item 8. REPORT OF THE INFRACTIONS COMMITTEE

8.1 The Commission Chairman, who presided over the Infractions Committee in the absence of the Committee Chairman (Cuba), presented the group's Report. This report, and all the recommendations contained therein, was adopted by the Commission, with the same condition as the Panel reports.

8.2 The Agenda sub-items 8.1 and 8.2 were duly discussed by the Infractions Committee during its meeting. Details on these items can be found in the Committee's report (attached as Annex 7).

Item 9. COLLABORATION OF NON-MEMBER COUNTRIES IN THE OBJECTIVES OF THE COMMISSION

9.1 The Commission recognized that this item had been discussed by and reported on by the Infractions Committee (Annex 7) and endorsed all the recommendations included therein.

Item 10. REPORT OF THE WORKING GROUP TO STUDY ALTERNATIVE SCHEMES TO CALCULATE THE MEMBER COUNTRY CONTRIBUTIONS TO THE COMMISSION BUDGET

10.1 The Chairman of the Working Group, Mr. L. Weddig, presented the Group's Report. He informed the Commission that the Working Group had reviewed alternative plans proposed at the 1989 meeting, especially Alternative 2, which was the one preferred by the majority. He indicated that several variations of this Alternative had been studied and that a new alternative was also presented at this year's meeting. The Groups decided to take these alternatives back to their respective governments for further analysis and to continue its work through correspondence during the intersessional period.

10.2 The Delegate of the U.S.S.R. emphasized the importance of following Article XIII of the Convention, as regards the procedure to follow in putting a new calculation scheme into effect.

10.3 Agenda sub-items 10.1 to 10.5 were duly discussed within the Working Group and details on these items can be found in the Group's report (attached as Annex 8). The Report was adopted by the Commission with the same condition as for the Panel Reports, as discussed under Agenda Item 7.

Item 11. REPORT OF THE STANDING COMMITTEE ON FINANCE AND ADMINISTRATION (STACFAD)

11.1 The Report of the Standing Committee on Finance and Administration (STACFAD) was presented by the Committee's Chairman. The Commission approved the Report and endorsed all the recommendations included in it, including the 1991 Revised Commission Budget and the 1991 member country contributions. However, it was also recognized that due to time constraints, the Report could not be thoroughly reviewed by the Committee and therefore, editorial changes could be presented by correspondence.

11.2 Agenda sub-items 11.1 to 11.13 were thoroughly discussed by the financial committee and details on these items can be found in the Committee's report (attached as Annex 9).

Item 12. REPORTS OF SUBSIDIARY BODIES APPOINTED BY THE COMMISSION FOR THE MEETING

12.1 There was no subsidiary bodies appointed by the Commission for the 1990 Meeting.

Item 13. POSSIBLE EFFECTS OF LARGE-SCALE DRIFTNET FISHING ON TUNA STOCKS

13.1 The Executive Secretary presented document COM-SCRS/90/18 which gives a compilation of the pertinent sections of last year's report dealing with driftnets, the text of United Nation's General Assembly Resolution 44/225 on "Large-scale pelagic driftnet fishing and its impact on the living marine resources of the world's oceans and seas", as well as correspondence the Secretariat had received in response to its distribution of this U.N. Resolution.

13.2 The U.S. Delegate proposed a draft resolution for consideration by the Commission, and expressed that U.N. Resolution 44/225 should be supported by this Commission, as it has been in other commissions. He stated that the draft resolution is in support of the U.N. Resolution, including that moratoria on large-scale pelagic driftnet fishing be effected and that there be no expansion of large-scale pelagic driftnet fishing on the high seas in the Atlantic Ocean.

13.3 The Delegate of Japan reiterated that his country's position was stated in the statement presented at the 1989 Meeting (Appendix 5 to Annex 5 to the 1989 Commission Proceedings). He added that his delegation felt that driftnet fishing should be managed on a scientific basis, just as any other fishing gear. He informed the Commission that his Government had taken measures to prohibit driftnet fisheries. He stressed that the U.N. Resolution was established with a very delicate balance of interests of the concerned nations after long, difficult efforts. Therefore, he believed that repeating such discussion again at this time would be very time consuming and should be avoided. While supporting the U.S. draft resolution, he proposed a few amendments to it, which may encompass the concern expressed by South Africa at the Panel 3 meeting.

13.4 The Delegate of Japan proposed the following amendments to the proposed U.S. draft resolution: (1) adding the following to paragraph which starts with FURTHER NOTES: "particularly relating to the possibility of movement of driftnet vessels from the southern Pacific Ocean to the Atlantic Ocean as a result of the moratorium on driftnet fishing provided in 4(b) of Resolution 44/225,"; and (2) some editorial changes to the last paragraph of this draft resolution.

13.5 The Delegate of France stated that he could agree with the draft resolution proposed by the U.S. and the amendment by Japan. With reference to paragraph 4(a) of the U.N. Resolution, he believed that this Commission must support the Resolution but with a rational and scientific approach to the matter. The French delegation's position is in line with the SCRS in that this type of fishing must be rationally studied, not only on a regional basis but also according to species.

13.6 The Delegate of South Africa supported the principle of the draft resolution proposed by the U.S., and strongly supported the U.N. Resolution, and believed that these are within the context and purpose of this Commission. When this matter was discussed in Panel 3, the Delegate of South Africa presented a draft resolution concerning South Atlantic large-scale driftnet fishing, based on the special concerns it has (attached as Appendix 2 to Annex 6). He hoped that the draft would be formally taken up by the Commission for consideration.

13.7 The Delegate of Spain supported the U.S. proposal to adopt U.N. Resolution 44/225. She expressed concern that large-scale pelagic driftnet fishing could extend to other areas as a consequence of the prohibition of that fishery on July 1, 1991, in the

South Pacific, and the adoption of the U.N. Resolution by the Indian Ocean Tuna Commission. The Spanish Delegation also supported inclusion of the South African concerns. Finally, she proposed an amendment to the draft resolution by adding the date of July 1, 1991, at the end of the last paragraph, which means that the moratoria starts on that date. The statement by Spain on driftnets is attached as Appendix 1 to Annex 5.

13.8 The Delegate of France stated that the draft proposed by South Africa is interesting as it concerns the specific relationship between a gear and target species. He reiterated that a rational and scientific approach should be taken to this problem and its impact should be fully evaluated. He pointed out that term "large-scale" was not even defined in the U.N. resolution. He noted in the SCRS Report that the Observer from Taiwan had explained that the Taiwanese driftnets had shifted to the Indian Ocean and some vessels landed in Cape Town. This may be the basis for the wide-spread rumors of driftnet fishing being carried out in the South Atlantic. He believed that decisions should not be made on such rumors, but on rational and scientific evidence. He urged that the Commission study these problems and noted that he could not support the Spanish amendment.

13.9 The Delegate of Portugal agreed with the U.S. proposal.

13.10 The Delegate of Japan expressed his country's concern of reopening the discussion of the moratoria and pointed out that it was very difficult to reach an agreement in 1989 at the U.N. General Assembly. He also observed that if the amendment proposed by Spain is accepted, the moratoria would be going into effect one year earlier than indicated in the U.N. Resolution and asked the Commission not to change the context of the U.N. Resolution. He added that the U.N. Resolution already calls for no expansion of driftnet fishing in the Atlantic. Japan also believed that the concerns expressed by Spain have already been discussed earlier.

13.11 The Delegate of Korea stated that no Korean driftnet fishing occurs in the Atlantic Ocean. Korea expressed their support of the U.S. proposal.

13.12 The Delegate of Côte d'Ivoire observed that the U.N. Resolution was a compromise negotiated on very difficult conditions. He believed that the Commission, as one of the international fishery management organizations, should support this Resolution. For this reason, he believed that the draft resolution proposed by the U.S. would be adequate. He also endorsed a scientific approach, such as assessing fishing gear and geographical location as well as target species.

13.13 The Commission Chairman noted that there was a consensus to adopt a resolution by the Commission, proposed by the U.S. However, there had been two amendments proposed by Japan and by Spain. Before asking for a vote, he asked Spain to clarify the reason for its amendment.

13.14 The Delegate of Spain once again made it clear that it supports the draft resolution. It clarified that paragraph 4(a) of the U.N. Resolution sets June 30, 1992, as the date when the moratoria should be imposed. However, paragraph 4(c) states that "further expansion of large-scale pelagic driftnet fishing on the high seas of the North Pacific and all the other high seas outside the Pacific Ocean should cease immediately, ..." Consequently, in accordance with this paragraph of the U.N. Resolution No. 44/225 Spain requested that the moratoria in the Atlantic begin on the same date as in the Pacific, i.e., July 1, 1991, to avoid the transfer of vessels which utilize large-scale driftnets to that area of the Atlantic Ocean.

13.15 The Delegate of Portugal originally supported the U.S. proposal without any amendments, but he took due note that Spain proposed an earlier disposition of the moratoria in the Atlantic. He noted the presence of industrial fishing boats with large scale driftnets were observed operating near the Assures Islands, in the Portuguese fishing zone, and this causes much concern for Portugal, as the boats obviously came from the Pacific Ocean.

13.16 The Delegate of France noted that the relevant provisions of the U.N. Resolution are included in the U.S. proposal and that it is not advisable to have the moratoria earlier than provided for by the U.N. Resolution, as the Commission has a responsibility in this matter. The French Delegate felt that the concern expressed by Portugal is already covered in the draft proposal and reiterated his support of the proposed resolution as written.

13.17 Mr. Z. Suzuki (Japan), as an SCRS scientist, clarified that at the albacore stock assessment session the SCRS held lengthy discussions on this matter. Some rumors of large pelagic driftnet fishing in the Atlantic Ocean were discussed. However, no documentation or evidence was provided. The possible sighting of Taiwanese boats with driftnet aboard at a South African port was explained by the Taiwan Observer that the driftnet fishery does not operate at all in the South Atlantic, but that it does transfer a part of the fish caught in the Indian Ocean in Cape Town harbor. The SCRS stressed the necessity for further collection of concrete evidence before making any recommendations on this matter.

13.18 The Delegate of Spain replied that she had in her possession photos taken in the North Atlantic of vessels without flags fishing with large-scale pelagic driftnets, which were beyond any doubt Oriental vessels and crews, and these photos were available to the delegates.

13.19 The Delegate of Canada, in noting that the problem is a very complex and sensitive issue, proposed that the U.S. draft resolution be adopted without any amendments.

13.20 The U.S. Delegate agreed with the inclusion of the amendments proposed by Japan. He had taken due note of the comments about implementing the moratoria before the date given in the U.N. Resolution. He indicated that the U.S. had already passed domestic regulations that require the administration to seek within the Atlantic a ban on large-scale pelagic driftnet fishing and that his delegation would consider an earlier date. However, the U.S. Delegate noted that there is no consensus of the countries present.

13.21 The Delegate of Venezuela recognized the sensitivity of this issue and supported the draft resolution proposed by the U.S.

13.22 The Delegate of Spain insisted that in view of the evidence of the presence of new vessels in the Atlantic using large-scale driftnets and other new gear, it would be convenient to apply the moratoria at an earlier date, July 1, 1991.

13.23 The Delegate of South Africa, after listening to all the comments expressed by various delegates, was still concerned about what is happening in the South Atlantic, concerning large pelagic driftnet fishing, and supported the draft resolution presented by the U.S. and amended by Japan.

13.24 The Delegate of the U.S.S.R. also endorsed the draft resolution proposed by the United States, with the amendments proposed by Japan, and noted that it would fully correspond to the U.N. Resolution.

13.25 The Commission Chairman proposed that a vote be taken, first on the amendments and then on the draft resolution.

13.26 After some clarifications were made on the voting procedures, an open vote was taken around the table. As regards the vote on the amendment by Spain which requested that the moratoria start on July 1, 1991, three countries (Spain, Portugal, and the United States) voted in favor of the amendment; eight countries (Angola, Gabon, Ghana, France, Japan, Republic of Korea, Sao Tomé & Principe, and the U.S.S.R.) voted against the amendment; and five countries (Canada, Côte d'Ivoire, Morocco, South Africa, and Venezuela) abstained.

13.27 The results of the vote on amendments proposed by Japan are as follows: ten countries (Angola, France, Ghana, Japan, Republic of Korea, Sao Tomé & Principe, South Africa, U.S.A., U.S.S.R., and Venezuela) voted in favor of these amendments; one country (Spain) voted against; and five countries (Canada, Côte d'Ivoire, Gabon, Morocco, and Portugal) abstained.

13.28 The Chairman indicated that there was a consensus to accept the resolution proposed by the U.S. and, based on the vote taken, the resolution stands adopted, with the amendments proposed by Japan. The final resolution thus adopted by the Commission is attached as Annex 5.

Item 14. RECOMMENDATIONS FOR RESEARCH AND STATISTICS

14.1 The Commission endorsed all the recommendations made by the Panels for research and statistics.

Item 15. DATE AND PLACE OF THE NEXT REGULAR MEETING OF THE COMMISSION

15.1 The Commission decided to hold its next regular meeting in Madrid, for a five-day period, from November 11 to November 15, 1991. The Standing Committee on Research and Statistics (SCRS) will be meet the week preceding the Commission Meeting (i.e. November 4 to 8, 1991), and the west Atlantic bluefin tuna stock assessment session will start on October 28, 1991.

Item 16. OTHER MATTERS

16.1 No other matters were discussed.

Item 17. ADOPTION OF REPORT

17.1 The Proceedings of the First and Second Plenary Sessions were adopted, and it was agreed to adopt the Proceedings of the Final Plenary Sessions held on the last day of the meeting (i.e., November 16, 1990) by correspondence. At the same time, it was confirmed that since the reports of the various committees, Panels and Working Group were adopted in a rush without thorough review, editorial changes to the delegates' interventions could be presented by correspondence.

Item 18. ADJOURNMENT

18.1 The 1990 Commission Meeting was adjourned.

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The Proceedings were formally adopted in their entirety, including all annexes, with some corrections sent by correspondence.

COMMISSION AGENDA

1. Opening of the meeting
2. Adoption of Agenda, arrangements for the meeting and appointment of subsidiary bodies
3. Admission of observers
4. Review of Commission membership
5. Status of the ratification of the Protocol of amendment to the Convention
6. Report of the Standing Committee on Research and Statistics (SCRS)
7. Reports of Panels 1 to 4

   7.1 Possible new regulatory measures to be considered

8. Report of the Infractions Committee

   8.1 Status of the application of the regulations recommended by the Commission on yellowfin, bigeye and bluefin tunas
   8.2 Port Inspection

9. Collaboration of non-member countries in the objectives of the Commission
10. Report of the Working Group to Study Alternative Schemes to Calculate the Member Country Contributions to the Commission Budget

    10.1 Review of the follow-up of the 1989 Working Group recommendations
    10.2 Review of the alternative schemes proposed at 1989 meeting
    10.3 Study of other possible calculation schemes
    10.4 Study of the procedure to implement a new calculation scheme
    10.5 Future plans

11. Report of the Standing Committee on Finance and Administration (STACFAD)

    11.1 Administrative Report (1990 activities)
    11.2 Auditor's Report - 1989
    11.3 Review of the 1st half of the biennial budget - 1990
    11.4 Member country contributions pending payment
    11.5 Review of the Working Capital Fund
    11.6 Review of the financial status of the Yellowfin Year Program
    11.7 Review of the financial status of the Albacore Research Program
    11.8 Review of the financial status of the Program of Enhanced Research for Billfish
    11.9 Review of the financial implications of proposed 1991 Commission activities:

a) Recommendations made in research and statistics
b) Proposed intersessional meetings
c) Commission publications
d) Next Regular Commission meeting
e) Others

11.10 Review of the 2nd half of the biennial budget - 1991
11.11 Review of Panel membership
11.12 Member country contributions to the 1991 budget
11.13 Other financial and administrative matters

12. Reports of subsidiary bodies appointed by the Commission for the meeting
13. Possible effects of large-scale driftnet fishing on tuna stocks
14. Recommendations for research and statistics
15. Date and place of the next regular meeting of the Commission
16. Other matters
17. Adoption of Report
18. Adjournment

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LIST OF COMMISSION DOCUMENTS

COM/90/ 1 1990 Tentative Commission Agenda
2 1990 Annotated Tentative Agenda
3 Tentative Agenda of the Standing Committee on Finance and Administration (STACFAD) - 1990
4 Tentative Agenda of Panels 1 to 4 - 1990
5 Tentative Agenda of the Infractions Committee
6 Tentative Agenda of the Working Group to study alternative schemes to calculate the member country contributions - 1990
7 Panels
8 Administrative Report - 1990
9 1990 Financial Report & Revision of the 2nd Half of the Biennial Budget-1991
10 Secretariat Report on Statistics and Coordination of Research
11 Report of the Fourteenth Session of the Coordinating Working Party on Atlantic Fishery Statistics (CWP) (Paris, France, 5-9 February, 1990) and Report of the Second ad hoc Consultation on Global Tuna Statistics (La Jolla, California, USA, 21-22 May, 1987)
12 Draft Report of the World Bluefin Meeting on Stock Assessment of Bluefin Tunas (La Jolla, California, USA, 25-31 May, 1990)
13 Number not used.
14 Progress Report on the ICCAT Program of Enhanced Research for Atlantic Billfish
15 Program Plan for the ICCAT Program of Enhanced Research for Atlantic Billfish - 1991
16 Report of the Prograss Made by the ICCAT Albacore Research Program
17 Report of the Second ICCAT Albacore Workshop - 1990
18 Possible Effects of Drift Net Fishing on Tuna Stocks
19 Status of the Regulatory Measures Recommended by ICCAT for the Conservation of Yellowfin, Bigeye and Bluefin Tuna Stocks
20 ICCAT Port Inspection
21 Relations with Countries that are not Members of ICCAT
22 Working Group on the Calculations of Member Country Contributions
23 Report of the Eleventh Session of the Committee for the Management of Tuna in the Indian Ocean

OPENING ADDRESSES

Opening Address by Mr. L. Loira Rua
General Secretary of Maritime Fisheries of Spain

On behalf of the Government of Spain, I am honored to welcome to Madrid the participants of the Seventh Special Meeting of ICCAT.

I am well aware that you have a lot of work to do and very little time in which to do it. Therefore, my intervention will be short and I am sure that you will appreciate my brevity.

In the early days of the Commission, priority attention was given to the tropical species: skipjack, yellowfin and bigeye, as well as to bluefin tuna.

As time went on, studies were extended to other species, such as albacore, swordfish and billfishes.

The Commission publications, which are numerous and very useful, serve as permanent reference materials in fisheries laboratories and research centers the world over.

I cannot emphasize enough the interest which the Spanish Government has in the activities of this Commission and the confidence it places in the results of the Commission's work and research activities.

Proof of this is the incorporation in Spanish legislation of all the ICCAT management measures for the conservation of the resources, as well as its acceptance of the Port Inspection Scheme.

Therefore, let us encourage those member countries that have not yet accepted all the aforementioned measures, and all those countries which have a tuna fleet, to put these recommendations in effect. In this way, collectively and in solidarity, we will assure compliance in the objectives of the Commission: the conservation of tuna and tuna-like fishes in the Atlantic Ocean at levels which will permit maximum, continuous catches for food purposes.

The International Commission for the Conservation of Atlantic Tunas has reached a maturity in its development cycle. It has been in operation for over 20 years and during this time it has accumulated experience as well as technical and scientific knowledge which has enabled it to evaluate the tuna resources in the Atlantic. However, new developments are occurring in the fisheries and these must be studied in depth.

Thus, we note with satisfaction that among the subjects to be discussed at this year's meeting is the use of driftnets in tuna fishing, a problem which is under discussion in various international fora.

Therefore, we are interested in learning the scientific conclusions as regards the state of swordfish stocks, which is a matter of concern to us and for which we have asked for several years that an assessment be carried out.

On the other hand, I would like to call your attention to the Commission's financial situation, which has worsened this year, in spite of efforts made the year before to solve these problems, which, unfortunately were not successful. For this reason, I feel obliged to ask all the delegations here present to make every possible effort to find solutions to this situation, which has been going on for the last few years. In this respect, I would like to announce that Spain is ready to augment its collaboration with the Commission, provided that the rest of the member countries also agree along these lines.

The work carried out by the Secretariat is commendable and deserves all our respect and appreciation.

I would like to express to the Secretariat staff our satisfaction for their work and our hopes that their level of effectiveness demonstrated to date, will continue in the future.

I close now with my sincere wishes that this Seventh Special Meeting of the Commission is successful. I also hope that you will enjoy your stay in Madrid, a city which for the majority of the people here present is very familiar.

Opening Address by Mr. S. Makiadi J. Lopes
Chairman of the Commission

This is the third time that I, as Chairman, have welcomed you to the Commission meetings, a task which gives me great pleasure.

During the last few years, I have had several opportunities to refer, always in a praising manner, the activities of the Commission, particularly as regards the programs for skipjack and yellowfin.

At this time, I would like to make special mention of the albacore and billfish programs. The activities of the Commission continue at an ever-increasing pace, as demonstrated by the scientific meetings that have taken place this year at the Secretariat, such as the meeting of the editorial group of the Yellowfin Year Program, the swordfish stock assessment session, the albacore workshop and the species groups meetings. Some of these meetings involved a great deal of preparatory work, documentation, data bases, computer programs, as well as translation and preparation of documents.

The SCRS has just completed its sessions and tomorrow the SCRS Chairman will present the Committee's report, including the results of its studies and pertinent recommendations, so that the Commission can take decisions based on scientific conclusions.

From our Agenda I can see that during the course of the week, the Commission will be faced with very important issues.

Among other things, I would like to point out the study of alternative methods to calculate the member country contributions, the possible repercussions of tuna fishing using driftnets, and, naturally, all matters referring to the conservation of the species, which is the main objective of this Commission.

However, in order for the machinery to function perfectly at its normal pace, we need a strong base which sets the machinery in motion and keeps is working.

The Commission needs the energy necessary to keep it active.

Undoubtedly, some of you have understood that I am referring to the financial aspect. The Commission should study carefully all the external factors which affect its finances and the level of incidence of each one of those factors. In this way, we will be able to find and reach agreements oriented towards a solution of the financial problems that have affected the Commission over the last few years and which have caused it serious difficulties.

Before ending, I would like to express my appreciation to the SCRS scientists who have worked very hard over the last few days in order to present us their report this morning.

Finally, I would also express my sincere gratitude to the Secretariat staff, who through their dedication and sacrifice during a very long and difficult period, have made it possible for the Commission to continue it activities.

RESOLUTION BY ICCAT
IN SUPPORT OF THE UNITED NATIONS GENERAL ASSEMBLY RESOLUTION 44/225, ADOPTED 22 DECEMBER 1989, REGARDING LARGE-SCALE PELAGIC DRIFTNET FISHING ON THE HIGH SEAS

WHEREAS among the objectives of the International Commission for the Conservation of Atlantic Tunas is to ensure the effective conservation and rational management of tuna and tuna-like fishes in the Atlantic Ocean, including the adjacent seas; and

WHEREAS Resolution 44/225 adopted by the United Nations General Assembly on 22 December 1989 on large-scale pelagic driftnet fishing and its impacts on the living marine resources of the world's oceans and seas requests entities, such as the Commission, to study urgently large-scale pelagic driftnet fishing and its impacts on the living marine resources and to report their views to the Secretary-General; and

WHEREAS Resolution 44/225 also calls on all members of the international community to cooperate so as to carry out its various provisions

now therefore the Commission

ENDORSES Resolution 44/225

NOTES that Resolution 44/225 recommends that all members of the international community agree that moratoria should be imposed on all large-scale pelagic driftnet fishing by 30 June 1992, with the understanding that such a measure will not be imposed in a region or, if implemented, can be lifted, should effective conservation and management measures be taken based upon statistically sound analysis to be jointly made by concerned parties of the international community with an interest in the fishery resources of the region, to prevent unacceptable impact of such fishing practices on that region and to ensure the conservation of the living marine resources of that region;

FURTHER NOTES, particularly relating to the possibility of movement of driftnet vessels from the southern Pacific Ocean to the Atlantic Ocean as a result of the moratorium on driftnet fishing provided in 4(b) of Resolution 44/225, that Resolution 44/225 calls for no expansion of large-scale pelagic driftnet fishing on the high seas in any of the world's oceans, including the Atlantic Ocean.

CALLS UPON all of its member nations to support the intent of the above Resolution 44/225 with regard to moratoria on large-scale pelagic driftnet fishing and with regard to no expansion of large-scale pelagic driftnet fishing on the high seas in the Atlantic Ocean.

Appendix 1 to Annex 5

Spanish Statement on Driftnets

The Spanish Delegation supports the proposal presented by the U.S. Delegation on the adoption by ICCAT of the United Nations Resolution 44/225.

The use of pelagic driftnets in the fisheries for small tunas is a relatively new phenomenon. Due to their high catch capacity, the use of these driftnets tends to increase, which could involve a grave risk for the rational exploitation of such species.

We cannot continue to ignore the prohibition of the use of large-scale driftnets in the area of the southern Pacific after 1 July 1991, as well as the adoption of the United Nations Resolution by the Indian Ocean Fisheries Council. If we do not adopt similar measures for the Atlantic Ocean, the effort of more than 1000 vessels that use these gear, as indicated in the Resolution, could be transferred to the Atlantic Ocean.

It was pointed out that during 1990 there was an increase in the number of vessels that use these gear in the Atlantic, which is reflected in the concern expressed by the scientists in their report. The interventions of diverse delegations pointing out the presence of these fleets for the first time, together with the communication that Bermuda had transmitted to ICCAT, confirm this trend and the need to eradicate this expansion, in coherence with the United Nations Resolution 44/225.

We know that the adoption of moratoria for the use of large-scale driftnets involves considerable expense for those countries whose fleets use these gear. We want to point out our recognition of Japan's position and their decisions in this respect. In this sense, we hereby announce that Spain must assume the cessation of fishing activities of more than 75 vessels which use these gear, due to the recent passing of a Ministerial Order dated 22 October 1990 which prohibits the use of this gear by the Spanish fleet, along the lines of the United Nations Resolution.

In conclusion, we reiterate once again our support of the moratoria proposed by the United States concerning large-scale driftnets, defined in the Wellington Convention at the end of last year as those whose length exceeds 2.5 km, for the whole ICCAT Convention Area, on the date in which such activities have been prohibited in the South Pacific, i.e., 1 July 1991.

REPORT OF THE MEETINGS OF PANELS 1 TO 4

REPORT OF THE MEETING OF PANEL 1

1. OPENING

Dr. L. Koffi, representing Côte d'Ivoire, chairman of the Panel, opened the meeting of Panel 1.

2. ADOPTION OF AGENDA

The Agenda was adopted without changes (Appendix 1 to Annex 6).

3. ELECTION OF RAPPORTEUR

Dr. A. Fonteneau (France) was designated rapporteur.

4. REVIEW OF PANEL MEMBERSHIP

The Panel currently has sixteen members: Angola, Brazil, Cape Verde, Côte d'Ivoire, Cuba, France, Gabon, Ghana, Japan, Korea, Morocco, Portugal, Sao Tomé & Principe, Spain, United States, U.S.S.R. and Venezuela.

The Observer from Mauritania expressed interest in being allowed to attend the Panel meeting as an observer, which was accepted by the Panel.

Three Panel members (Brazil, Cape Verde and Cuba) were not represented at the meeting.

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

The SCRS Chairman, Dr. J. L. Cort (Spain), summarized the conclusions of the Committee as regards yellowfin and skipjack.

5.a Yellowfin

Dr. Cort indicated that the SCRS usually uses the hypothesis of two stocks of yellowfin in the east and west Atlantic, even though this hypothesis is being questioned due to several recoveries of tagged adult yellowfin which have crossed the Atlantic from off the United States to off the coasts of west Africa.

In the west Atlantic, preliminary estimates of the state of the yellowfin stock were presented to the SCRS. This analysis concludes that the west Atlantic yellowfin stock is near full exploitation. The SCRS felt that this conclusion was very preliminary and recommended that the state of the stock analyses be conducted by the Working Group that will meet in April, 1991.

In the east Atlantic, nominal purse seine fishing effort has remained moderate since 1984, when part of the purse seine fleet moved to the Indian Ocean. The yield of this stock, however, is high, particularly in 1989 when 122,000 MT were taken due to exceptionally high catch rates for large yellowfin. The SCRS tried to estimate the effective effort which is currently being exerted on the east Atlantic yellowfin stock. Even though this effective effort still cannot be measured with precision, it seems probable that the marked increases in purse seine efficiency are recent (for example, the use of bird radar), and that the SCRS still does not adequately take these changes into account.

The SCRS conclusion is that effective fishing effort on this stock has returned to a level near full exploitation which was observed at the beginning of the 1980's.

5.b Skipjack

In the east Atlantic, the skipjack catch has remained at a high level since 1985, in spite of the reduced purse seine fishing effort. The 1989 level (119,000 MT) is lower than the record 1988 level, but is still high. This is due to the increased efficiency of the purse seine fleets in catching skipjack, particularly by the FIS fleet where the catch rates of this species are considerably higher since 1984. The west Atlantic catch reached a level of 27,000 MT, mainly due to the good catches made in 1989 by the Brazilian baitboats (22,800 MT).

No analysis of the state of the skipjack stock of the east Atlantic was presented to the SCRS. The scientific committee felt, however, that the conclusion of the International Skipjack Year Program that the stock was under-exploited from 1980 to 1982, when high fishing effort was exerted, is still valid with the present reduced purse seine effort. The potential increase in catches is still not determined.

A preliminary analysis of the state of the west stock, based on catch rates of the Venezuelan tuna fleet, was presented to the SCRS. This analysis concludes that the stock is near full exploitation. This very preliminary assessment must be developed.

6. MEASURES FOR THE CONSERVATION OF STOCKS

The chairman of the Panel reviewed the ICCAT regulation prohibiting the landing of yellowfin less than 3.2 kg.

France expressed its concern on the possible transfer of intensive purse seine fishing effort, due to the shift of the fleet from other oceans. The Delegate of France expressed concern and noted that this massive arrival of purse seiners should be avoided because it involves a risk once again of over-exploitation of the east Atlantic yellowfin stock, comparable to that observed in the early 1980's. Spain shared this concern, and expressed its own fears of the development, without scientific control, of yellowfin fisheries using large driftnets. Spain also emphasized the necessity for these fishing countries to take all useful measures to arrive at an improved application of the size-limit regulation in effect for yellowfin tuna.

Following these discussions, Panel 1 felt that the size-limit regulation in effect for yellowfin tuna should be maintained.

7. RESEARCH

The Panel reviewed the SCRS recommendations concerning yellowfin and skipjack. One of these recommendations noted that the Working Group on Western Atlantic Tropical Tunas was not able to meet as planned in 1990. The Delegate of the United States expressed the special interest of his country to conduct research and assessments at least on the west Atlantic yellowfin stock, due to the recent, rapid development of the fisheries exploiting this stock. Panel 1 supported the research recommended by the SCRS.

8. DATE AND PLACE OF THE NEXT PANEL MEETING

The Panel agreed to meet during the next Commission meeting.

9. OTHER MATTERS

In this Agenda item, the Delegate of Gabon spoke of the statistical problem which his country has had to face for a number of years. He stated that many purse seiners, among others those of Spain, catch yellowfin and skipjack in his country's exclusive economic zone, which is rich in tunas, and that no fishing statistics from this fleet are given to his country. The Delegate of Spain replied that all fishing statistics of her country are submitted to ICCAT, as required by the scientists. In the case of countries which have signed fishing agreements with the EEC, which is not the case of Gabon, all detailed fishing statistics are then submitted by the EEC.

The Observer of Mauritania also expressed the difficulties that he has experienced reading ICCAT documents, to geographically locate the tuna catches.

The ICCAT Assistant Executive Secretary, Dr. P. Miyake, stated that all the catch data for the surface fishery are available at the Secretariat by 1°x1° area and by month, and that the summaries of these data are published in the Data Record. These figures are, therefore, accessible to all countries. He also recalled that ICCAT member countries could easily obtain these statistics by fleet by simply sending a request to the Secretariat.

The members of the Panel took due note of these comments.

10. ADOPTION OF REPORT

The Report of Panel 1 was adopted with the condition that editorial changes can be presented by the Panel members, by correspondence, on their respective interventions and insofar as such changes are consistent with has actually transpired during the meeting, after the report has been circulated by the Secretariat. This adoption procedure had to be followed due to the extreme time constraints on the last day of the 1990 Commission Meeting.

11. ADJOURNMENT

The meeting of Panel 1 was adjourned.

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The adopted Report now includes all those corrections presented by the member country delegates and observers to their respective interventions.

REPORT OF THE MEETING OF PANEL 2

1. OPENING

The meeting was opened by the Chairman of the Panel, Mr. D. Silvestre (France).

2. ADOPTION OF AGENDA

The Agenda was adopted without changes (Appendix 1 to Annex 6).

3. ELECTION OF RAPPORTEUR

Mr. A. Fernández Aguirre (Spain) was designated rapporteur.

4. REVIEW OF PANEL MEMBERSHIP

All the Panel members (Canada, France, Japan, Korea, Morocco, Portugal, Spain and the United States) were represented.

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

The Chairman of the SCRS, Dr. J. L. Cort, reviewed and summarized the work of the SCRS on bluefin and albacore in the North Atlantic.

5.a Bluefin tuna

Bluefin fisheries exist in the west and east Atlantic.

Regarding the west stock, the results of this year's assessment show trends similar to those in the 1989 SCRS assessment as well as to other analyses conducted previously, particularly those from the last few years. The size of the stock of large fish (ages over 8) is approximately 10 percent of that of 1970 and the stock of ages 6 and 7 is approximately 50 percent.

The population of small fish (ages 1 to 5) of the last few years has not been well estimated. The best estimates of recruitment (age 1) in recent years seem almost the same as for previous years (1979-82).

Estimates of medium-sized fish in recent years have increased with respect to the low 1983 figure.

For the east stock, the results of this year's analyses show a trend similar to that of the 1989 SCRS analysis. In 1989, the size of the stock of medium-sized fish (ages 5 to 9) represented 3/4 the 1970 value, while the size of ages 10+ (large fish) represented somewhat more than half. The most recent estimates of stock size for ages 2 to 4 have been increasing since 1970, although there are great fluctuations. This shows that east Atlantic bluefin tuna recruitment is variable.

Fishing mortality on small fish increased in the time series. No trends were observed for large fish.

5.b Albacore - North

The Report of the Second ICCAT Albacore Workshop describes the available data, the process used in creating the catch tables and the abundance indices by age chosen for the 1975-1989 period.

Many uncertainties and defects were pointed out in the data used, which can be summarized as follows:

- The catch-at-age table was generated by the slicing method for older age classes. This separation does not seem realistic, especially for age classes over three years.
- The abundance indices used could not be standardized and doubts exist on the values for some years.
- There were discrepancies in the longline catch at age for the years 1981-1985 which were considered by the Workshop. These catches at age were corrected; however, they should be confirmed.

Additional studies indicate that fishing mortality for the period 1975-1989 was perhaps under-estimated by the Workshop.

Estimated recruitment fluctuated moderately without noticeable trends.

The yield-per-recruit analysis indicates that during recent years (1987-1989) the exploitation rate was below the level of maximum sustainable yield, although with a range of uncertainty. In conclusion, the North Atlantic stock seems to be moderately exploited at present. However, the above-mentioned uncertainties could introduce some changes in this conclusion if they are clarified in the future.

The Spanish delegation expressed its concern for this resource and made some observations about the SCRS Report.

The assessment was based on data that were not sufficiently detailed, as the nominal effort for the four different fleets which catch this resource was not standardized. Therefore, the catch per unit of effort is not reliable and the exact point on the exploitation pattern cannot be defined.

For this reason the Spanish delegation expressed its surprise at the SCRS opinion that the stock is moderately exploited.

As for the activities of the Spanish fleet in this very traditional fishery, it noted that while fishing effort in the last few years has remained stable, a small but continuing decrease has been observed in the catches. Analyzing the fishing days used by the troll and baitboat gears, it is seen that while the troll fishery has increased the number of fishing days, it has not been able to maintain the catches at last year's level. As for the baitboat fishery, there was a reduction in the number of effective fishing days, and, consequently, a reduction in catches.

The Spanish delegation reported on the verification of the dispersion of the resource due to the introduction of new fishing gears in the Bay of Biscay and the obvious incompatibility of the new gears with the traditional gears.

The Delegate of Spain expressed the hope that the Albacore Research Program, as well was the study of this resource financed by the EEC, can demonstrate the real exploitation level, as well as the high level of interaction between gears. She ended by expressing the hope that the studies would allow analysis of the foreseeable effects of the new gears on the migrations of albacore.

The Panel Chairman stated that it was desirable to have available finer data and suggested that vessels of all fleets be encouraged to submit catch data.

The Delegate of Spain indicated that it was necessary to obtain better data on gears and catches, but wished to emphasize that the SCRS had indicated that there was an under-estimation of fishing mortality. She applauded the work of the SCRS and encouraged this Committee to continue its work of providing reliable results and to overcome the present uncertainties.

The French delegation recalled that the SCRS had reached the conclusion of the stock being moderately exploited, being a clear example of an over-exploited stock. There are no serious uncertainties as indicated by the historical series. The French delegation stated that the SCRS had good reasons to consider that the stock is moderately exploited, which is clear even for those who are not experts in population dynamics. In fact, during more than 25 years, the North Atlantic albacore stock has supported an equilibrium catch above 50,000 MT. Since the beginning of the 1980's, fishing effort exerted on this stock declined considerably for economic reasons; this decline led to a decrease in the catch, which was only 32,000 MT in 1989. This results in the present under-exploitation of the stock, independent of the usual uncertainties on these indices. These uncertainties are common, in fact, in most of the stock assessments. The SCRS report was drafted with some haste, but the diagnostic and the conclusions are clear.

The French Delegate stated that the possible interactions between new and traditional fishing methods were reviewed by the SCRS and that there was no evidence to confirm that there is a major problem. Active research should be conducted, however, on this possible interaction.

The Spanish Delegate indicated that with that idea, the stock could apparently absorb any additional effort with any type of gear. She requested a simulation of the situation that would occur if the fleet operating with traditional gears were converted to the new gear and asked that the SCRS analyze up to what point the north stock of albacore could assume additional effort.

Concerning the question presented by Spain that the decline in effort has apparently had no effect on the catch rates of the fleet, Dr. A. Fonteneau responded on the behalf of France that:

1. The departure of longliners which exploited a fraction of the adult stock (age 5+) could in no way bring about an improvement in catch rates (CPUE) of the surface gears which catch juveniles.

2. The departure of French trollers could only contribute in a marginal fashion to the improvement in catch rates of the Spanish fleet, due to the fact that the two fleets essentially catch juveniles. In fact, the catch rates of these surface fisheries depend much more on the fluctuations in recruitment than on the moderate mortality rate exerted at that time.

The Panel Chairman agreed with Spain that the maximum equilibrium yield of the stock must be evaluated more precisely in order to determine the potential of the development of different fisheries which exploit this stock, which corresponds to the mission as defined in the Convention.

The SCRS Chairman recalled the limitations of the scientists and explained the difficulties that arise in the stock assessments of highly migratory species like tunas.

The SCRS Chairman emphasized that the study carried out by the SCRS on North Atlantic albacore was voluntarily conservative because by taking into account the uncertainties the scientists had made their projections cautiously.

The observer of the European Economic Community informed the Panel that the EEC had financed a scientific study on albacore which was carried out jointly by the IEO and IFREMER, and that the results will be sent to ICCAT upon official request by the latter.

6. MEASURES FOR THE CONSERVATION OF STOCKS

6.a Bluefin tuna

A regulation prohibiting the catch and landing of bluefin tuna less than 6.4 kg for the entire Atlantic went into effect in August, 1975. After putting this measure into effect, the percentage in the catches of individuals less than 6.4 kg was low in the west Atlantic since 1976. For the east Atlantic and Mediterranean, the percentage of individuals of less than 6.4 kg is still high. In the opinion of the bluefin group, this measure is not being applied in the east Atlantic and Mediterranean.

As for the west stock of bluefin tuna, an additional measure limited the catches in 1982 to 1,160 MT and to 2,660 MT annually during the period 1983-1990 and a third measure limited catching bluefin tuna less than 120 cm.

As regards the management of the resource in the west Atlantic, taking into account the concern of the Committee which does not see an improvement in the stock abundance, catches made for scientific monitoring should not be increased.

In the east Atlantic, because of the doubts concerning previous assessments, the Committee recommended that no changes be made in the present management measures. Although there is still great uncertainties, it can be said that the population of older fish has been reduced to half that of 1970.

The SCRS Chairman commented on the recommendation of this Committee to conduct alternate-year analyses, that is, the assessments would be made one year on the east stock and the next on the west stock.

The Panel Chairman noted that there were no SCRS recommendations to change the measures presently in effect; he also summarized the non-compliance in the size limit and the new proposal for alternate-year assessments for each stock.

The Delegate of the U.S.A. congratulated Dr. Cort and the SCRS and noted that the SCRS Report was not encouraging. He said that since 1983, the U.S. had maintained its monitoring quota and that, together with Canada and Japan, had hoped for more positive indices, especially in the medium and large size categories. However, there is no appreciable increase in the spawning stock. The U.S. delegation felt that we must continue to be cautious and that it was necessary to consider that next year new measures would have to be studied. He also reported that the frequent contacts with Canada and Japan would continue.

The Delegate of Canada shared the concern of the scientists and pointed out that some of the regulation measures had not been successful. In any case, the improvement in the situation would be in the long term and the conservation efforts should also be planned for the long term. The Canadian delegation also was willing to continue the consultations with the countries concerned.

The Delegate of Japan joined the previous delegations and congratulated the SCRS for its work. He emphasized the positive aspects of the report and pointed out the stable situation of the west stock and the detection of possible increases in population size of medium-sized fish. He suggested an increase in research on juveniles in the Gulf of Mexico, mainly in terms of recruitment. The Delegate of Japan mentioned harpoon fishing, noting that the good results show that something had occurred in the west stock. On the other hand, the CPUEs for ages over 4 or 5 years were very stable. He also announced his desire to cooperate with the Government of Morocco to develop the technology of securing artificially hatched seeds of bluefin tuna in the Mediterranean.

As regards which stock would be studied first by the SCRS, the Committee Chairman referred to Item 16 of the 1991 research program in which the Committee recommended concentrating on the assessment of the west Atlantic stock in 1991 as Commission requested advise for that stock.

6.b Albacore

The SCRS Chairman reported that the Committee had not recommended any regulations for albacore in the Atlantic. The Panel did not recommend any conservation measures for this resource.

7. RESEARCH

7.a Bluefin tuna

The SCRS Chairman reported on the group's recommendation to develop better methods for estimating partial recruitment of bluefin and to develop CPUE indices from Japanese longline data for the west stock.

As regards the east stock, data need to be improved.

In general biological and basic statistical data need to be improved for Atlantic bluefin tuna. In order to have more biological information and statistical data, and to improve the analytical aspects of the assessment, a steering committee was created. One of its duties will be to carry out the coordination with other agencies, especially with the General Fisheries Council of the Mediterranean (GFCM). The Committee should also coordinate the possible sources of financing and study the viability of an ICCAT Bluefin Year Program.

Finally, the SCRS Chairman mentioned the need for research on reproduction biology and on growth, incorporating information from tagging studies.

The Spanish delegation asked the SCRS Chairman to clarify the gears that appear under the title "Other Gears", as concerns the statistics for the east stock. Under this title appear catches made by pelagic trawls and driftnets and these should be recorded in the statistics in the future.

The French delegation supported this proposal, noting the convenience of having available finer data.

The observer of the EEC also commended the SCRS for its work, and expressed the willingness of the EEC to cooperate. He shares the concerns expressed as to the increasing catches of juveniles and the lack of observance of the recommendations in force. He moreover recalled that the EEC's status as observer does not provide it with any basis for monitoring effectively the application of these recommendations by its member countries which fish bluefin tuna and are not members of ICCAT.

In reply to an query from the EEC as to the presence of "pirate" vessels in the Mediterranean, the Delegate of Japan reported that his country had sent a patrol boat to the Mediterranean from May 27 to June 30, 1990 to see that no Japanese vessel would fish during the spawning season. Japan reported that it had observed seven vessels in the Mediterranean, five of which were identified, and that it also had photographs which it placed at the Commission's disposal.

The Panel Chairman proposed sending this information to the ICCAT Executive Secretary so that he could write to the countries concerned.

The Delegate of Spain thanked Japan for the information and noted that they were the same vessels that last year had been identified by her country. She reported that these vessels had not used Spanish ports as bases and requested information from the rest of the delegations as to the ports from which these vessels could be operating. However, she assured that studies and controls will be continued at Spanish ports in order to have available the most current information.

7.b Albacore

The SCRS Chairman noted that in the Committee's Report reference was made to the twelve recommendations on statistics and research made by the Second Albacore Workshop. In addition, the Albacore Research Program has planned research activities to be carried out in 1991 and 1992, as agreed in the previous recommendations. The SCRS Chairman made special reference to the need for obtaining data on the stock structure and size and for assessing the Mediterranean stock. He recommended a tagging program on large albacore in the Bay of Biscay and in the Azores.

The Spanish delegation supported the SCRS recommendation, emphasized its interest in the EEC study and indicated the need for research on the interaction between gears, concretely, the problem which has arisen with the appearance of new fishing gears competing with the traditional gears. She recalled, also, that the SCRS recommended that attention be placed on large-scale driftnet fishing.

8. DATE AND PLACE OF NEXT PANEL MEETING

The Panel agreed to meet at the same time and at the same place as the next Commission Meeting.

9. OTHER MATTERS

No other matters were discussed.

10. ADOPTION OF REPORT

The Report of Panel 2 was adopted with the condition that editorial changes can be presented by the Panel members, by correspondence, on their respective interventions and insofar as such changes are consistent with what has actually transpired during the meeting, after the report has been circulated by the Secretariat. This adoption procedure had to be followed due to the extreme time constraints on the last day of the 1990 Commission Meeting.

11. ADJOURNMENT

The Meeting of Panel 2 was adjourned.

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The adopted Report now includes all those corrections presented by the member country delegates and observers to their respective interventions.

REPORT OF THE MEETING OF PANEL 3

1. OPENING

The meeting of Panel 3 was opened by the Chairman, Mr. L. Weddig of the United States of America.

2. ADOPTION OF AGENDA

The tentative Panel Agenda proposed in document COM/90/4 was adopted unchanged. The Agenda is attached as Appendix 1 to Annex 6.

3. ELECTION OF RAPPORTEUR

Mr. A. Penney of South Africa volunteered to act as rapporteur for this meeting.

4. REVIEW OF PANEL MEMBERSHIP

Panel members Japan, South Africa, Spain and United States were present. Brazil was absent. There were no requests for change in Panel membership.

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

5.a Southern bluefin tuna

Dr. J. L. Cort reviewed the SCRS Report on southern bluefin tuna. The state of the stock was reviewed at the Ninth Tripartite Scientific Meeting of Australia, Japan and New Zealand. It was determined that the biomass of the parent stock (age 8 and older) is at historically low levels and that, under current catch levels (11,750 MT), projections show the parent stock should reach its lowest level in 1990 or 1991. Many projections predict recovery, even under increased catches of up to 20,000 MT, with the parent stock attaining 1980 biomass levels by 2010.

5.b Albacore - South

Dr. Cort reviewed the SCRS report on albacore in the southern Atlantic. The generalized production model for southern Atlantic albacore was updated using standardized catch and effort data for the Taiwanese longline fishery. The MSY predicted by this model was 27,300 MT. Catches in 1986 and 1987 exceeded this figure, while 1988 and 1989 catches were slightly below MSY. Effective effort has also declined since 1987 to slightly below the predicted optimal effort.

There were no comments from the Panel on these assessments.

6. MEASURES FOR THE CONSERVATION OF STOCKS

6.a Southern bluefin tuna

Since 1971, the Japanese have adopted a voluntary restriction on fishing in areas where young fish are abundant. Australia has maintained a national quota of 14,500 MT since 1984. Japan and New Zealand introduced quotas of 23,150 MT and 1,000 MT, respectively, in 1985. The 1989 Tripartite Administrative Meeting decided to reduce catch limits to 6,065 MT (Japan), 5,265 MT (Australia) and 420 MT (New Zealand), although the possible revision of these limits is currently being considered as a result of this year's scientific discussions.

6.b Albacore - South

No regulations are currently in effect for albacore in the southern Atlantic Ocean.

In commentary on the absence of regulatory measures for albacore, South Africa noted that the first assessment for this species in the southern Atlantic showed a number of disturbing conclusions. Taiwanese longline catch rates had decreased from 1967 to 1989 and the catch of juvenile albacore in the surface fishery had increased since 1979. The predicted MSY and optimal effort levels were significantly exceeded in 1986 and 1987. The SCRS recommended no management measures, but did recommend that close attention be paid to the possible development of fishing with large driftnets in the Atlantic Ocean, noting that Pacific driftnet vessels were capable of rapidly shifting effort to the Atlantic. South Africa noted that a marked decline in catch rates and decrease in mean size of albacore caught had also been observed by her own fleet during the past year. She had additionally observed almost 200 foreign vessels equipped with gillnets transshipping in excess of 3,000 MT of albacore and other tuna species in Cape Town harbour during the year. South Africa accordingly presented a draft proposal on the prohibition of driftnet fishing in the Atlantic Ocean (Appendix 2 to Annex 6).

Spain requested that this proposal be made available in writing, but noted that the issue of driftnet fishing was of concern to the entire Atlantic Ocean. She therefore proposed that the proposal be introduced in the Plenary Session, when driftnets were being discussed.

Japan noted that its government had already responded to the U.N. resolution on August 15 by prohibiting her vessels from using driftnets outside the north Pacific Ocean. She further noted that Japan conducted no driftnet fishing outside the Pacific Ocean.

Both Spain and the United States took note of South Africa's concern and suggested that this should be reflected in the Panel Report, but suggested that South Africa's proposal be presented under the relevant agenda item during the Commission Plenary Session.

7. RESEARCH

7.a Southern bluefin tuna

The SCRS Chairman noted that research on southern bluefin tuna was being directed by other international arrangements and that no research recommendations had been made.

7.b Albacore - South

The SCRS supported the research recommendations made by the Second Albacore Workshop. The Workshop initially evaluated the state of exploitation of the northern albacore stock and it was recommended that a similar evaluation be conducted for the southern stock. It was noted that the participation of scientists from all countries exploiting the southern stock was essential to the success of such an evaluation.

8. DATE AND PLACE OF NEXT PANEL MEETING

It was agreed to hold the next meeting of Panel 3 to coincide with the next Regular Meeting of the Commission, to be held during 1991.

9. OTHER MATTERS

No other matters were discussed.

10. ADOPTION OF REPORT

The Report of Panel 3 was adopted with the condition that editorial changes can be presented by the Panel members, by correspondence, on their respective interventions and insofar as such changes are consistent with what has actually transpired during the meeting, after the report has been circulated by the Secretariat. This adoption procedure had to be followed due to the extreme time constraints on the last day of the 1990 Commission Meeting.

11. ADJOURNMENT

The Meeting of Panel 3 was adjourned.

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The adopted Report now includes all those corrections presented by the member country delegates and observers to their respective interventions.

REPORT OF THE MEETING OF PANEL 4

1. OPENING

The Chairman, Mr. A. Kharlamov of the U.S.S.R. delegation, opened the meeting by welcoming the Panel to the discussion.

2. ADOPTION OF AGENDA

The Chairman reviewed the agenda which was adopted by the Panel (Appendix 1 to Annex 6).

3. ELECTION OF RAPPORTEUR

The Delegate for Canada offered Mr. D. Aldous to serve as the Rapporteur for the Panel.

4. REVIEW OF PANEL MEMBERSHIP

The Chairman confirmed the membership of the Panel as including: Angola, Canada, France, Japan, Korea, Portugal, Spain, United States, U.S.S.R. and Venezuela.

All Panel members were present.

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

5.a Bigeye

Dr. Cort referred to the state of the stock as a single stock in the Atlantic. Using longline data and a production model, abundance indices suggest a Maximum Sustainable Yield (MSY) of 74,900 MT. The current catch is below that level.

The opinion of the Delegation of Ghana was that there could be no scientific basis whereby FIS purse seiners fishing the same schools as Tema baitboats could select tuna fish larger than 2.5 kg as alleged by the SCRS report, leaving the smaller than 2.5 kg fish exclusively for the Tema baitboats.

The Ghana delegation requests that the documents should be amended to read as follows: "In the eastern Atlantic, the purse seine and baitboat fleets take small bigeye tuna (approximate average weight 2.5 kg to 5.5 kg).

5.b Bonito

Dr. Cort reported that the current level of information concerning bonito does not enable the Commission to make an assessment on the state of the stock. Food availability studies suggest there is a large biomass.

5.c Billfish

Regarding blue marlin, Dr. Cort pointed out that the SCRS report indicated the Venezuelan catch per unit effort (CPUE) has been in a decline since 1984. Similar results are shown by SCRS for white marlin taken by the Venezuelan recreational fishery. The CPUE for sailfish is also in decline in the western Atlantic taken in the same fishery. There is no new analysis regarding sailfish in the eastern Atlantic.

A statement by the United States on billfish is attached herewith as Appendix 3 to Annex 6.

5.d Other Species

Dr. Cort referred to the work of the stock assessment meeting held in September, 1990, and reviewed the SCRS report regarding swordfish, reporting that three sets of assessment were completed for the three stock structure hypotheses of (a) a north/south division of the Atlantic stock; (b) a single Atlantic stock; and (c) an east/west division of the North Atlantic stock. Virtual population analyses (VPA) were completed for each option.

He reported similar results from the separate analyses of stock size each indicating an increasing trend in the one year old and two to three year old fish combined with a decreasing trend in the stock size of older fish (age 5 and over) in the catch. Studies indicate swordfish fishing mortalities are currently higher than F-max.

Dr. Cort advised that the use of production models in these SCRS analyses provided inconclusive results. Longer periods of catch history need to be analyzed to improve this work.

Dr. Fonteneau, of the French Delegation, indicated that the current stock structure analysis gave inconclusive results concerning the high catches of juveniles. Two hypotheses can be derived of the increased yields observed for juveniles: that recruitment has increased as indicated by SCRS, that recruitment has remained constant and it is the fishing mortality on juveniles which is then very increased. He has suggested that a production model be used in the analysis of the swordfish catch.

Dr. Fonteneau has, however, indicated that the use of a production model showed clearly that swordfish were under-exploited, and that consequent measures should be taken to conserve this stock, especially by reducing the catch.

6. MEASURES FOR THE CONSERVATION OF THE STOCKS

6.a Bigeye

Dr. Cort offered the current minimum size regulation of 3.2 kg has not reduced the catch of small fish by the tropical surface fleet. He recommended maintaining current regulations for the management of the stock.

6.b Bonito

Dr. Cort stated coastal management programs, which may be adjusted every year, are effective in assisting the recovery of this stock which is close to maximum exploitation. There were no further recommendations from the Commission on management of bonito.

6.c Billfish

Dr. Cort reported that no regulations are currently in effect for the conservation of billfish and no such recommendations are made by SCRS at this time.

6.d Other Species

The Delegate of Spain commended the work of the SCRS. She also stated that the Spanish fishing fleet has demonstrated its concern for the condition of the swordfish stock in a responsible manner by moving its fishing effort out of the North Atlantic. The Spanish delegation is surprised that other nations, who in previous meetings have expressed concern for the condition of the stock, have at the same time increased their landings of swordfish. This appears to be an inconsistent position.

Spain expressed concern that it has not been possible to identify the swordfish stocks in the Atlantic and for the big increase observed in the catch of age 1 and 2 juveniles. Based on this, Spain considers that precautionary measures should be taken and proposes the following:

1) that ICCAT adopt a minimum size restriction of 20-22 kg live weight to protect age 1 and age 2 fish. This measure could be complemented by national legislation dealing with time/area closures as appropriate;

2) that effort be frozen throughout the Atlantic considering the development of new fleets and changing of flags of current fleets;

3) banning the use of new gears in harvesting swordfish; and

4) promotion of the shifting of fishing activity to areas outside the Atlantic. Spain noted the past successful introduction of such a measure with regard to yellowfin.

These measures have been developed in consultation with scientists and are deemed as the most efficient measure which may be enforced.

The Delegate of the U.S. expressed his appreciation for the comments by Spain and could agree that immediate conservation measures must be implemented. He noted that the U.S. delegation took a strong stand on this issue during the ICCAT session of 1989 where no action was taken. He read from a prepared statement which is attached to these minutes as Appendix 4 to Annex 6. He advised that he has had informal discussions with other delegations regarding the proposal to reduce catch by 30 percent and has heard their concerns in this regard. He is prepared to consider the minimum size proposal of Spain. He is willing to consider provisions for fleets which take swordfish only as a by-catch of other fisheries. He is also willing to consider provisions for nations who take less than 1,000 MT annually. He stated that effective action must be taken now. It is too late to limit action to only the provision of a minimum size measure. More drastic action must be taken. It is the view of the U.S. that catch must be reduced to approximately 13,000 MT.

The U.S. Delegate read from a prepared statement providing the U.S. proposal in this matter which is attached to this report as Appendix 5 to Annex 6.

The Delegate of Portugal agreed with the assessment that the stock is in a declining position and accepted that measures must be taken to reduce catch. He cannot support that these measures be applied to member nations with small fleets taking small amounts of swordfish. He does not support freezing the catch of the smaller fleets. The larger fleets have caused the problem and they should be responsible for taking the most drastic action to reduce the catch.

The Delegate of Canada noted the comments of nations landing the larger share of the catch and reported that although he could support some of the proposals made, he noted that Canada has implemented controls over its own fleet. While he recognizes that further measures may have to be taken, he suggested that those nations responsible for the majority of the catch should be responsible for most of the reduction. He tabled a prepared statement which is attached to this report as Appendix 6 to Annex 6.

The Delegate of France stated that in view of the information attached to the SCRS Report, it seemed that the shift in Spanish effort towards the South was located just below 50°N in the Gulf of Guinea area and did not correspond to a real shift of the fishing fleet outside the North Atlantic. He has also supported the proposal of Portugal in that the smallest fleet not be affected by the measures to reduce catches.

The Delegate of Japan offered that since the U.S. and Spain account for 82 percent of total catch in 1988, these nations should take the most drastic measures to reduce catch. The Japanese fleet directs its effort toward bigeye and cannot accept a reduction in this fishery due to a restrictive swordfish by-catch measure. His prepared statement is attached to this report as Appendix 7 to Annex 6.

The Delegate of Spain advised that Article 64 of the Convention on the Law of the Sea requires all nations to cooperate in the conservation of highly migratory species. Therefore, all participants in the fishery should shoulder the responsibility for management measures. She also advised the responsible attitude of the Spanish fleet in shifting their effort to the south has reduced the catch of the fleet in the North Atlantic by 36 percent and 17 percent in the total Atlantic. The Spanish proposal for a minimum size is reasonable and justified by SCRS recommendations and is also enforceable.

The U.S. Delegate advised that he supports a minimum size restriction and stated that both the U.S. and Spain should take the majority of the reduction in catch. Smaller fleets could be accommodated and Canada should be recognized for effort taken already to limit its catch.

Spain proposed that the measures adopted should apply to the whole Atlantic since a smaller stock definition is inconclusive. She also offered that a minimum size provision of 25 kg would reduce catch by 40 percent in terms of the number of fish taken and 15-40 percent by weight in the North Atlantic. This will have the effect of reducing the catch in the overall Atlantic by 15-20 percent.

The Delegate of the U.S. suggested that although he supports the application of minimum size to the whole Atlantic, he proposes a reduction of catch in the North Atlantic by 30 percent.

The Delegate of Spain stated they support a limit on effort in the whole Atlantic and suggested that the minimum size measure would provide a reduction in the Spanish catch in the North Atlantic. She also offered that the Panel should receive technical advice regarding the by-catch level of the Japanese fishery in order to determine the level appropriate to the fishery.

The Delegate of Japan stated he could not support the policy of using a by-catch provision of swordfish to restrict the activity of the bigeye directed fishery.

The Delegate of Korea supported the Japanese concerns.

The Delegate of Canada proposed that the fleets of vessels fishing swordfish could be separated into three categories: those who take swordfish as a by-catch; those who take the largest proportion of the catch; and those that have small fleets fishing small amounts of swordfish.

The Delegate of the U.S. stated that he is prepared to take steps to reduce the catch of swordfish involving the reduction of catch in the North Atlantic using 1988 as a base year. He is also prepared to accept a minimum size of 25 kg applied on a per landing basis. Regarding by-catch in other fisheries, he is prepared to take the advice of a technical group. In addition, he is willing to accept relief for nations landing less than 1500 MT with the understanding that these fleets could not increase their catch beyond 45 percent in excess of this figure in any year.

The Delegate of Spain provided that she could not accept the notion of dividing fleets into categories and offered that we must achieve consensus on the measures to be applied to all members without differentiation.

The Delegate of the U.S. responded that although he is in agreement that it would be better to achieve a set of measures to apply to every member, the U.S. is prepared to recognize the efforts of some members in restricting landings and is desirous of taking these circumstances into consideration.

The Delegate of Canada stated his appreciation of the position of the Spanish delegation and suggested that the Canadian fleet has been under restriction for some time and has effectively reduced its portion of the catch while other nations did not curb effort or catch. The U.S. proposal to restrict the increase of catch of smaller players to 45 percent of 1988 levels will not produce drastic increases in landings overall.

The Delegate of Spain reaffirmed her position that the measures adopted must apply to all members. The arguments of the U.S. and Canada did not convince her to reassess her position.

The Delegate of the U.S. offered that there is a precedent for adoption of different measures for different fleet components in recognizing the mobility of vessels in the application of restrictive measures. It will be the U.S. fleet which will undertake a real reduction in catch. The shift of Spanish effort to the South Atlantic will assist in easing the effect of the restriction on its fleet.

The Delegate of Portugal stated that there is justification for the application of special measure for the smaller fleets considering the mobility of vessels, the relative importance of swordfish in the fishery, and the importance of the fishery to the economy as a whole. He supported Spain in that measures should be taken uniformly where possible, but the present circumstances provide for special measures to be taken.

The Delegate of Canada suggested that other years may be used in the determination of the base. He offered that if 1988 is not appropriate, members could use some other year. He added that 1988 is seen by his delegation as a compromise.

The Delegate of Spain suggested that some analysis be conducted to demonstrate the implications of the U.S. proposal to limit smaller fleets to a 45 percent increase in catch. She also commented on the nature of the Canadian proposal to use other years for the base, suggesting that SCRS used the base of 1988 and this should be used by the Panel.

The Delegate of Canada offered to prepare the calculations of the implications of the U.S. proposal.

The Delegate of the U.S. suggested that if ICCAT were to adopt management measures, these could be applied to activities of non-member nations if they enter the fishery. There are actions which could be taken and in the longer term, he suggested the establishment of a Working Group of legal experts to study this further. He also offered the U.S. delegation would prepare a draft statement for consideration of the Panel.

The Delegate of Spain supported this proposal and tabled its written statement for the record. This is attached to this report as Appendix 8 to Annex 6.

The Delegate of Japan provided information to the Panel regarding the catch level of various species by the Japanese fleet. This is attached to this report as Appendix 10 to Annex 6. He stated that the Japanese fleet does not now or in the future intend to direct its efforts toward swordfish and proposed a 10 percent by-catch limit of swordfish of the total catch of swordfish and bigeye.

The Delegate of the U.S. tabled a Working Draft of regulatory measures representing a composite of the views of all delegations. He thanked delegations for their contributions which led to the preparation of the document and proceeded to review it by paragraph.

The Delegate of Spain expressed her desire to use the precise wording of the SCRS document in the preamble.

The Delegate of the U.S. expressed his willingness to use the wording proposed by Spain.

The Delegate of Angola proposed that the Panel review the substance of the document paragraph by paragraph to gain commonality.

The Delegate of Spain expressed her concern that the first paragraph does not reflect the Spanish position.

The Delegate of Canada suggested the document must be considered as a whole as Spanish concerns are addressed in other paragraphs.

The Delegate of Spain expressed her support for paragraph two relating to minimum size and proposed that the measure apply to the whole Atlantic in order to be effective.

The Delegate of Japan expressed a practical concern for the implementation of this measure and proposed it apply to the North Atlantic only. He proposed alternate wording for paragraph three incorporating their concerns.

The Delegate of Spain proposed that the measure of limitation of catch should not restrict a member government to the methods of implementation. Each party may adopt different measures including license control or Total Allowable Catches (TAC's) to achieve the same result.

The Delegate of the U.S. introduced paragraph four dealing with countries with small catches.

The Delegate of Portugal supported the proposed wording since the total impact of allowing the countries with smaller catches to increase by 45 percent is far less than the by-catch now taken and which would be permissible to countries who take swordfish as a by-catch.

The Delegate of Canada supported the position of Portugal.

The Delegate of Spain expressed her concern that the measures proposed to conserve swordfish must be applied to all members. She stated that some members, such as Canada made a strong stand on conservation measures last year and then increased her catch in an irresponsible manner. She requested that Canada be consistent with positions taken in NAFO in this regard.

The Delegate of Canada responded that Canada is the only member with restrictive legislation in place and a modest increase in 1989 catch cannot compare to the relative increases by other members since 1986. He suggested the this is not the forum for discussion of NAFO and proposed the Panel restrict its comments to swordfish.

The Delegate of the U.S. suggested there is precedent for special measures for countries with small catches. Bluefin measures within ICCAT allowed for such a measure. Also, the IATTC adopted separate measures for large boats and coastal fisheries. He suggested the language used in this measure is similar to other measures taken in similar circumstances. This point of view was shared by France.

The delegate of Canada suggested he could support a more general wording of this measure.

The Delegate of the U.S. introduced paragraph five relating to by-catch measures.

The Delegate of Japan proposed new wording restricting the application of this measure to the North Atlantic and adding the intention to maintain fishing mortality at current levels.

The Delegate for the U.S. introduced paragraph six relating to application to non-ICCAT countries.

The Delegate of France proposed deleting paragraph seven, which made reference to prohibiting "new gears" in the fishery. The Delegate of France asked about the meaning of the term "new gears" and felt what is important is not so much the use of one gear or another, but the compliance with the ICCAT conservation measures. He added that it did not seem right that one Contracting Party resolves its internal problems within the framework of ICCAT.

The proposal of France was supported by the U.S., Japan and Korea.

The Delegate of Japan proposed the deletion of paragraph eight dealing with movement of vessels.

The paragraph was withdrawn by the delegate of Spain.

A new document was produced, translated and distributed to the Panel for review. This document is attached to this report as Appendix 11 to Annex 6.

The Delegate of the U.S. expressed the concern that the preamble does not reflect the alternate wording as suggested by Spain and indicated he is willing to accept that wording.

The Delegate of Spain indicated that the application of the proposed measures in the North Atlantic only would reduce their effectiveness and therefore she proposed that they be applied to the whole Atlantic in order to be truly effective.

The Delegate of the U.S. pointed out that the measures have a two-tiered application, some in the whole Atlantic and some in the North Atlantic only.

The Delegate of Japan confirmed his position of the application of the by-catch provision to the North Atlantic only.

The Delegate of Spain expressed her concern for the 30 percent reduction as proposed by the U.S. suggesting the minimum size measure would provide for effort reductions of 15-20 percent.

The Delegate of the U.S. proposed that in order to recognize this concern, the first paragraph could be amended to reduce the 30 percent to a 15 percent reduction and apply this measure to fish weighing greater than 25 kilograms.

The Delegate of Spain stated that she would have to consider this proposal and consult with her delegation.

The Delegate of Angola congratulated the Panel for the work undertaken so far but deplored the lack of cooperation in attempting to resolve the matter fully. He reserved the right to participate in any future discussion regarding conservation of swordfish.

The Delegate of Canada suggested that delegations may need to consult on the proposed wording of the draft agreement.

The Chairman introduced the revised text of the agreement regarding the conservation of swordfish.

The Delegate of the U.S. noted his understanding that the Panel had reached a provisional agreement and they were consulting on technical matters regarding the latest amendments.

The Delegate of Spain expressed their disagreement since paragraph four does not address the concerns of her delegation in that the application of the measures is not uniform for all member countries. She also noted a concern that the by-catch provision of paragraph five does not apply in the South Atlantic. Given these concerns, while the Spanish delegation supports some measures of the proposal, it cannot give its support for the document as a whole. The Spanish statement on swordfish is attached to this report as Appendix 9 to Annex 6.

The Delegate of Canada noted his appreciation for the concerns of both Spain and the U.S. and although he also has some reservations concerning the text, the Panel must view this document as an attempt at reaching a compromise in this regard. Canada, therefore, supports the proposal.

The Chairman suggested that the document be submitted without consensus to the Commission Plenary Session as an attachment to the minutes of the meeting while noting the concerns expressed by members.

The Delegate of Morocco expressed his concern that paragraph four will limit the development of coastal states to utilize the resources off their coasts and he does not support the intention of the paragraph.

The Delegate of the U.S. offered that the concerns of Morocco would probably be addressed in paragraph four.

The Chairman pointed that there is an error in the French text of the proposal which would be rectified for the submission to delegates.

The Delegate of the U.S. noted the record of the meeting would contain the comments of all delegations and moved that this compromise document, in its original English version, be sent to the Commission Plenary Session.

The motion was seconded by Japan and Venezuela.

7. RESEARCH

7.a Bigeye

There were no recommendations for bigeye research by the Panel.

7.b Bonito

Dr. Cort offered current studies regarding stock assessment should be handed to ICCAT when complete.

7.c Billfish

The U.S. supports the activities of the ICCAT Program of Enhanced Research for Billfish and urges the adoption of the proposed research program.

7.d Other Species

The Delegate of the U.S. recommended the Panel support the SCRS recommendations regarding swordfish research.

8. DATE AND PLACE OF NEXT PANEL MEETING

The Panel will meet at the time of the next Regular Meeting of the Commission.

9. OTHER MATTERS

No other matters were discussed.

10. ADOPTION OF REPORT

The Report of Panel 4 was adopted with the condition that editorial changes can be presented by the member countries, by correspondence, on their respective interventions and insofar as such changes are consistent with what has actually transpired during the meeting, after the report has been circulated by the Secretariat. This adoption procedure had to be followed due to the extreme time constraints on the last day of the 1990 Commission Meeting.

(Later, at the Commission Plenary Session, it was agreed that the wording of the proposed "Regulatory Measures Recommended by ICCAT for the Conservation of Atlantic Swordfish Stocks" (Appendix 11 to Annex 6), originally drafted in English, should not be altered.)

11. ADJOURNMENT

The Meeting of Panel 4 was adjourned.

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The adopted Report now includes all those corrections presented by the member country delegates and observers to their respective interventions.

Appendix 1 to Annex 6

Agenda for Panel 1 (Tropical Tunas)
Panel 2 (Temperate Tunas-North)
Panel 3 (Temperate Tunas-South)
Panel 4 (Other Species)

1. Opening
2. Adoption of Agenda
3. Election of Rapporteur
4. Review of Panel membership
5. Report of the Standing Committee on Research and Statistics (SCRS)6. Measures for the conservation of stocks:

Panel 1	*Panel 2*	*Panel 3*	*Panel 4*
a) Yellowfin	a) Bluefin (North)	a) Southern bluefin	a) Bigeye
b) Skipjack	b) Albacore (North)	b) Albacore (South)	b) Atlantic bonito
			c) Billfishes
			d) Other species

7. Research
8. Date and place of next Panel meeting
9. Other matters
10. Adoption of Report
11. Adjournment

Appendix 2 to Annex 6

Draft Resolution Proposed by South Africa on Driftnet Fishing in the Southern Atlantic Ocean (Attached to the Report of Panel 3)

Considering the indications of heavy exploitation of the albacore stock in the southern Atlantic Ocean presented by the SCRS and noted by South Africa's own tuna fleet;

Noting the general concern expressed by the SCRS and Panels 2 and 3 at the possibility of movement of driftnet vessels from the southern Pacific Ocean to the Atlantic Ocean as a result of the moratorium on driftnet fishing proposed in United Nations General Assembly Resolution 44/225;

Noting the statement by the observer from Taiwan at the SCRS meeting, stating that Taiwan had introduced a voluntary moratorium on driftnet fishing by her vessels in the Atlantic Ocean;

South Africa proposes that all ICCAT member countries encourage the progressive reduction of any driftnet fishing activities in the southern Atlantic Ocean, with a view to a total prohibition on driftnet fishing in the southern Atlantic by 1 July 1991, with the provision that this prohibition can be relaxed in future if recommended by the SCRS on the basis of revised stock assessments.

Appendix 3 to Annex 6

Statement by the United States on Billfish (Attached to the Report of Panel 4)

The United States once again wishes to applaud the work done by the SCRS on its implementation of the ICCAT Program of Enhanced Research for Billfish. The necessary collection of data is progressing; however, much work still remains to be done. The SCRS has indicated the areas of statistical data collection where increased effort is still required. The Committee specifically recommends the collection of the following statistics:

a) Accurate estimates of total landings for all types of gear, by species, for Atlantic blue marlin, white marlin, sailfish, and spearfish;

b) Catch, effort, size and landings by sex (where possible) statistics from all countries, by month and by five-degree areas;
c) Separate sailfish and spearfish statistics;
d) Descriptions of the billfish fisheries continued in the Eastern Atlantic; and
e) Evaluation of discards of swordfish/marlin in both historical and recently developed fisheries, particularly for fisheries in the Gulf of Guinea.

In addition, four areas of research are identified:

a) Age and growth studies of marlin and sailfish should continue;
b) Standardized abundance indices for billfish should be developed;
c) Increased effort in implementing the ICCAT billfish tagging program;
d) Focus research on the reproductive biology of billfishes.

The United States supports the outlined activities of the ICCAT Program of Enhanced Research for Billfish and once again urges the adoption of the proposed research program.

In light of the original premise and the continuing fiscal situation of the Commission, the cost of such program should and will continue to come from private contributions.

Finally, we would emphasize the need for member states to publicize the work of the Billfish Program and encourage active participation in the tagging program and accurate reporting in order to provide the basic data needed for these important analyses.

Appendix 4 to Annex 6

Statement by the United States on Swordfish
(Attached to the Report of Panel 4)

Since 1987, the U.S. Delegation has expressed its concern over the decline in the swordfish resource in the North Atlantic. We have noted the need for expanded monitoring of the stock by ICCAT countries and for the last two years have stressed the need for effective management measures to avoid more severe over-fishing of the resource.

This year's SCRS Workshop on swordfish again reported that "a consistent decreasing trend in stock size of adults (age 5+) has been observed from 1978 to the present." Additionally, there has been a consistent trend of declining average weight in the catch. The report further stated that the present yield cannot be maintained over the long-term without either a decreasing fishing mortality or continued increases in recruitment. The workshop report also noted that it is unlikely that recruitment will continue to increase and SCRS recommended that fishing mortality be reduced below the 1988 level.

The 1990 Swordfish Workshop report went on to report that the analysis conducted by the SCRS indicated that there is a high likelihood (90 percent) that the reduction needed to reach optimum is in excess of 50 percent. Despite uncertainties in the analyses which indicate that the absolute values estimated for fishing mortality on age 5+ fish may be higher than probably occurred, the Workshop concluded that without decreases in fishing mortality over the next few years, there is a strong probability of detrimental effects on future yield.

In addition, independent assessments conducted more than a year ago in the united States concluded: that the spawning biomass had declined to about 40 percent of the 1978 level; that fishing mortality has increased for all ages with the highest mortality rates occurring for the spawning stock in recent years; and that the average size of swordfish taken in the northwestern Atlantic had decreased steadily to about 50 percent of the 1978 level.

It was with this background that the U.S. last year proposed limiting or reducing the catch of swordfish throughout the north Atlantic. We believed then that a 20 percent was warranted and so proposed that this international organization which has the responsibility for developing effective management measures for the tuna and tuna-like species in the Atlantic take such action. As a concession, the U.S. was even prepared to accept a cap on fishing mortality as a first step toward addressing this problem.

Unfortunately, we left this forum last year with no management plan agreed to by members of this Commission. While we are encouraged to hear indications that some member states have taken unilateral action, it continues to be the U.S. view that this Commission has the obligation to take effective international action involving the participation of all ICCAT members.

Based upon our review of the science and the recommendations of the SCRS, the United States supports the reduction in fishing mortality on North Atlantic swordfish of 30 percent. The formula by which this reduction is applied is a matter for further discussion and we welcome the opportunity to work with our fellow ICCAT Commissioners and their delegations to develop the necessary formula and conservation plan.

Appendix 5 to Annex 6

U.S. Proposal Concerning the Management of Swordfish
(Attached to the Report of Panel 4)

The United States delegation proposes the following regulatory measure concerning the North Atlantic swordfish stock.

Taking into account that the SCRS has determined that the present yield of the North Atlantic swordfish stock cannot be maintained over the long term without decreasing fishing mortality, and since it is unlikely that recruitment will continue to increase:

The Commission recommends that effective in 1991, the Contracting Parties whose nationals have been actively fishing for swordfish in the North Atlantic take measures to reduce the fishing mortality in the area north of 5 degrees North latitude, by 30 percent from recent levels.

The reduction in fishing mortality from recent levels shall be determined by each Contracting Party from the average catch in recent years 1986 to 1989, or may be a reduction from the average fishing effort during the same period that will result in the equivalent reduction of fishing mortality.

In view of the advice by the SCRS that the analysis conducted indicated that there is a high likelihood that the reduction needed to reach the optimum (F0.1) is in excess of 50 percent, further reductions in subsequent years may be required consistent with the future analysis by SCRS.

Appendix 6 to Annex 6

Statement by Canada Concerning Swordfish (Attached to the Report of Panel 4)

Canada would like to compliment the SCRS for the work they have done and for the very useful report which they have produced. The scientists have provided a valuable assessment of the swordfish fishery. Unfortunately, the news is not good. The swordfish stock or stocks are in decline. Canada is concerned about the health of swordfish in the Atlantic Ocean, especially as it relates to the over-harvesting of small fish and to the decline in age 5+ fish.

There are a number of fundamental points mentioned in the SCRS report that we must bear in mind when we address this species. First of all landings have increased substantially since 1978 and fishing mortality is higher. Secondly, the catch of small fish is increasing at the same time as the number of large fish is decreasing. Thus the average size of fish caught is declining, at the same time as the tonnage of the catch is increasing.

The SCRS states (Section SWO-4.c, paragraph 3) that the present yield cannot be maintained over the long term without either a decreasing fishing mortality or continued increases in recruitment. In the SCRS's view it is unlikely that recruitment will continue to increase.

Because of increased catches of swordfish, in particular small fish, the decline in the numbers of large fish and the decline in the mean weight of the catch and high recruitment, the SCRS report has recommended that fishing mortality on juveniles be reduced. The SCRS report also indicates that the yield per recruit could be increased by allowing more young fish to survive. The SCRS report further suggests that to achieve this, amongst others, the following control measures could be explored:

a) Controls on effort
  - Restricted entry, vessel replacement,
  - Seasons,
  - Reducing overall catch, and

b) Measures to avoid small fish
  - Time area closures and
  - Gear restrictions.

Canada is proud of its efforts to manage the swordfish stocks in the Canadian zone through the implementation of:

- Limited entry
- Quotas
- Gear restrictions
- Vessel replacement restrictions
- Submission of log record requirements.

Canada recognizes that further measures are necessary for the conservation of the Atlantic swordfish stock and is willing to do its part. However, we feel strongly that countries such as Canada have already made significant contribution to the protection of the resource. We encourage those Contracting Parties which have permitted harvests to increase to what we feel are unacceptable levels, to reverse this trend by considering measures similar to those adopted by Canadian domestic swordfish management.

Canada encourages Contracting Parties to approach this matter in the spirit of open and cooperative dialogue which can and in fact must result in conservation and management measures for the improvement of the swordfish fishery.

Canada recognizes the benefit of these measures and has in fact already incorporated many of them in its domestic swordfish management plan. To further promote development of the stock, Canada proposes that no more than 15 percent of the catch (by weight) be less than 25 kg round weight.

Canada also recognizes that other measures could have a positive impact on the fishery and calls for other countries to implement some or all of these recognizing each measures equivalent effect as a means of promoting growth in the stock and increased yield/recruit.

Appendix 7 to Annex 6

Japanese Statement on Swordfish
(Attached to the Report of Panel 4)

1. The main reason for the problem of swordfish in the North Atlantic is the sharp increase of U.S. and Spanish catch in the 1980's. Namely, the U.S. increased the swordfish catch from 912 MT in 1977 to 6,129 MT in 1988, whereas Spain increased the catch from

3,309 MT in 1977 to 9,600 MT in 1988. In 1988 the catch of both countries constituted 82 percent of the total catch of swordfish in the North Atlantic. Thus, the two countries have the primary responsibility to adjust the current excessive level of swordfish catch in this area.

2. For the Japanese fishery, swordfish is a subsidiary target species, which is unavoidably caught in the fishing operation targeting bigeye tuna. Japan cannot accept the swordfish catch restriction which will hamper the fishing operations for bigeye, a species of under-exploited status according to the SCRS.

However, in stating this, Japan is not taking a negative position on cooperation for the swordfish conservation in the North Atlantic. Japan does not have an intention to increase the fishing mortality of swordfish in the region, and is prepared to accept the restriction of juvenile catch which was recommended by the SCRS.

1. Japan will not conduct the operation targeting swordfish. We will restrict incidental catch of swordfish less than 10 percent of the total catch in terms of number of fish.

2. We prohibit the retention of small swordfish (1-2 years old).

Appendix 8 to Annex 6

Regulatory Measures for Swordfish Proposed by Spain
(Attached to the Report of Panel 4)

1. Measures to protect juveniles:

   -- Minimum landing size or minimum landing weight set by ICCAT: 125 cm or 25 kg round weight. Proposed to protect specifically ages 1 and 2.

   -- Establishment of time/area closures (measures on national level).

2. Freezing of fishing effort in the entire Atlantic Ocean.

3. Prohibition of the use of new gears or contrivances which could cause a real increase in fishing effort.

4. The member countries will promote as much as possible the movement of their fleets to other under-exploited areas outside the Atlantic Ocean.

5. The incidental catches of swordfish in the fishery targeting other species will not surpass 10 percent in number of of individuals or in weight of total catch.

Appendix 9 to Annex 6

Statement by Spain on Swordfish
(Attached to the Report of Panel 4)

In accordance with the position expressed by our delegation at the ICCAT Meetings since 1987, once again we manifest our concern for this fishery.

We want to emphasize that this concern has been expressed clearly by the responsible behavior of the Spanish fleet which, contrary to other fleets, has shifted its fishing effort considerably in the last two years to areas outside the North Atlantic, to the South Atlantic and the Pacific Ocean. This was done at their own initiative and without any financial assistance from the Government, as is reflected in the catch data submitted to the SCRS.

We are very surprised to find that countries which, at the last ICCAT meeting asked for drastic reductions for the sake of the conservation of the resource, have maintained and in some cases increased their catches and their effort in the North Atlantic. We profoundly regret, therefore, that the behavior of these fleets have not corresponded to the declarations which their respective delegations made at this forum.

With respect to the report presented this year by the Scientific Committee concerning swordfish, we can see the enormous task which faced the scientists to try to clarify the uncertainties reflected in last year's report which prevented the Spanish delegation from accepting the drastic management measures proposed by the United States delegation. Taking into account the considerable effort, we want to express our appreciation to all the scientists for the work carried out and we urge them to continue their studies on this resource in order to clarify the doubts which still persist.

One of the basic contradictions which, in our understanding, is derived from the report is having set the catch level at 1978 as the Fmax for the swordfish fishery, since the evolution of this fishery throughout a ten-year period has shown that the catches have tripled and in spite of this, the abundance of age 1 individuals is at a level one and a half time that of 1978.

However, in spite of these doubts, taking into account that, on the one hand it has not been possible to identify the swordfish stocks in the Atlantic Ocean, and on the other, that there has been an important increase in recent years in the catch of juveniles which has consequently resulted in a decrease in the average weight, and the fishing mortality on age 1 and age 2 fish has increased considerably, the Spanish delegation considers it necessary to adopt precautionary measures in the meantime until results of the assessments provide more reliable and realistic conclusions. These measures are as follows:

1. Measures to protect juveniles:-- Minimum size or minimum weight at landing established in ICCAT: 125 cm or 25 kg live weight. Proposed to protect specifically ages 1 and 2.

   -- Establishing time-area closures (measures at the national level).

2. Freezing of fishing effort in the whole Atlantic Ocean.

3. Prohibition of the use of new gear or devices which may involve a real increase in fishing effort.

4. The member countries will encourage inasmuch as possible the shift of their fleets to other under-exploited areas outside the Atlantic Ocean.

Appendix 10 to Annex 6

Swordfish By-catch Statistics Provided by Japan
(Attached to the Report of Panel 4)

The numbers of swordfish and bigeye tuna caught by the Japanese longline fishery in the Atlantic Ocean (in 1,000 fish) are as follows:

Year	*Swordfish*	*Bigeye*	*Total*	*Percent of Swordfish*
1982	66	704	770	8.6
1983	32	352	384	8.3
1984	63	524	587	10.7
1985	73	676	749	9.2
1986	44	500	544	8.1
1987	39	419	458	8.5

Appendix 11 to Annex 6

Regulatory Measures Recommended by ICCAT for the Conservation of Atlantic Swordfish Stocks (Attached to the Report of Panel 4)

Taking into account that the SCRS has determined that the present yield of the swordfish stock cannot be maintained over the long term without decreasing fishing mortality or the unlikely continued increase in recruitment over the next few years, and without decreasing fishing mortality over the next years, there is a significant probability of detrimental effects on future yield;

The Commission recommends that effective in 1991:

FIRST: That the Contracting Parties whose nationals have been actively fishing for swordfish in the North Atlantic take measures to reduce the fishing mortality of fish weighing more than 25 kg in the area north of five degrees North latitude by 15 percent from recent levels. The reduction in fishing mortality shall be determined by the catch in 1988 or may be a reduction of fishing effort that will result in the equivalent reduction of fishing mortality.

SECOND: In order to protect small swordfish, the Contracting Parties take the necessary measures to prohibit the taking and landing of swordfish in the entire Atlantic Ocean weighing less than 25 kg live weight (125 cm lower jaw fork length); however, the Contracting Parties may grant tolerances to boats which have incidentally captured small fish, with the condition that this incidental catch shall not exceed 15 percent of the number of fish per landing of the total swordfish catch of said boats.

In addition, the Contracting Parties are encouraged to take other appropriate measures within their national jurisdictions to protect small swordfish, including, but not limited to, the establishment of time and area closures.

THIRD: The Contracting Parties that are directly fishing for swordfish shall take the necessary measures to limit the fishing mortality of swordfish in the entire Atlantic Ocean to the level of catch in 1988, or will limit the fishing effort that will result in the equivalent level of fishing mortality.

FOURTH: That, notwithstanding the first and third paragraphs, Contracting Parties whose recent catch levels are small shall keep their annual catches within levels that are reasonable and abide by conservation measures mentioned in paragraph two.

FIFTH: That the Contracting Parties whose nationals do not target swordfish in the North Atlantic Ocean shall take necessary measures to limit the incidental catch to no more than 10 percent of the total weight of the entire catch so that fishing mortality of swordfish will stay at the current level.

SIXTH: That the Executive Secretary bring to the attention of governments of countries other than Contracting Parties, whose nationals fish for swordfish in the Atlantic Ocean, the measures being taken by the Contracting Parties and seek their cooperation in taking similar conservation measures consistent with the recommendations of the Commission.

REPORT OF THE MEETING OF THE INFRACTIONS COMMITTEE

1. OPENING OF THE MEETING

The meeting was opened by the Mr. S. Makiadi J. Lopes, Chairman of the Commission. Mr. Makiadi stated he would chair the Committee meeting since Cuba, the elected chairman, was not present at this year's meeting, and there were no volunteers.

2. ADOPTION OF AGENDA

The Agenda, circulated prior to the meeting, was adopted without modification. It is attached as Appendix 1 to Annex 7.

3. ELECTION OF RAPPORTEUR

Ms. M. E. McCall (U.S.A.) was designated rapporteur.

4. STATUS OF THE APPLICATION OF THE REGULATIONS RECOMMENDED BY THE COMMISSION ON YELLOWFIN, BIGEYE AND BLUEFIN TUNAS

The Executive Secretary presented Document COM/90/19, which contains the text of the ICCAT regulations currently in effect, and shows the status of their application in the different member countries (See Tables 1, 2 and 3 attached to this Report). The Executive Secretary noted that some countries have replied that they have not implemented regulations because they do not fish for the specific species.

5. COLLABORATION OF NON-MEMBER COUNTRIES AS REGARDS THE REGULATORY MEASURES ADOPTED BY THE COMMISSION

The Executive Secretary presented document COM/90/21, which contains a copy of the letter sent by the Secretariat in January 1990 to all non-ICCAT countries that have an Atlantic coast or that fish tuna and tuna-like fishes in the Atlantic. Responses have been received form Belgium, Bermuda, England, Denmark, Guatemala, Mexico, Mauritania and Trinidad and Tobago. Bermuda and Mauritania responded that they were very interested in ICCAT; and Mauritania has attended the SCRS meeting and meetings of the Commission this year.

The United States asked whether it is possible to encourage other countries to join ICCAT when the Secretariat informs them of the ICCAT regulations.

Spain seconded the comments of the United States and commented that the responsibility involves all countries, including those that fish and even those in the process of developing fisheries. It is necessary to have more involvement so the scientists have all the data for the entire Atlantic. Spain encouraged the Secretariat to begin negotiations with non-member countries because the Commission may reach agreement on management measures for swordfish, but the measures may not be completely effective without cooperation. Spain added that reflagging will be a problem, as well as the lack of sufficient scientific information and the lack of regulations in non-member countries. Spain concluded that the countries might be interested in joining now because of the new scheme to calculate contributions being considered.

The Chairman stated that ICCAT opens its doors to all and will ask the Secretariat to encourage the non-member countries to join.

The Executive Secretary confirmed that all countries with coasts on the Atlantic and those that fish for tuna or tuna-like fishes are sent the recommendations of ICCAT. He stated that the Secretariat will draft an information document to send these countries, to inform them of the activities and objectives of ICCAT. The information document will include an invitation to join ICCAT as observers. Thus, the non-member countries will have no doubt about ICCAT.

6. REVIEW OF PORT INSPECTION

The Executive Secretary presented document COM/90/20, which gives background information on port inspection and contains forms used for inspections, as well as a list of inspectors and correspondents named by each country. He noted that the scheme, signed in 1978 and in effect since 1983, has been officially accepted by ten countries and that two countries have indicated their intention to participate in the scheme by designating inspectors.

The Executive Secretary noted the list of port inspectors, listed by country, that fish for tunas. He added that in some cases, such as the United States, an organization is responsible for inspection, and the representative of the United States has more information if anyone requires it.

The Executive Secretary noted that, as indicated on page 1, South Africa has reported no infractions. The report on vessels inspected by Spain was distributed to the Commission.

The Executive Secretary stated that few reports were received, either because few inspections were conducted or no infractions were found. He suggested that perhaps the Commission should be "shaken up" and questioned the point of recommendations if no one puts them in force.

The Chairman responded that ten countries have accepted the scheme and he inquired whether more countries would add their names to the list. No countries responded.

In response to the Executive Secretary's comments about lack of response, Gabon suggested that perhaps some inspectors are not effective due to a lack of training.

The Chairman agreed that training is important for effective inspection.

The Executive Secretary requested clarification as to in what manner the inspectors are not effective.

Gabon responded that few inspection reports were received because perhaps the inspectors were inadequately trained or went on board and found nothing.

The Executive Secretary replied that he could not solve the problem of training. He continued that this is the second time Gabon mentioned training and that soon the Commission will discuss finances and then training could be discussed.

The Chairman agreed that STACFAD could take up the issue.

Spain supported the comments of Gabon and agreed that the matter should be discussed by STACFAD. Additionally, Spain proposed that a special technical meeting be held at the next Commission meeting. Each country could be represented by technical experts who could exchange information on the practical difficulties, the criteria used, and the methods of inspections under the scheme.

The United States expressed support for adherence to the ICCAT port inspection scheme or for any equivalent domestic program. The United States added it will submit its report soon. The United States asked whether the lack of information is because countries have equivalent domestic schemes and whether ICCAT could broaden the reporting to include the results of domestic inspection as well as the ICCAT port inspection.

The Chairman responded that if there were no objections, the Committee could recommend to STACFAD that there be a technical meeting at the next Commission meeting, and, at the same technical meeting, the inclusion of domestic inspection could be discussed.

Sao Tomé & Principe inquired about the identification of inspectors and stated that it had sent a list for 1989. Sao Tomé also asked how soon it could receive a list of inspectors, which is important because the country has no experience in the field of inspection. It supported the proposal of Spain on a technical meeting and added that the meeting should deal with practical issues as well as theoretical issues, and that particular attention should be given to countries developing inspection programs.

The Chairman confirmed the necessity to help countries without experience.

The Executive Secretary stated that if SAo Tomé delegation contacts him before it leaves Madrid, he will give it identification cards to take to Sno Tomé & Principe. The Executive Secretary stated that, in his personal opinion, countries such as Gabon, that have complied fully with the contributions, certainly should get help developing inspection schemes.

Angola asked whether the Executive Secretary had already sent the identification cards to Angola.

The Chairman requested that Angola contact the Executive Secretary.

The Chairman requested that countries update the lists of inspectors by submitting the information to the Executive Secretary.

7. FUTURE WORK OF THE COMMITTEE AND PLANS FOR IMPROVEMENT

There were no comments.

8. DATE AND PLACE OF THE COMMITTEE MEETING

The Infractions Committee will hold its next meeting at the same place and time of the next Commission meeting.

9. OTHER MATTERS

Spain noted its concern about the appearance this past spring of vessels using large driftnets, and that it has photos available of these vessels. Spain expressed concern about these vessels because of conflicts with other vessels and the dangers they pose to navigation. Spain added that it hopes to discuss the issue in depth under Agenda Item 13.

The Chairman expressed concern about the pirate ships without flags sailing in the ICCAT area.

10. ADOPTION OF REPORT

The Report of the Infractions Committee was adopted with the condition that editorial changes can be presented by the member countries, by correspondence, on their respective interventions and insofar as such changes are consistent with what has actually transpired during the meeting, after the report has been circulated by the Secretariat. This adoption procedure had to be followed due to the extreme time constraints on the last day of the 1990 Commission Meeting.

11. ADJOURNMENT

The meeting of the Infractions Committee was adjourned.

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The adopted Report now includes all those corrections presented by the member country delegates and observers to their respective interventions.

Status of implementation by the member countries of the ICCAT recommendations.

Table 1. SIZE LIMIT - YELLOWFIN, BIGEYE and BLUEFIN TUNAS.

Species	*YELLOWFIN*	*BIGEYE*		*BLUEFIN*
Commission recommendation *Area of application*	*3.2 kg limit* *Entire Atlantic*	*3.2 kg limit* *Entire Atlantic*	*3.2 kg limit* *Entire Atlantic*	*6.4 kg limit* *Entire Atlantic*
Date of entry into effect *Date of expiration*	*July 1, 1973* *Indefinite period*	*September 7, 1980* *December 31, 1984*	*July 17, 1985* *Indefinite period*	*August 10, 1975* *Indefinite period*
ANGOLA	June 17, 1979			No fishing
BENIN				
BRAZIL	Feb. 23, 1973	March 1981		
CANADA	Sept. 4, 1973	No fishing		Feb. 17, 1973
CAPE VERDE	Sept. 5, 1987		Sept. 5, 1987	
COTE D'IVOIRE	March 2, 1970	March 2, 1970		
CUBA	July 1, 1973	Sept. 7, 1980		No fishing
EQUATORIAL GUINEA	..................No fishing..................			
FRANCE	June 29, 1973	March 3, 1981		Aug. 8, 1975
GABON	No fish. or land.	Being considered		No fish. or land.
GHANA	June 19, 1976			
JAPAN	June 14, 1973	Sept. 7, 1980	Sept. 7, 1980	April 16, 1975
KOREA	Jan. 21, 1973	Sept. 15, 1980		Dec. 17, 1975
MOROCCO	No fishing			
PORTUGAL	Nov. 26, 1973	July 17, 1981	Aug. 10, 1984	Nov. 27, 1976
SAO TOME & PRINCIPE				
SOUTH AFRICA	May 1973	Dec. 5, 1980	Dec. 5, 1980	June 27, 1975
SPAIN	May 29, 1974		Aug. 14, 1987	March 3, 1975
URUGUAY				
USA	Nov. 5, 1975	March 30, 1981	April 9, 1986	Aug. 13, 1975
USSR	Sept. 28, 1978	Sept. 28, 1978		Sept. 28, 1978
VENEZUELA	Nov. 19, 1981	Nov. 19, 1981	Nov. 19, 1981	Nov. 19, 1981

NOTE: For more details on national regulations, please request information from the country's administration.

Status of implementation by the member countries of the ICCAT recommendations.

Table 2. FISHING MORTALITY - BLUEFIN TUNA.

Commission recommendation	*Limiting fishing mortality to recent levels*	*1st Extension*	*2nd Extension*	*3rd Extension*	*4th Extension*
Area of application	*Entire Atlantic*	*Entire Atlantic*	*Entire Atlantic*	*Entire Atlantic*	*East Atl. only*
Date of entry into effect	*August 10, 1975*	*August 10, 1976*	*Oct. 10, 1978*	*Sept. 4, 1980*	*July 21, 1982*
Date of expiration	*August 10, 1976*	*August 10, 1978*	*August 10, 1980*	*August 10, 1982*	*Indefinite*
ANGOLA	..................No fishing..................				
BENIN					
BRAZIL	Aug. 10, 1977	Aug. 18, 1977	March 2, 1979	Nov. 17, 1980*	
CANADA	Feb. 17, 1976	Feb. 17, 1976	Feb. 15, 1979	Feb. 15, 1979	Feb. 15, 1979
CAPE VERDE					
COTE D'IVOIRE					
CUBA	.............Zero catches in 1976-78.............				
EQUATORIAL GUINEA					
FRANCE		Dec. 27, 1974	Dec. 27, 1974	Dec. 27, 1974	Dec. 27, 1974
GABON	..................No fishing..................				
GHANA					
JAPAN	April 16, 1975	April 16, 1975	April 16, 1975	April 16, 1975	March 3, 1982
KOREA	Dec. 17, 1975	Dec. 17, 1975	Oct. 14, 1978	Sept. 15, 1980	
MOROCCO					
PORTUGAL		Nov. 27, 1976	**	**	**
SAO TOME & PRINCIPE					
SOUTH AFRICA	June 27, 1975	Oct. 19, 1976	Feb. 9, 1979	Jan. 11, 1980	
SPAIN	Feb. 19, 1976	Feb. 19, 1976	Feb. 19, 1976	Jan. 24, 1980	
URUGUAY					
USA	Aug. 13, 1975	May 18, 1976	June 15, 1979	June 13, 1980	
USSR					
VENEZUELA					

* In process.
** Objections presented and ratified on November 16, 1978, March 19, 1980, and July 21, 1982.

NOTE: For more details on national regulations, please request information from the country's administration.

Status of implementation by the member countries of the ICCAT recommendations.

Table 3. WEST ATLANTIC BLUEFIN TUNA CATCHES.

Catch prohibited, except for monitoring purposes	*1,160 MT*	*2,660 MT*	*2,660 MT*	*2,660 MT*	*2,660 MT*
Size limit at 120 cm	*no*	*yes*	*yes*	*yes*	*yes*
Catch prohibited on Gulf of Mexico spawning stock	*yes*	*yes*	*yes*	*yes*	*yes*
Date of entry into effect	*Feb. 15, 1982*	*January 1983*	*January 1984*	*January 1985*	*January 1986*
Date of expiration	*January 1983*	*January 1984*	*January 1985*	*January 1986*	*January 1987***
ANGOLA	..........No fishing..........				
BENIN					
BRAZIL	..........Developing fishery not subject to limitation..........				
CANADA	June 14, 1982	June 21, 1983	June 21, 1983	Sept. 16, 1985	Sept. 16, 1985
CAPE VERDE					
COTE D'IVOIRE					
CUBA	..........Developing fishery not subject to limitation..........				
EQUATORIAL GUINEA					
FRANCE					
GABON	..........No fishing or landings..........				
GHANA					
JAPAN	March 3, 1982	March 7, 1983	March 7, 1983	March 7, 1983	March 7, 1983
KOREA					
MOROCCO					
PORTUGAL	..........No fishing..........				
SAO TOME & PRINCIPE					
SOUTH AFRICA	..........No fishing or landings..........				
SPAIN					
URUGUAY					
USA	June 11, 1982	June 17, 1983	July 24, 1984	Nov. 25, 1985	Nov. 25, 1985
USSR			Feb. 15, 1984	Feb. 15, 1984	
VENEZUELA					

* Details on the ICCAT recommendations are given in the Biennial Reports of the Commission, starting with the "Report for Biennial Period 1982-83, Part I".
** This recommendation has been extended each year since 1986. It was decided at the 1989 meeting that it would be in force until the end of 1991.

NOTE: For more details on national regulations, please request information from the country's administration.

Appendix 1 to Annex 7

Agenda of the Infractions Committee

1. Opening of the meeting
2. Adoption of Agenda and organization of the meeting
3. Election of Rapporteur
4. Status of the application of the regulations recommended by the Commission on yellowfin, bigeye, and bluefin tunas
5. Collaboration of non-member countries as regards the regulatory measures adopted by the Commission
6. Review of port inspection:

   a) Review of the reports of inspections carried out
   b) Updating of the list of authorized inspectors
   c) Updating of the list of national correspondents

7. Future work of the Committee and plans for improvement
8. Date and place of the next Committee meeting
9. Other matters
10. Adoption of Report
11. Adjournment

REPORT OF THE MEETING OF THE WORKING GROUP TO STUDY ALTERNATIVE SCHEMES TO CALCULATE THE MEMBER COUNTRY CONTRIBUTIONS TO THE COMMISSION BUDGET

1. OPENING OF THE MEETING

The Working Group to Study Alternative Schemes to Calculate the Member Country Contributions to the Commission Budget met at the time of the Seventh Special Meeting of the Commission in Madrid at the Hotel Pintor, November 13 and November 14, 1990.

2. ADOPTION OF AGENDA

The Tentative Agenda, circulated prior to the meeting, was adopted without change and is attached as Appendix 1 to Annex 8.

3. ELECTION OF RAPPORTEUR

Mr. C. Seoanez (Spain) was nominated Rapporteur.

4. REVIEW OF THE FOLLOW-UP OF THE 1989 WORKING GROUP RECOMMENDATIONS

The Chairman, Mr. L. Weddig (U.S.A.), referred the Group to Document COM/90/22 and summarized the Group's work at the Eleventh Ordinary Meeting of the Commission (Madeira, November 1989). He noted that the Group had reached a consensus to find an adequate scheme to calculate the member contributions which would be appropriate for all the countries. The Group also agreed that the member countries would be classified into three groups as indicated in the aforementioned document. Three alternative schemes were presented. However, the majority of the delegates preferred Alternative 2. This Alternative divided the total budget among the three groups in the following percentages: Group A (developed countries) - 85%; Group B (medium developed countries) - 14%; and Group C (developing countries) - 1%. It was also agreed that these three Alternatives would be presented by the Delegates to their respective governments and that the Group would keep in contact with the Secretariat in the interim period. The Group also agreed to meet again to decide on which scheme was the most adequate. It was observed in 1989 that the percentages assigned to each category should be flexible in order to reflect the changes in the economics of a country and in its tuna production.

The action taken by the Secretariat since the 1989 meeting is summarized as follows:

1) The Secretariat wrote to the Legal Department of FAO (the depository of the Convention) concerning whether a change in the contributions calculation scheme would involve a change in the ICCAT Convention. The FAO indicated that any change in such schemes would indeed require an amendment to the Convention.

2) As regards the United Nations classification of its member countries, it was noted that the U.N. does not have a formal criteria to determine the economic status of a country. Therefore, we will have to study this concern if we are to maintain the grouping of countries by categories.

3) The data received up to now from the European Economic Community (EEC) are not sufficient to determine from them the impact that EEC membership would have on the ICCAT budget.

4) The Secretariat also wrote to Senegal to inform them of the progress made by the Group, but no response was received from that government.

5. REVIEW OF THE ALTERNATIVE SCHEMES PROPOSED AT THE 1989 MEETING

and

6. STUDY OF OTHER POSSIBLE CALCULATION SCHEMES

During this meeting, a revised version of Alternative 2 was distributed to the Working Group, including modifications related to Panel Membership for France and Cuba, and the catch statistics for Venezuela. (This revised table is attached herewith as Table-Alternative 2 (1989) Revised.)

The Delegate from the United States inquired whether the current grouping of the member countries was arbitrary and if it would be appropriate to look at other possibilities. The Delegate of Spain clarified that the grouping of countries was open to other suggestions. However, that such discussions at this time would, in all cases, delay the work of the Group.

The Chairman reiterated that while in 1989 Alternative 2 was preferred, it was recognized that it was not a perfect solution, since there could be some difficulties concerning the components of Groups B and C. Group A seems to be less conflictive.

The Delegate of South Africa pointed out that the proposals presented in 1989 were merely indicative and therefore they should be flexible as concerns the groupings of the countries and the percentages corresponding to the groups, in accordance with their economic changes. The Delegates of Japan and the United States supported this view. The U.S. Delegate further noted that four or five groups of countries, rather than three, might better reflect the reality. The Delegate of Spain also agreed with the need to be flexible so as to take into account the variations in the countries, while trying to maintain the three groups, although particular cases should be studied. She asked whether our

Convention establishes a ceiling on the proportion of the total budget paid by one country, as is the case in other international organizations.

The Executive Secretary clarified that a priori he did not find a reference to such a limit in the ICCAT Convention. Concerning a limit being placed on the contribution of one country, the Delegate of France agreed that this matter should be studied. He also agreed with having three groups and noted that in considering such grouping, we should assure that the Secretariat will have sufficient money to operate. He also favored flexibility in the scheme.

The Delegate of Angola reiterated that the proposal made by Côte d'Ivoire to change the calculation scheme was made with the idea to protect the developing countries, but it also took into account maintaining an adequate financial status of the Commission. He proposed that the 85-14-1% breakdown be maintained, which was also supported by the Delegate of Sao Tomé & Principe.

The Delegate of Korea noted that the calculation scheme should take tuna harvest in the Convention area into account. The Delegate of the U.S.S.R. supported, in general, the views expressed by Japan and the U.S. and pointed out that the current grouping is not very flexible.

The Chairman indicated that, since an amendment to the Convention is involved in changing the contribution scheme, we should be very careful in the direction we are taking to ensure that any new procedure implies enough flexibility so as not to complicate the financial operation of the Commission.

The Delegate of Spain indicated that Groups B and C include mainly the countries which have had difficulties meeting their financial obligations to the Commission in recent years. So maybe this classification is the correct one.

The Chairman of the Working Group, in referring to the U.N. "Handbook of International Trade and Development Statistics", suggested that the Group could use gross national product (GNP) as a fundamental factor in our considerations. In this sense, Group C would be comprised of those countries with a GNP/per capita of less than US$ 500, except those countries which have a tuna production of more than 1000 MT.

The United States supported the suggestion made by the Chairman, but asked about the range of GNP/per capita in Group B with respect to Group A. The Chairman responded that the range could go from US$ 500 to US$ 2,800 for Group B. The Delegates of France and Spain felt that more information was required.

The Delegate of South Africa proposed that tables be presented showing basically the percentage of each group divided among the countries within that group.

The Observer of the EEC noted that he was not in a position to provide the detailed information requested by ICCAT to make theoretical calculations of the EEC contribution. In effect, the EEC's status as observer in ICCAT does not provide it with an adequate basis to claim from its twelve Member States detailed statistics relating, in particular, to the production of canned products from tuna caught in the Atlantic/Mediterranean, which do not come under a statutory obligation in force in the EEC, all the more so (a fortiori) if this information which involves these same Member Countries and the EEC is meant for an entity of which the EEC is not a member.

The information already provided by the EEC to ICCAT allows the ICCAT Secretariat to effect the requested estimate of the contribution of the EEC as a member. In this respect, the observer of the EEC noted that this sole contribution will certainly exceed the accumulated contribution of its three Member States which are currently members of ICCAT.

The Chairman concluded that there seemed to be a consensus to continue our study and reminded the Group that any amendment should be prepared in such a way that the Convention will not have to be changed on every occasion. In order to advance in our work, we have to proceed accordingly to what has been said, especially as concerns the matter of the grouping of the countries and the factors to take into account in this division (e.g. tuna production, GNP/per capita, or both).

The Chairman, Mr. L. Weddig, opened the second session of the Working Group on Wednesday, November 14, 1990. He referred to several tables distributed today to the Group:

1) Table A, which shows the GNP per capita (for 1987 and 1988) and catch and canning (1987) of the ICCAT member countries, based on data obtained from the U.N. Handbook of Statistics and the World Bank.

2) Table B shows a revision of Alternative 2 (based on a proposal by South Africa), in which a theoretical budget of US$ 900,000 is distributed, in principle, as 85%, 14% and 1% for Groups A, B and C, respectively. However, it assigns 1.4% per country to Group B, 0.25% per country in Group C and the remainder per country in Group A, and takes into account for Group C a GNP per capita below US$ 500 and a tuna production below 1,000 MT.

3) Table C, which is the same as Table B, but does not use 1000 MT production as a limit for Group C. This table also used GNP per capita over US$ 500 for Group B.

4) Table D illustrates a scheme assembled by dividing the groups into four categories, based on the following ranges of GNP per capita:

   Group D: less than US$ 500;
   Group C: US$ 500 to US$ 2,000;
   Group B: US$ 2,000 to US$ 5,000; and
   Group A: more than US$ 5,000.

The assignment of percentiles (0.25, 0.5, 2 for each country in Groups D, C and B; and the remainder divided among the countries in Group A) corresponds to the relationship of the average per capita for each category.

These tables are attached herewith to this Report.

In response to a request by the Delegate of Côte d'Ivoire that simulations be carried out including the introduction of the EEC data, the Chair referred the Group to the last pages of document COM/90/22 which shows these calculations (these tables are attached as EEC-Table 1 and EEC-Table 2). The Observer from the EEC indicated that the EEC contribution would be about 52 % of the total budget. He noted that the accumulated contributions of Spain, France and Portugal, based on applying Alternative 2, represent approximately 52% of the total budget. He moreover specified that the sole contribution of the EEC as a member would mean as even higher percentage.

The Chairman also informed the Working Group that while the formulas used on the simulations were basically the same, the differences in the total contribution are due to shifts of the countries between groups.

The Delegate of France expressed the opinion that Alternative 2 presented at the 1989 meeting of the Working Group, and which was preferred by the majority of the Group, still appeared to be the most appropriate. There was some doubt expressed regarding the introduction of new parameters, such as GNP per capita, etc., since the contribution of some countries, namely Cape Verde, was double that shown in the original Alternative 2 scheme.

However, the Chairman pointed out that some decisions had to be made since the grouping made last year was not based on any sound criteria.

The Delegate of Spain fully supported the views expressed by France that Alternative 2 was the most equitable for all the member countries. She felt that since ICCAT is a fishery organization tuna production must definitely be taken into account. She also suggested that perhaps the Group might also consider such factors as whether catches by a given country are taken by an industrial fishery or by an artisanal fishery.

The Secretariat clarified some doubts on the simulations and indicated that the GNP per capita was used to group the countries, but that once a country was classified in a group the catch and canning data were taken into account in the calculation of the contribution.

The Delegate of South Africa referred to the initial proposal presented by Côte d'Ivoire, which was based on the idea to help the developing countries of ICCAT meet their financial obligations to the Commission, irrelevant of their catch. South Africa feels that the main and only basis for separating the countries into groups should be an overall economic indicator for that country. He strongly supports a scheme based entirely on GNP per capita, but suggested that there should be a cutoff of per capita between each group.

In response to a request by the Group, and after some comments from various delegations, the Secretariat prepared two simulations based on three groups of countries and using per capita cutoffs of US$ 600 and US$ 1,000, respectively, for Group C. These tables are attached as Tables E and F.

The Delegate of South Africa noted that the three-group division seemed to be the accepted one, but he suggested a cutoff of US$ 3,000 between Groups A and B, since the countries in these groups showed widespread variability. He stated that the criteria for the allocation of a country to a given group should be determined carefully so that it will take into account any future changes in the economies of the countries.

The Delegate of Spain wished to remind the group that it should not lose sight of the fact that ICCAT is a fishery organization and that exclusive reference to per capita in our calculation scheme may not be valid for some countries. She expressed her delegation's doubts about taking a final stand at this point.

The Delegate of the United States clarified that the percentage distributions among the groups, i.e. 85, 14 and 1%, were only arbitrary starting points and were not adopted by the Group last year, but were subject to further discussion and study. He noted that the Group was in agreement to help those countries who cannot pay to pay less, but noted that there was a wide range of factors and options to be considered before adopting any scheme.

In view of the many requests for different simulations, the Secretariat pointed out that the Alternative schemes presented at the 1989 meeting were taken home for review by the respective country governments with a view to coming to the 1990 meeting with specific instructions. Therefore, perhaps we can assume that most of the delegates have come with instructions to adopt one of the schemes presented last year, but if new alternatives are presented, then the delegates would not be prepared to take any firm position until consulting with their governments. In that case, the Group's work will be delayed another year. The U.S.S.R. reiterated the concern expressed by the Secretariat about procedures to follow for the continuation of the Group's work.

The Delegate of Portugal informed the Working Group that he had come prepared to accept Alternative 2 as the best for ICCAT. He added that while GNP per capita may not be a completely fair parameter, it has the advantage of being objective, clear and simple, so he was prepared to accept the use of this factor and Alternative 2.

The Delegate of Côte d'Ivoire proposed to select Alternative 2 (Table F), using a GNP of US$ 1,000 per capita as the cutoff between Groups B and C. This proposal was supported by France, Morocco, Venezuela and Angola.

Following the meeting, several members of the Group asked for a revision of Alternative 2 as presented in Table F to reflect more closely the original concept of allocating the overall budget so that the developed nation category (Group A) is assigned approximately 85% and Groups B and C are allocated 15%. This simulation is provided in Table G.

In closing this session of the Working Group, the Chairman pointed out that all the simulations had been based on a hypothetical budget of US$ 900,000 and that the proportion of the contributions could be affected by a change in the total budget figure.

7. STUDY OF THE PROCEDURE TO IMPLEMENT A NEW CALCULATION SCHEME

Since the Working Group had not yet reached an agreement on the final contribution scheme, discussion of this Agenda item was deferred for the time being.

8. FUTURE PLANS

It was agreed that the Working Group would continue its work through correspondence during the interim period. It was also recommended that the Group meet again at the 1991 Commission Meeting.

9. ADOPTION OF REPORT

The Report of the Working Group was adopted with the condition that editorial changes can be presented by the member countries, by correspondence, on their respective interventions and insofar as such changes are consistent with what has actually transpired during the meeting, after the Report has been circulated by the Secretariat. This adoption procedure had to be followed due to the extreme time constraints on the last day of the 1990 Commission Meeting.

10. ADJOURNMENT

The Meeting of the Working Group was adjourned.

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The adopted Report now includes all those corrections presented by the member country delegates and observers to their respective interventions.

TABLE ALTERNATIVE 2 - TOTAL BUDGET DIVIDED BY 85%, 14% AND 1% FOR GROUP A, B AND C AND THE APPLICATION OF ARTICLE X OF THE CONVENTION (CURRENT SCHEME) WITHIN EACH GROUP (REVISED ON NOVEMBER 13, 1990)

TOTAL BUDGET= $ 900,000

COUNTRY	PANEL NO.	MEM + PANEL %	CATCH (MT)	CANNING (MT)	CATCH+ CANNING (MT)	CATCH+ CANNING %	MEMBER FEE	PANEL FEE	1/3(A)TOT DIST'D BY MEM+PANEL	2/3(A)TOT DIST'D BY CATCH+CAN	TOTAL CONTRIB $	TOTAL %
Canada	2	9.68	1,279	398	1,677	0.43	1,000	2,000	23,677	2,101	28,778	3.20
Espana	4	16.13	155,793	33,500	189,293	48.46	1,000	4,000	39,462	237,115	281,578	31.29
France	3	12.90	42,000	29,100	71,100	18.20	1,000	3,000	31,570	89,062	124,632	13.85
Japan	4	16.13	34,473	0	34,473	8.82	1,000	4,000	39,462	43,182	87,644	9.74
Portugal	3	12.90	14,623	4,282	18,905	4.84	1,000	3,000	31,570	23,681	59,251	6.58
South Africa	1	6.45	5,545	361	5,906	1.51	1,000	1,000	15,785	7,398	25,183	2.80
U.S.A.	4	16.13	23,865	36,586	60,451	15.47	1,000	4,000	39,462	75,723	120,185	13.35
U.S.S.R.	2	9.68	7,840	998	8,838	2.26	1,000	2,000	23,677	11,071	37,748	4.19
GROUP A SUB-TOTAL	23	100.00	285,418	105,225	390,643	100.00	8,000	23,000	244,667	489,333	765,000	85.00
Angola	2	12.00	1,819	1,637	3,456	3.10	1,000	2,000	4,040	2,087	9,127	1.01
Brasil	2	12.00	16,240	2,499	18,739	16.81	1,000	2,000	4,040	11,317	18,357	2.04
Cote d'Ivoire	1	8.00	0	0	0	0.00	1,000	1,000	2,693	0	4,693	0.52
Cuba	1	8.00	7,650	1,837	9,487	8.51	1,000	1,000	2,693	5,729	10,423	1.16
Gabon	1	8.00	0	0	0	0.00	1,000	1,000	2,693	0	4,693	0.52
Ghana	1	8.00	33,465	0	33,465	30.01	1,000	1,000	2,693	20,210	24,903	2.77
Korea	3	16.00	7,625	0	7,625	6.84	1,000	3,000	5,387	4,605	13,991	1.55
Maroc	2	12.00	4,993	247	5,240	4.70	1,000	2,000	4,040	3,164	10,204	1.13
Uruguay	0	4.00	1,194	7	1,201	1.08	1,000	0	1,347	725	3,072	0.34
Venezuela	2	12.00	24,820	7,464	32,284	28.96	1,000	2,000	4,040	19,496	26,536	2.95
GROUP B SUB-TOTAL	15	100.00	97,806	13,691	111,497	100.00	10,000	15,000	33,667	67,333	126,000	14.00
Benin	0	16.67	97	0	97	1.55	1,000	0	167	31	1,198	0.13
Cap Vert	1	33.33	5,133	228	5,361	85.87	1,000	1,000	333	1,717	4,051	0.45
Guinea Ecuatorial	0	16.67	400	0	400	6.41	1,000	0	167	128	1,295	0.14
S.Tome et Principe	1	33.33	385	0	385	6.17	1,000	1,000	333	123	2,457	0.27
GROUP C SUB-TOTAL	2	100.00	6,015	228	6,243	100.00	4,000	2,000	1,000	2,000	9,000	1.00
TOTAL	40		389,239	119,144	508,383		22,000	40,000	279,333	558,667	900,000	100.00

TABLE A - GNP PER CAPITA FOR ICCAT MEMBER COUNTRIES (1987 & 1988); CATCH AND CANNING (1987)

COUNTRY	GNP* $/CAP 1987	GNP** $/CAP 1988	CATCH (MT) 1987	CANNING (MT) 1987	CATCH + CANNING (MT) 1987
Angola	495	no info	1819	1637	3456
Benin	388	340	97	0	97
Brasil	2,141	2,280	16240	2499	18739
Canada	15,849	16,760	1279	398	1677
Cap Vert	544	no info	5133	228	5361
Cote d'Ivoire	963	740	0	0	0
Cuba	no info	no info	7650	1837	9487
Espana	7,412	7,740	155793	33500	189293
France	16,047	16,080	42000	29100	71100
Gabon	2,918	2,970	0	0	0
Ghana	333	400	33465	0	33465
Guinea Ecuat.	383	350	400	0	400
Japan	19,453	21,040	34473	0	34473
Korea	2,842	3,530	7625	0	7625
Maroc	821	750	4993	247	5240
Portugal	3,607	3,670	14623	4282	18905
S.Tome & Principe	352	280	385	0	385
South Africa	2,366	2,290	5545	361	5906
U.S.A.	18,429	19,780	23865	36586	60451
U.S.S.R.	no info	no info	7840	998	8838
Uruguay	2,534	2,470	1194	7	1201
Venezuela	2,714	3,170	24820	7463	32283
TOTAL			389239	119143	508382

* 1987 GNP PER CAPITA, FROM U.N. HANDBOOK FOR STATISTICS.
** 1988 GNP PER CAPITA, FROM WORLD BANK STATISTICS.

TABLE B - ALTERNATIVE 2 : AS REVISED ACCORDING TO PROPOSAL BY SOUTH AFRICA FOR PERCENTAGES AMONG THE GROUPS

GROUP C : 0.25 PERCENT ASSIGNED PER COUNTRY IN GROUP
GROUP B : 1.4 PERCENT ASSIGNED PER COUNTRY IN GROUP
GROUP A : REMAINDER ASSIGNED PER COUNTRY IN GROUP

COUNTRY CATEGORIES: A=GNP/PER CAPITA OVER $2000
B=GNP/CAPITA OF MORE THAN $500 OR PRODUCTION OVER 1000 MT
C=GNP/CAPITA OF LESS THAN $500 AND PRODUCTION LESS THAN 1000 MT

TOTAL BUDGET= $ 900,000

COUNTRY	PANEL NO.	MEM + PANEL %	CATCH (MT)	CANNING (MT)	CATCH+ CANNING (MT)	CATCH+ CANNING %	MEMBER FEE	PANEL FEE	1/3(A)TOT DIST'D BY MEM+PANEL	2/3(A)TOT DIST'D BY CATCH+CAN	TOTAL CONTRIB $	TOTAL %
Brasil	2	6.82	16,240	2,499	18,739	4.16	1,000	2,000	17,583	21,454	42,037	4.67
Canada	2	6.82	1,279	398	1,677	0.37	1,000	2,000	17,583	1,920	22,503	2.50
Espana	4	11.36	155,793	33,500	189,293	42.02	1,000	4,000	29,305	216,721	251,026	27.89
France	3	9.09	42,000	29,100	71,100	15.78	1,000	3,000	23,444	81,402	108,846	12.09
Gabon	1	4.55	0	0	0	0.00	1,000	1,000	11,722	0	13,722	1.52
Japan	4	11.36	34,473	0	34,473	7.65	1,000	4,000	29,305	39,468	73,773	8.20
Korea	3	9.09	7,625	0	7,625	1.69	1,000	3,000	23,444	8,730	36,174	4.02
Portugal	3	9.09	14,623	4,282	18,905	4.20	1,000	3,000	23,444	21,644	49,088	5.45
South Africa	1	4.55	5,545	361	5,906	1.31	1,000	1,000	11,722	6,762	20,484	2.28
Uruguay	0	2.27	1,194	7	1,201	0.27	1,000	0	5,861	1,375	8,236	0.92
U.S.A.	4	11.36	23,865	36,586	60,451	13.42	1,000	4,000	29,305	69,210	103,515	11.50
U.S.S.R.	2	6.82	7,840	998	8,838	1.96	1,000	2,000	17,583	10,119	30,702	3.41
Venezuela	2	6.82	24,820	7,464	32,284	7.17	1,000	2,000	17,583	36,962	57,545	6.39
GROUP A SUB-TOTAL	31	100.00	335,297	115,195	450,492	100.00	13,000	31,000	257,883	515,767	817,650	90.85
Angola	2	21.43	1,819	1,637	3,456	6.06	1,000	2,000	4,400	2,490	9,890	1.10
Cap Vert	1	14.29	5,133	228	5,361	9.40	1,000	1,000	2,933	3,862	8,795	0.98
Cote d'Ivoire	1	14.29	0	0	0	0.00	1,000	1,000	2,933	0	4,933	0.55
Cuba	1	14.29	7,650	1,837	9,487	16.64	1,000	1,000	2,933	6,834	11,767	1.31
Ghana	1	14.29	33,465	0	33,465	58.70	1,000	1,000	2,933	24,107	29,040	3.23
Maroc	2	21.43	4,993	247	5,240	9.19	1,000	2,000	4,400	3,775	11,175	1.24
GROUP B SUB-TOTAL	8	100.00	53,060	3,949	57,009	100.00	6,000	8,000	20,533	41,067	75,600	8.40
Benin	0	25.00	97	0	97	11.00	1,000	0	229	202	1,431	0.16
Guinea Ecuatorial	0	25.00	400	0	400	45.35	1,000	0	229	831	2,061	0.23
S.Tome et Principe	1	50.00	385	0	385	43.65	1,000	1,000	458	800	3,259	0.36
GROUP C SUB-TOTAL	1	100.00	882	0	882	100.00	3,000	1,000	917	1,833	6,750	0.75
TOTAL	40		389,239	119,144	508,383		22,000	40,000	279,333	558,667	900,000	100.00

TABLE C - ALTERNATIVE 2 : AS REVISED ACCORDING TO PROPOSAL BY SOUTH AFRICA FOR PERCENTAGES AMONG THE GROUPS

GROUP C : 0.25 PERCENT ASSIGNED PER COUNTRY IN GROUP
GROUP B : 1.4 PERCENT ASSIGNED PER COUNTRY IN GROUP
GROUP A : REMAINDER ASSIGNED PER COUNTRY IN GROUP

COUNTRY CATEGORIES: A=DEVELOPED MARKET ECONOMY COUTRIES + U.S.S.R.
B=GNP/CAPITA OF MORE THAN $500
C=GNP/CAPITA OF LESS THAN $500

TOTAL BUDGET= $ 900,000

COUNTRY	PANEL NO.	MEM + PANEL %	CATCH (MT)	CANNING (MT)	CATCH+ CANNING (MT)	CATCH+ CANNING %	MEMBER FEE	PANEL FEE	1/3(A)TOT DIST'D BY MEM+PANEL	2/3(A)TOT DIST'D BY CATCH+CAN	TOTAL CONTRIB $	TOTAL %
Canada	2	9.68	1,279	398	1,677	0.43	1,000	2,000	24,011	2,130	29,142	3.24
Espana	4	16.13	155,793	33,500	189,293	48.46	1,000	4,000	40,019	240,459	285,477	31.72
France	3	12.90	42,000	29,100	71,100	18.20	1,000	3,000	32,015	90,318	126,333	14.04
Japan	4	16.13	34,473	0	34,473	8.82	1,000	4,000	40,019	43,791	88,810	9.87
Portugal	3	12.90	14,623	4,282	18,905	4.84	1,000	3,000	32,015	24,015	60,030	6.67
South Africa	1	6.45	5,545	361	5,906	1.51	1,000	1,000	16,008	7,502	25,510	2.83
U.S.A.	4	16.13	23,865	36,586	60,451	15.47	1,000	4,000	40,019	76,791	121,810	13.53
U.S.S.R.	2	9.68	7,840	998	8,838	2.26	1,000	2,000	24,011	11,227	38,238	4.25
GROUP A SUB-TOTAL	23	100.00	285,418	105,225	390,643	100.00	8,000	23,000	248,117	496,233	775,350	86.15
Brasil	2	13.64	16,240	2,499	18,739	23.44	1,000	2,000	4,155	14,284	21,439	2.38
Cap Vert	1	9.09	5,133	228	5,361	6.71	1,000	1,000	2,770	4,087	8,856	0.98
Cote d'Ivoire	1	9.09	0	0	0	0.00	1,000	1,000	2,770	0	4,770	0.53
Cuba	1	9.09	7,650	1,837	9,487	11.87	1,000	1,000	2,770	7,232	12,001	1.33
Gabon	1	9.09	0	0	0	0.00	1,000	1,000	2,770	0	4,770	0.53
Korea	3	18.18	7,625	0	7,625	9.54	1,000	3,000	5,539	5,812	15,352	1.71
Maroc	2	13.64	4,993	247	5,240	6.56	1,000	2,000	4,155	3,994	11,149	1.24
Uruguay	0	4.55	1,194	7	1,201	1.50	1,000	0	1,385	915	3,300	0.37
Venezuela	2	13.64	24,820	7,464	32,284	40.39	1,000	2,000	4,155	24,609	31,764	3.53
GROUP B SUB-TOTAL	13	100	67,655	12,282	79,937	100	9,000	13,000	30,467	60,933	113,400	12.60
Angola	2	33.33	1,819	1,637	3,456	9.14	1,000	2,000	250	137	3,387	0.38
Benin	0	11.11	97	0	97	0.26	1,000	0	83	4	1,087	0.12
Ghana	1	22.22	33,465	0	33,465	88.52	1,000	1,000	167	1,328	3,495	0.39
Guinea Ecuatorial	0	11.11	400	0	400	1.06	1,000	0	83	16	1,099	0.12
S.Tome et Principe	1	22.22	385	0	385	1.02	1,000	1,000	167	15	2,182	0.24
GROUP C SUB-TOTAL	4	100.00	36,166	1,637	37,803	100.00	5,000	4,000	750	1,500	11,250	1.25
TOTAL	40		389,239	119,144	508,383		22,000	40,000	279,333	558,667	900,000	100.00

TABLE D - COUNTRIES CATEGORIZED ACCORDING TO GNP/CAPITA

GROUP B : 2 PERCENT ASSIGNED PER COUNTRY IN GROUP
GROUP C : 0.5 PERCENT ASSIGNED PER COUNTRY IN GROUP
GROUP D : 0.25 PERCENT ASSIGNED PER COUNTRY IN GROUP
GROUP A : REMAINDER ASSIGNED PER COUNTRY IN GROUP

COUNTRY CATEGORIES: A=GNP/CAPTITA OF MORE THAN $5000
B=GNP/CAPITA OF $2000 - $5000
C=GNP/CAPITA OF $500 - $2000
D=GNP/CAPITA OF LESS THAN $500

TOTAL BUDGET= $ 900,000

COUNTRY	PANEL NO.	MEM + PANEL %	CATCH (MT)	CANNING (MT)	CATCH+ CANNING (MT)	CATCH+ CANNING %	MEMBER FEE	PANEL FEE	1/3(A)TOT DIST'D BY MEM+PANEL	2/3(A)TOT DIST'D BY CATCH+CAN	TOTAL CONTRIB $	TOTAL %
Canada	2	12.00	1,279	398	1,677	0.46	1,000	2,000	28,250	2,158	33,408	3.71
Espana	4	20.00	155,793	33,500	189,293	51.74	1,000	4,000	47,083	243,624	295,707	32.86
France	3	16.00	42,000	29,100	71,100	19.44	1,000	3,000	37,667	91,507	133,174	14.80
Japan	4	20.00	34,473	0	34,473	9.42	1,000	4,000	47,083	44,367	96,451	10.72
U.S.A.	4	20.00	23,865	36,586	60,451	16.52	1,000	4,000	47,083	77,802	129,885	14.43
U.S.S.R.	2	12.00	7,840	998	8,838	2.42	1,000	2,000	28,250	11,375	42,625	4.74
GROUP A SUB-TOTAL	19	100.00	265,250	100,582	365,832	100.00	6,000	19,000	235,417	470,833	731,250	81.25
Brasil	2	14.29	16,240	2,499	18,739	19.90	1,000	2,000	5,857	16,321	25,178	2.80
Cuba	1	9.52	7,650	1,837	9,487	10.08	1,000	1,000	3,905	8,263	14,168	1.57
Gabon	1	9.52	0	0	0	0.00	1,000	1,000	3,905	0	5,905	0.66
Korea	3	19.05	7,625	0	7,625	8.10	1,000	3,000	7,810	6,641	18,451	2.05
Portugal	3	19.05	14,623	4,282	18,905	20.08	1,000	3,000	7,810	16,466	28,275	3.14
South Africa	1	9.52	5,545	361	5,906	6.27	1,000	1,000	3,905	5,144	11,049	1.23
Uruguay	0	4.76	1,194	7	1,201	1.28	1,000	0	1,952	1,046	3,998	0.44
Venezuela	2	14.29	24,820	7,464	32,284	34.29	1,000	2,000	5,857	28,119	36,976	4.11
GROUP B SUB-TOTAL	13	100.00	77,697	16,450	94,147	100.00	8,000	13,000	41,000	82,000	144,000	16.00
Cap Vert	1	28.57	5,133	228	5,361	50.57	1,000	1,000	619	2,191	4,810	0.53
Cote d'Ivoire	1	28.57	0	0	0	0.00	1,000	1,000	619	0	2,619	0.29
Maroc	2	42.86	4,993	247	5,240	49.43	1,000	2,000	929	2,142	6,071	0.67
GROUP C SUB-TOTAL	4	100.00	10,126	475	10,601	100.00	3,000	4,000	2,167	4,333	13,500	1.50
Angola	2	33.33	1,819	1,637	3,456	9.14	1,000	2,000	250	137	3,387	0.38
Benin	0	11.11	97	0	97	0.26	1,000	0	83	4	1,087	0.12
Ghana	1	22.22	33,465	0	33,465	88.52	1,000	1,000	167	1,328	3,495	0.39
Guinea Ecuatorial	0	11.11	400	0	400	1.06	1,000	0	83	16	1,099	0.12
S.Tome et Principe	1	22.22	385	0	385	1.02	1,000	1,000	167	15	2,182	0.24
GROUP D SUB-TOTAL	4	100.00	36,166	1,637	37,803	100.00	5,000	4,000	750	1,500	11,250	1.25
TOTAL	40		389,239	119,144	508,383		22,000	40,000	279,333	558,667	900,000	100.00

TABLE E - ALTERNATIVE 2 : AS REVISED ACCORDING TO PROPOSAL BY SOUTH AFRICA FOR PERCENTAGES AMONG THE GROUPS

GROUP C : 0.25 PERCENT ASSIGNED PER COUNTRY IN GROUP
GROUP B : 1.4 PERCENT ASSIGNED PER COUNTRY IN GROUP
GROUP A : REMAINDER ASSIGNED PER COUNTRY IN GROUP

COUNTRY CATEGORIES: A=DEVELOPED MARKET ECONOMY COUTRIES + U.S.S.R.
B=GNP/CAPITA OF MORE THAN $600
C=GNP/CAPITA OF LESS THAN $600

TOTAL BUDGET= $ 900,000

COUNTRY	PANEL NO.	MEM + PANEL %	CATCH (MT)	CANNING (MT)	CATCH+ CANNING (MT)	CATCH+ CANNING %	MEMBER FEE	PANEL FEE	1/3(A)TOT DIST'D BY MEM+PANEL	2/3(A)TOT DIST'D BY CATCH+CAN	TOTAL CONTRIB $	TOTAL %
Canada	2	9.68	1,279	398	1,677	0.43	1,000	2,000	24,345	2,160	29,505	3.28
Espana	4	16.13	155,793	33,500	189,293	48.46	1,000	4,000	40,575	243,802	289,377	32.15
France	3	12.90	42,000	29,100	71,100	18.20	1,000	3,000	32,460	91,574	128,034	14.23
Japan	4	16.13	34,473	0	34,473	8.82	1,000	4,000	40,575	44,400	89,975	10.00
Portugal	3	12.90	14,623	4,282	18,905	4.84	1,000	3,000	32,460	24,349	60,809	6.76
South Africa	1	6.45	5,545	361	5,906	1.51	1,000	1,000	16,230	7,607	25,837	2.87
U.S.A.	4	16.13	23,865	36,586	60,451	15.47	1,000	4,000	40,575	77,859	123,434	13.71
U.S.S.R.	2	9.68	7,840	998	8,838	2.26	1,000	2,000	24,345	11,383	38,728	4.30
GROUP A SUB-TOTAL	23	100.00	285,418	105,225	390,643	100.00	8,000	23,000	251,567	503,133	785,700	87.30
Brasil	2	15.00	16,240	2,499	18,739	25.13	1,000	2,000	4,040	13,535	20,575	2.29
Cote d'Ivoire	1	10.00	0	0	0	0.00	1,000	1,000	2,693	0	4,693	0.52
Cuba	1	10.00	7,650	1,837	9,487	12.72	1,000	1,000	2,693	6,853	11,546	1.28
Gabon	1	10.00	0	0	0	0.00	1,000	1,000	2,693	0	4,693	0.52
Korea	3	20.00	7,625	0	7,625	10.22	1,000	3,000	5,387	5,508	14,894	1.65
Maroc	2	15.00	4,993	247	5,240	7.03	1,000	2,000	4,040	3,785	10,825	1.20
Uruguay	0	5.00	1,194	7	1,201	1.61	1,000	0	1,347	867	3,214	0.36
Venezuela	2	15.00	24,820	7,464	32,284	43.29	1,000	2,000	4,040	23,319	30,359	3.37
GROUP B SUB-TOTAL	12	100	62,522	12,054	74,576	100	8,000	12,000	26,933	53,867	100,800	11.20
Angola	2	27.27	1,819	1,637	3,456	8.01	1,000	2,000	227	133	3,361	0.37
Benin	0	9.09	97	0	97	0.22	1,000	0	76	4	1,080	0.12
Cap Vert	1	18.18	5,133	228	5,361	12.42	1,000	1,000	152	207	2,359	0.26
Ghana	1	18.18	33,465	0	33,465	77.53	1,000	1,000	152	1,292	3,444	0.38
Guinea Ecuatorial	0	9.09	400	0	400	0.93	1,000	0	76	15	1,091	0.12
S.Tome et Principe	1	18.18	385	0	385	0.89	1,000	1,000	152	15	2,166	0.24
GROUP C SUB-TOTAL	5	100.00	41,299	1,865	43,164	100.00	6,000	5,000	833	1,667	13,500	1.50
TOTAL	40		389,239	119,144	508,383		22,000	40,000	279,333	558,667	900,000	100.00

TABLE F - ALTERNATIVE 2 : AS REVISED ACCORDING TO PROPOSAL BY SOUTH AFRICA FOR PERCENTAGES AMONG THE GROUPS

GROUP C : 0.25 PERCENT ASSIGNED PER COUNTRY IN GROUP
GROUP B : 1.4 PERCENT ASSIGNED PER COUNTRY IN GROUP
GROUP A : REMAINDER ASSIGNED PER COUNTRY IN GROUP

COUNTRY CATEGORIES: A=DEVELOPED MARKET ECONOMY COUTRIES + U.S.S.R.
B=GNP/CAPITA OF MORE THAN $1000
C=GNP/CAPITA OF LESS THAN $1000

TOTAL BUDGET= $ 900,000

COUNTRY	PANEL NO.	MEM + PANEL %	CATCH (MT)	CANNING (MT)	CATCH+ CANNING (MT)	CATCH+ CANNING %	MEMBER FEE	PANEL FEE	1/3(A)TOT DIST'D BY MEM+PANEL	2/3(A)TOT DIST'D BY CATCH+CAN	TOTAL CONTRIB $	TOTAL %
Canada	2	9.68	1,279	398	1,677	0.43	1,000	2,000	25,013	2,219	30,232	3.36
Espana	4	16.13	155,793	33,500	189,293	48.46	1,000	4,000	41,688	250,489	297,177	33.02
France	3	12.90	42,000	29,100	71,100	18.20	1,000	3,000	33,351	94,086	131,436	14.60
Japan	4	16.13	34,473	0	34,473	8.82	1,000	4,000	41,688	45,618	92,306	10.26
Portugal	3	12.90	14,623	4,282	18,905	4.84	1,000	3,000	33,351	25,017	62,367	6.93
South Africa	1	6.45	5,545	361	5,906	1.51	1,000	1,000	16,675	7,815	26,491	2.94
U.S.A.	4	16.13	23,865	36,586	60,451	15.47	1,000	4,000	41,688	79,994	126,682	14.08
U.S.S.R.	2	9.68	7,840	998	8,838	2.26	1,000	2,000	25,013	11,695	39,708	4.41
GROUP A SUB-TOTAL	23	100.00	285,418	105,225	390,643	100.00	8,000	23,000	258,467	516,933	806,400	89.60
Brasil	2	20.00	16,240	2,499	18,739	27.03	1,000	2,000	4,040	10,919	17,959	2.00
Cuba	1	13.33	7,650	1,837	9,487	13.68	1,000	1,000	2,693	5,528	10,221	1.14
Gabon	1	13.33	0	0	0	0.00	1,000	1,000	2,693	0	4,693	0.52
Korea	3	26.67	7,625	0	7,625	11.00	1,000	3,000	5,387	4,443	13,830	1.54
Uruguay	0	6.67	1,194	7	1,201	1.73	1,000	0	1,347	700	3,046	0.34
Venezuela	2	20.00	24,820	7,464	32,284	46.56	1,000	2,000	4,040	18,811	25,851	2.87
GROUP B SUB-TOTAL	9	100.00	57,529	11,807	69,336	100.00	6,000	9,000	20,200	40,400	75,600	8.40
Angola	2	18.75	1,819	1,637	3,456	7.14	1,000	2,000	125	95	3,220	0.36
Benin	0	6.25	97	0	97	0.20	1,000	0	42	3	1,044	0.12
Cap Vert	1	12.50	5,133	228	5,361	11.08	1,000	1,000	83	148	2,231	0.25
Cote d'Ivoire	1	12.50	0	0	0	0.00	1,000	1,000	83	0	2,083	0.23
Guinea Ecuatorial	0	6.25	400	0	400	0.83	1,000	0	42	11	1,053	0.12
Ghana	1	12.50	33,465	0	33,465	69.14	1,000	1,000	83	922	3,005	0.33
Maroc	2	18.75	4,993	247	5,240	10.83	1,000	2,000	125	144	3,269	0.36
S.Tome et Principe	1	12.50	385	0	385	0.80	1,000	1,000	83	11	2,094	0.23
GROUP C SUB-TOTAL	8	100.00	46,292	2,112	48,404	100.00	8,000	8,000	667	1,333	18,000	2.00
TOTAL	40		389,239	119,144	508,383		22,000	40,000	279,333	558,667	900,000	100.00

TABLE G - ALTERNATIVE 2 : REVISED USING A CUT-OFF GNP $1000 PER CAPITA BETWEEN GROUPS B AND C

GROUP A : 100 PERCENT LESS PERCENT OF GROUPS B AND C
GROUP B : 2.17 PERCENT ASSIGNED TO EACH COUNTRY IN THIS CATEGORY
GROUP C : 0.25 PERCENT ASSIGNED TO EACH COUNTRY IN THIS CATEGORY

COUNTRY CATEGORIES: A=DEVELOPED MARKET ECONOMY COUTRIES + U.S.S.R.
B=GNP/CAPITA OF MORE THAN $1000
C=GNP/CAPITA OF LESS THAN $1000

				TOTAL BUDGET= $	900,000							
COUNTRY	PANEL NO.	MEM + PANEL %	CATCH (MT)	CANNING (MT)	CATCH+ CANNING (MT)	CATCH+ CANNING %	MEMBER FEE	PANEL FEE	1/3(A)TOT DIST'D BY MEM+PANEL	2/3(A)TOT DIST'D BY CATCH+CAN	TOTAL CONTRIB $	TOTAL %
Canada	2	9.68	1,279	398	1,677	0.43	1,000	2,000	23,677	2,101	28,778	3.20
Espana	4	16.13	155,793	33,500	189,293	48.46	1,000	4,000	39,462	237,115	281,578	31.29
France	3	12.90	42,000	29,100	71,100	18.20	1,000	3,000	31,570	89,062	124,632	13.85
Japan	4	16.13	34,473	0	34,473	8.82	1,000	4,000	39,462	43,182	87,644	9.74
Portugal	3	12.90	14,623	4,282	18,905	4.84	1,000	3,000	31,570	23,681	59,251	6.58
South Africa	1	6.45	5,545	361	5,906	1.51	1,000	1,000	15,785	7,398	25,183	2.80
U.S.A.	4	16.13	23,865	36,586	60,451	15.47	1,000	4,000	39,462	75,723	120,185	13.35
U.S.S.R.	2	9.68	7,840	998	8,838	2.26	1,000	2,000	23,677	11,071	37,748	4.19
GROUP A SUB-TOTAL	23	100.00	285,418	105,225	390,643	100.00	8,000	23,000	244,667	489,333	765,000	85.00
Brasil	2	20.00	16,240	2,499	18,739	27.03	1,000	2,000	6,800	18,378	28,178	3.13
Cuba	1	13.33	7,650	1,837	9,487	13.68	1,000	1,000	4,533	9,304	15,838	1.76
Gabon	1	13.33	0	0	0	0.00	1,000	1,000	4,533	0	6,533	0.73
Korea	3	26.67	7,625	0	7,625	11.00	1,000	3,000	9,067	7,478	20,545	2.28
Uruguay	0	6.67	1,194	7	1,201	1.73	1,000	0	2,267	1,178	4,445	0.49
Venezuela	2	20.00	24,820	7,464	32,284	46.56	1,000	2,000	6,800	31,662	41,462	4.61
GROUP B SUB-TOTAL	9	100.00	57,529	11,807	69,336	100.00	6,000	9,000	34,000	68,000	117,000	13.00
Angola	2	18.75	1,819	1,637	3,456	7.14	1,000	2,000	125	95	3,220	0.36
Benin	0	6.25	97	0	97	0.20	1,000	0	42	3	1,044	0.12
Cap Vert	1	12.50	5,133	228	5,361	11.08	1,000	1,000	83	148	2,231	0.25
Cote d'Ivoire	1	12.50	0	0	0	0.00	1,000	1,000	83	0	2,083	0.23
Guinea Ecuatorial	0	6.25	400	0	400	0.83	1,000	0	42	11	1,053	0.12
Ghana	1	12.50	33,465	0	33,465	69.14	1,000	1,000	83	922	3,005	0.33
Maroc	2	18.75	4,993	247	5,240	10.83	1,000	2,000	125	144	3,269	0.36
S.Tome et Principe	1	12.50	385	0	385	0.80	1,000	1,000	83	11	2,094	0.23
GROUP C SUB-TOTAL	8	100.00	46,292	2,112	48,404	100.00	8,000	8,000	667	1,333	18,000	2.00
TOTAL	40		389,239	119,144	508,383		22,000	40,000	279,333	558,667	900,000	100.00

CEE-TABLE 1.

A - EEC TUNA CATCHES IN THE ATLANTIC (MT)

COUNTRY	1986	1987
Denmark	2	-
France	24,407	28,180
Spain	152,545	142,073
Portugal	14,959	15,290
TOTAL EEC	191,913	185,543

B. EEC CANNED PRODUCTION OF TUNAS

COUNTRY	1986 IN MT	1986 IN ECUS	1987 IN MT	1987 IN ECUS
FRANCE	29,100	285,678	29,600	249,955
Albacore	2,400	-	2,137	-
Tropical tuna	26,700	-	27,463	-
SPAIN	25,719	144,852	38,607	221,278
Albacore	4,007	31,286	3,900	31,173
Tropical tuna	21,712	113,566	34,707	190,105
PORTUGAL	7,320	56,533	6,180	52,191
ITALY	78,700	424,427	84,000	432,433
EEC TOTAL	140,839	911,490	158,387	955,857

NOTE: The amounts are expressed in net weight, estimated by the EEC (except Italy) from data provided by the Member States on a base of 1/2 gross weight.

EEC-TABLE 2. PRESENT CONTRIBUTION SCHEME - BASED ON EEC DATA FOR TUNA CATCH AND CANNING, 1987
(FRANCE, PORTUGAL AND SPAIN HAVE BEEN EXCLUDED)

HYPOTHETICAL TOTAL BUDGET = US$ 900,000

				TOTAL BUDGET= $		900,000						
	A	B	C	D	E	F	G	H	I	J	K	K
COUNTRY	#	%	(MT)	(MT)	(MT)	%	$	$	$	$	$	%
Angola	2	5.56	1819	1637	3456	0.60	1,000	2,000	15,667	3,402	22,068	2.45
Benin	0	1.85	97	0	97	0.02	1,000	0	5,222	95	6,318	0.70
Brasil	2	5.56	16240	2499	18739	3.27	1,000	2,000	15,667	18,444	37,111	4.12
Canada	2	5.56	1279	398	1677	0.29	1,000	2,000	15,667	1,651	20,317	2.26
Cap Vert	1	3.70	5133	228	5361	0.94	1,000	1,000	10,444	5,277	17,721	1.97
Cote d'Ivoire	1	3.70	0	0	0	0.00	1,000	1,000	10,444	0	12,444	1.38
Cuba	1	3.70	7650	1837	9487	1.66	1,000	1,000	10,444	9,338	21,782	2.42
EEC	4	9.26	185543	158387	343930	60.02	1,000	4,000	26,111	338,520	369,631	41.07
Gabon	1	3.70	0	0	0	0.00	1,000	1,000	10,444	0	12,444	1.38
Ghana	1	3.70	33465	0	33465	5.84	1,000	1,000	10,444	32,939	45,383	5.04
Guinea Ecuat.	0	1.85	400	0	400	0.07	1,000	0	5,222	394	6,616	0.74
Japan	4	9.26	34473	0	34473	6.02	1,000	4,000	26,111	33,931	65,042	7.23
Korea	3	7.41	7625	0	7625	1.33	1,000	3,000	20,889	7,505	32,394	3.60
Maroc	2	5.56	4993	247	5240	0.91	1,000	2,000	15,667	5,158	23,824	2.65
S.Tome & Principe	1	3.70	385	0	385	0.07	1,000	1,000	10,444	379	12,823	1.42
South Africa	1	3.70	5545	361	5906	1.03	1,000	1,000	10,444	5,813	18,258	2.03
U.S.A.	4	9.26	23865	36586	60451	10.55	1,000	4,000	26,111	59,500	90,611	10.07
U.S.S.R.	2	5.56	7840	998	8838	1.54	1,000	2,000	15,667	8,699	27,366	3.04
Uruguay	0	1.85	1194	7	1201	0.21	1,000	0	5,222	1,182	7,404	0.82
Venezuela	2	5.56	24820	7463	32283	5.63	1,000	2,000	15,667	31,775	50,442	5.60
TOTAL	34	100	362366	210648	573014	100.00	20,000	34,000	282,000	564,000	900,000	100.00

A: Panel membership.

B: Percentage of payments for annual membership and panel membership (G+H).

C: Catch (live weight) - 1987

D: Canned production (net product weight) - 1987

E: Total (C+D).

F: Percentage distribution of E.

G: Payment of $1,000 annual membership contribution.

H: Payment of $1,000 for each panel membership.

I: 1/3 of (Total contribution less G+H) distributed percentage-wise according to column B.

J: 2/3 of (Total contribution less G+H) distributed percentage-wise according to column F.

K: Total (G+H+I+J)

Appendix 1 to Annex 8

Agenda of the Working Group to Study Alternative Schemes to Calculate the Member Country Contributions to the Commission Budget

1. Opening of the meeting
2. Adoption of Agenda
3. Election of Rapporteur
4. Review of the follow-up of the 1989 Working Group recommendations
5. Review of the alternative schemes proposed at the 1989 meeting
6. Study of other possible calculation schemes
7. Study of the procedure to implement a new calculation scheme
8. Future plans
9. Adoption of report
10. Adjournment

REPORT OF THE MEETING OF THE STANDING COMMITTEE ON FINANCE AND ADMINISTRATION (STACFAD)

Item 1. OPENING OF THE MEETING

1.1 The 1990 Meeting of the Standing Committee on Finance and Administration (STACFAD) was opened by the Committee Chairman, Ms. P. García Doñoro, on Monday, November 12, 1990.

Item 2. ADOPTION OF AGENDA

2.1 The Tentative Agenda, circulated prior to the meeting, was reviewed by the Standing Committee. One modification was made, i.e. the item "Review of the financial status of the Albacore Research Program" was added. The revised Agenda, thus modified, was adopted and is attached as Appendix 1 to Annex 9.

Item 3. ELECTION OF RAPPORTEUR

3.1 Mr. J. Pereira (Portugal) was designated to serve as rapporteur for the STACFAD.

Item 4. ADMINISTRATIVE REPORT (1990 activities)

4.1 The Chairman referred the Committee to Administrative Report (COM/90/8), which was presented by the Executive Secretary of the Commission. He called attention to various items contained in the Report, such as the current Commission membership, the status of the ratification of the Protocol to the Convention, current Commission officers, Panel membership, the meetings organized by ICCAT in 1990 or those at which ICCAT was represented, the Commission's publications, relations with other organizations, etc.

4.2 As regards the coordination of research carried out by the Secretariat in 1990, the Executive Secretary referred the Committee to COM-SCRS/90/10, which gives details on these coordination activities.

4.3 He extended a special note of thanks to the Institute of Oceanography of Spain (IEO) for having sent two experts to Morocco at IEO expense to assist scientists there in setting up a biological sampling system.

4.4 In pointing out the increase in Commission publications during this past year, the Executive Secretary made special mention of the recently published Third Edition of the "Field Manual for Statistics and Sampling" (English version). He noted that the French and Spanish versions will be published shortly. He also mentioned the translation into Spanish of the FAO publication on tropical tunas and noted that this work is progressing and would be completed in the near future.

Item 5. AUDITOR'S REPORT - 1989

5.1 The 1989 Auditor's Report, which had been distributed in May, was presented by the Executive Secretary. This report gives the status of the Commission finances at end of Fiscal Year 1989, based on the audit carried out.

Item 6. REVIEW OF THE 1ST HALF OF THE BIENNIAL BUDGET - 1990

6.1 The Executive Secretary presented the Financial Report for Fiscal Year 1990 (COM/90/9).

6.2 The Delegate of Spain asked for clarification as to whether the balance in the Working Capital Fund shown in Statement 1 of the Financial Report (US$ 354,431.49) was real or theoretical. The Executive Secretary clarified that real cash balance at the end of 1989 was US$ 355,938.49, which was deposited to the Working Capital Fund, except for the US$ 1,507 from Angola to be applied towards their 1991 contribution. He added that this substantial cash balance was due to the payment of $100,000 received from Ghana, US$ 31,548 from Gabon and US$ 33,814 from Venezuela in past-due contributions, as well as a voluntary contribution from Portugal which amounted US$ 31,048.18.

6.3 The STACFAD Chairman expressed the hope that additional member country contributions corresponding to the 1990 Budget would be received before the end of the Fiscal year and that some countries would pay their past-due contributions corresponding to other years to help alleviate the financial difficulties of the Commission.

6.4 The Executive Secretary pointed out that the downward fluctuation of the U.S. dollar had seriously affected the Commission's finances in 1990 and resulted in an increase in practically all the expenditures. He also emphasized the extreme loss in salary endured by the Secretariat staff, since their salaries were fixed in dollars by the Commission in order to keep the salaries chapters within the amount budgeted. In view of this serious problem, the Executive Secretary contacted the Commission Chairman and discussed the matter affecting the staff loss in salaries, with the First Vice-Chairman and the STACFAD Chairman. It was agreed to utilize extra-budgetary income from bank interest, and return of Value Added Taxes to compensate the staff for at least part of the loss.

6.5 The Executive Secretary emphasized the increase in the accumulated debt owed to the Commission which amounts to US$ 656,375.21 at this time. He also pointed out that based on a total budget of $900,000 for 1990, expenditures will exceed the amount budgeted by US$ 27,107.

6.6 The estimated balance in the Working Capital Fund at the end of the current Fiscal Year will amount to $107,960.37.

6.7 The Chairman of STACFAD informed the Committee of her contacts with the Secretariat during the year regarding finances. She made special note of loss endured by the staff and noted that, due to the downward currency fluctuation, the budget approved in 1989 was not sufficient to meet staff costs so that an adjustment was warranted, using funds from extra-budgetary income as mentioned earlier.

6.8 It was pointed out that the Executive Secretary had renounced any adjustment in his salary in a spirit of solidarity with the Commission and the staff.

6.9 The Chairman of STACFAD noted that the matter of the long overdue debts corresponding to contributions by some member countries should be seriously considered. This situation has been going on for several years and threatens to continue. Specific mention was made of Senegal, which withdrew from the Commission as of December 31, 1988, and left an outstanding debt of US$ 75,860.88 and some decisions should be made in this aspect. She suggested that Senegal be reminded of this debt. The STACFAD Chairman also pointed out that only 12 of the 22 member countries had paid their 1990 contributions to date and asked the delegations to make every effort to investigate this matter and encourage payment.

6.10 The Delegate of Ghana noted that in the past his country had honored all its obligations to ICCAT, until about 1980 when Ghana had serious economic difficulties. However, Ghana wishes to honor all its obligations to the Commission and has demonstrated its willingness to collaborate by reducing its debt by $100,000 in 1989. However, Ghana recognized that they still have a considerable outstanding debt which they will try to meet at a future date.

6.11 The Chairman thanked Ghana for their information and recognized the good will shown by this country to satisfy its financial obligations to ICCAT.

6.12 The Delegate of France expressed his regret on behalf of his country that Senegal is no longer a member of ICCAT. France sincerely hopes that Senegal can again adhere to the Convention. In this regard, a change in the contribution scheme could facilitate this adhesion.

6.13 It should be noted that the Secretariat, in accordance with a recommendation from STACFAD in 1989, informed Senegal of the alternative contribution schemes discussed and included Senegal in the hypothetical calculations.

6.14 The Delegate of Spain expressed her regrets that the critical situation in the Commission finances has had such a negative effect on the Secretariat staff salaries.

6.15 The Delegate of Spain also expressed her support of the Executive Secretary's proposal that all extra-budgetary income received in 1990 from bank interest and Value Added Tax return be used to compensate Secretariat staff for part of their loss in salary during the current Fiscal Year.

6.16 The Delegate of Spain noted that at the 1989 meeting several inquiries were made concerning the possibility of preparing the ICCAT budget in pesetas as a means to alleviate the effect of the downward fluctuation of the U.S. dollar. She added that other international organizations prepared their budgets in local currency, since most of their expenses are in this currency. Spain also asked for clarification as to whether such a change in currency would involve an amendment to the ICCAT Convention.

6.17 The U.S. Delegate agreed with comments made by the Delegate of Spain. He added that the variability currently occurring with U.S. dollar would also be true of any currency not consistent with that of the organization's headquarters. The U.S. Delegate noted his support of a change to local currency and added that Article X, Paragraphs 2 and 5, of the Convention seems to give authority to change currency without changing the Convention.

6.18 The proposal to change the budget base currency to pesetas was also supported by France and Angola.

6.19 The Executive Secretary noted that a change in the budget currency would not involve a change in the Convention. He also referred to Article X, paragraph 2 of the Convention which states: "Each Contracting Party shall contribute annually to the budget of the Commission in an amount equal to..."; and paragraph 5 of the same Article which states: "Contributions to the biennial budget shall be payable in such currencies as the Commission may decide."

6.20 The Executive Secretary also referred briefly to the status of funds corresponding to the Yellowfin Year Program, the Albacore Research Program and the Enhanced Research Program for Billfish. He noted that these will be discussed in more detail under Agenda Items 9, 10 and 11.

6.21 In his closing remarks concerning the 1990 Financial Report, the Executive Secretary noted that he encountered serious difficulties in administering Commission funds in times of crisis.

6.22 The second session of STACFAD was opened by the Committee Chairman. The Committee reviewed the report of the first session and after introducing some minor changes, the report was adopted.

6.23 In referring to Item 6.17 of the report, some discussion ensued on the legal aspect of a change in the ICCAT budget currency and whether the delegates were prepared at this time to take a position. Some delegations expressed the wish to discuss this aspect with the legal advisors of their respective countries. The Secretariat distributed a letter from FAO Legal Department which responded to the Secretariat's inquiry as to whether a change in the budget currency would involve an amendment to the ICCAT Convention. The FAO Legal Advisor indicated that no amendment would be required. Further discussion this issue was referred to Agenda Item 13 of the STACFAD Agenda.

Item 7. MEMBER COUNTRY CONTRIBUTIONS PENDING PAYMENT

7.1 The Committee was referred to the Statement 2 of the 1990 Financial Report (COM/90/9), which provides information on the status of the member country contributions as regards the pending contributions corresponding to the 1990 budget as well as past-due amounts corresponding to other years. The total pending balance owed to the Commission (as of September 30, 1990) amounted to US$ 656,375.21. The member countries were urged to meet their financial obligations to the Commission.

Item 8. REVIEW OF THE WORKING CAPITAL FUND

8.1 The Committee was referred to Statement 5 of the 1990 Financial Report which provided information on the status of the Working Capital Fund. The Fund showed a starting balance of US$ 354,431.49, to which was added the deposit of US$ 19,509.88 in past-due contributions. Thus the Fund showed a balance of US$ 373,941.37. However, of this amount, $265,981 have been deducted to cover the difference between the total expenditures and the income received in 1990 contributions. Consequently, the Fund will have an estimated balance of US$ 107,960.37 at the end of Fiscal Year.

8.2 It was pointed out, however, that information had been received from the Ambassador of Morocco concerning payment of that country's 1990 contribution (US$ 22,274). If that contribution is received, plus income received during the 1990 meetings towards observer fees (about US$ 6,000), and if other income is received before the end of the Fiscal year, then the balance in the Fund will be higher.

Item 9. REVIEW OF THE FINANCIAL STATUS OF YELLOWFIN YEAR PROGRAM

9.1 The Chairman referred the Committee to the Financial Report. It was noted that the YYP Program Funds show a balance of US$ 8,832.39 which will be used for the publication of the final results of the Program.

Item 10. REVIEW OF THE FINANCIAL STATUS OF THE ALBACORE RESEARCH PROGRAM

10.1 Statement 4 (Chapter 8-h of the Budget) of the 1990 Financial Report shows the status of the Albacore Program Funds. Expenditures for the fourth quarter are estimated at US$ 18,000.

Item 11. REVIEW OF THE FINANCIAL STATUS OF PROGRAM OF ENHANCED RESEARCH FOR BILLFISH

11.1 The Billfish Research Program, which is funded by private contributions that are kept in a separate account from Commission regular funds, shows a current balance of US$ 6,032.77.

Item 12. REVIEW OF THE FINANCIAL IMPLICATIONS OF PROPOSED 1991 COMMISSION ACTIVITIES

12.1 Recommendations made in research and statistics: The Committee was referred to the recommendations sections of the 1990 SCRS Report for details on the scientific committee's recommendations in research and statistics.

12.2 Proposed intersessional meetings: The SCRS Chairman informed the financial committee that, based on the recommendations made by his committee, funds are required in 1991 for sampling in Yugoslavia and indicated that two intersessional meetings are foreseen: a swordfish stock assessment session to be held in St. Andrews, New Brunswick (Canada) in the latter part of September, and a meeting of the Working Group on Western Atlantic Tropical Tunas to be held at the National Marine Fisheries Laboratory in Miami, Florida (USA) in April, 1991.

12.3 Commission publications: The Committee was referred to Point 11 of the 1990 Administrative Report (COM/90/8).

12.4 Next regular meeting of the Commission: This item was referred back to the Commission for discussion.

12.5 Others: No other SCRS matters were discussed.

Item 13. REVIEW OF THE SECOND HALF OF THE BIENNIAL BUDGET - 1991

13.1 The Chairman referred the Committee to the Estimated Budget for 1991 presented in the 1990 Financial Report (COM/90/9), which contains the Revised 1991 Budget.

13.2 The Executive Secretary gave some background on the budget and reiterated that the biennial budget was approved at the 1989 Meeting, which was based on an exchange rate of 120 pesetas. In view of the downward fluctuation of the U.S. dollar, a revised budget was prepared based on the same total budget, but applying the exchange rate at that time (97 Ptas/US$). This was distributed to the member countries in October, 1990, for their consideration. He explained that in preparing this revision the real value of the budget was taken into account. He indicated that if the budget is approved in dollars it should be assured that there is no negative effect on Secretariat staff salaries, as has been the case in recent years.

13.3 The Delegate of the U.S.A. noted that the budget agreed upon was in dollars and that the Committee should still agree on a budget in this currency. He also indicated that the matter of a change in the budget currency could be discussed and decided in the future. He recognized the difficulties of the Commission and the financial problems affecting the staff, but asked the Committee to study a budget in a lesser amount than $1,225,000.

13.4 The Delegate of Portugal expressed his regret that the letter from the Legal Department of FAO, which indicated that a change in the Commission budget currency would not require an amendment to the Convention, had not been distributed earlier, since he then could have come to this meeting with necessary instructions regarding a change in the budget currency.

13.5 The Delegate of France agreed with the view expressed by Portugal and added that a Peseta-based budget would be advantageous since that currency is part of the European monetary system and is a "basket currency", so fluctuations are limited.

13.6 The Delegate of Spain pointed out that the delay in contributions has been the cause of the Commission's financial difficulties, which linked to the downward fluctuation of the U.S. dollar, has meant an additional element to the detriment of the budget, which has to be taken into account. She added that in other years when the dollar fluctuated upward her country was faced with a higher contribution. She emphasized that Spain agreed with the amount of the total budget, i.e., US$ 1,225,000, whether it was in dollars or pesetas. She indicated that the problem facing the Committee is the real value of the budget, in terms of its purchasing power. She also indicated that the Revised Budget for 1991 had no provision for funds for the Albacore Program and noted that funds may be needed in the future for this Program. Therefore, she asked that a line be added to the Budget (i.e., a sub-chapter), even though there is no allocation for 1991.

13.7 The Delegate of Portugal reiterated his support of a budget in U.S. dollars for 1991. This view was also supported by Ghana, Japan and the U.S.S.R. The Delegate of the U.S.S.R. also referred to Regulation 2, paragraph 3, of the Financial Regulations which states that budget estimates "...shall be presented in United States dollars." The U.S. Delegate also reiterated his support of a dollar-based budget and noted that the Committee should advance in its work by deciding on the total budget and then the allotments among the budget chapters.

13.8 The Delegate of Spain reminded the Committee that at the 1989 meeting several members agreed that the budget should be based in Pesetas, so the Committee appeared to be moving backwards at this stage in its work.

13.9 The Delegate of Portugal also stated that the base currency could be discussed at the 1991 meeting and perhaps be put into effect for 1992 or 1993. The Delegate of France expressed his reluctance to approve the budget without a reference date as regards the currency exchange rate.

13.10 The Delegate of Spain agreed with this view, but emphasized that her country is very flexible and was not insistent that the base currency be changed this year, but rather for 1991. She noted that the total budget of US$ 1,225,000 corresponds, in general, to the value of the budget approved in 1989, and added that the most coherent solution would be to take into account the exchange rate at the time the budget was approved (i.e. 120 pesetas in this case).

13.11 The Delegate of Canada noted that the budget should be studied in terms of the increase in discretionary and non-discretionary items and requested that a table be prepared showing the percentage increase per chapter, which could then be analyzed to decide whether or not such increases are justified.

13.12 The U.S.S.R stressed the importance of strictly observing the Convention, i.e., a dollar-based budget.

13.13 The Delegate of Venezuela fully agreed with Portugal in that the 1991 budget should be based in dollars and the change in the base currency should be discussed at next year's meeting with a view to the future. He also suggested that the Working Capital Fund should be used as a "cushion" as regards the shortfall in the budget funds. In this regard, the Delegate of Ghana suggested a proportional extra contribution as a means to build up the Working Capital Fund.

13.14 The Executive Secretary noted that the biggest increase as regards the allocations in the salaries chapters of the Revised 1991 Budget corresponds to salaries. He reminded the Committee that the staff salaries have been adversely affected by budget cuts, currency fluctuation, etc., since 1987. He noted that salaries calculated in dollars at 120 are now being received by the staff at an exchange rate of 93! He stressed that the Committee should not forget the matter of the accumulated debt of the Commission, which is the crux of the whole problem. No matter what total budget is approved, the real income will be reduced by the contributions of non-paying countries.

13.15 The Delegate of France declared that he could not support any increase in the Working Capital Fund through an extra-budgetary contribution. France can, however, in this case only accept a readjustment of the budget, to take into account the strong devaluation of the dollar with respect to the peseta. In this case, the exchange rate should be fixed logically at 1 January 1991, since Article X(c)4 of the Convention indicates that the contributions are payable the first of January of the year for which the contributions are levied. France also requests that the matter of changing the base currency be formally included on the agenda of the next Commission meeting.

13.16 The Delegate of Spain reiterated her country's position that future Commission budgets should be calculated in Pesetas.

13.17 The Delegate of Ghana stressed the importance of having a reference currency, whether it be dollars or pesetas. He also questioned the legality of fixing the exchange rate.

13.18 The Delegate of Korea expressed concern that if a total budget was not decided, Commission activities might be adversely affected.

13.19 The Delegate of the United States asked that contribution tables be prepared using a total budget figure of US$ 1,100,000 and US$ 1,150,000 for the Committee's review. This suggestion was supported by Spain, with the reservation that since not all the contributions will be received, the real income will be insufficient to meet the Commission's needs.

13.20 The Chairman opened the third session of STACFAD on Friday, November 16, 1990. She summarized the Committee's discussions up to now. She noted that today's session would concentrate on the 1991 Budget.

13.21 As requested at yesterday's session, the Secretariat prepared some alternative budget tables for review by the Committee. He emphasized that the Secretariat is a service organization and therefore the chapters corresponding to salaries represents the biggest expenditure of the budget.

13.22 The Assistant Executive Secretary explained briefly the U.N. salary system. In justifying the increases in the salaries chapter, he spoke on behalf of the staff, and informed the Committee that total loss endured by the staff over the three-year period (1988, 1989 and 1990) amounted to more than $200,000!

13.23 The Assistant Executive Secretary further explained that the Revised Budget presented in October, 1990, was already out of date since it had been calculated at an exchange rate of 1 US$ = 97 Ptas. Accordingly, the Budget presented at this time shows an adjustment to the salaries chapters, i.e. the application of today's exchange rate of 93 Ptas. However, it maintains the same total budget as that presented in October (US$ 1,225,000). If the exchange rate had remained at the same level as when the budget was approved in 1989 (i.e. 120), this revision to the salaries chapters would only represent an increase of about 3.7% over the 1990 level.

13.24 The Assistant Executive informed the Committee that if this budget is approved, then the Secretariat staff salaries would be normalized. That is, staff in the General Services category would be paid in Pesetas and Professional staff can receive the "post adjustment" to which they are entitled. This proposed Budget includes an allotment to the "Contingencies" chapter amounting to US$ 40,000, which can be utilized as extra funding in case the Dollar/Peseta exchange rate drops below the 93 Peseta level (the level on which the salaries chapters were calculated).

13.25 In a response to an inquiry from the Delegate of Spain, the Assistant Executive Secretary informed the Committee that in the preparation of the revised budget the SCRS Chairman was consulted in general, and that he, as the coordinator of ICCAT Research, had carefully studied each sub-chapter under Budget Chapter 8. He reassured the Committee that scientific activities would be covered in 1991 by this revised Budget.

13.26 In explaining about Commission publication costs, the Executive Secretary assured the Committee that attention would be given to improving the printing quality of the Field Manual (Third Edition).

13.27 The U.S. Delegate reiterated the difficulties of his delegation to accept the revised total budget of US$ 1,225,000 and asked that other, lower total budgets be reviewed by the Committee as to their impact on country contributions. He suggested a total budget of US$ 1,150,000.

13.28 The Delegate of France questioned whether adjustments in the budget could be made at the time of a special meeting of the Commission.

13.29 In response to several inquiries, it was clarified that adjustments to the budget can be made at a special meeting of the Commission. The Delegate of France also insisted on information on the text which authorized such an adjustment.

13.30 The Executive Secretary expressed his doubts about a lower budget since the Commission will not receive the total budget income. So far this year only 12 of the 22 member countries have paid their 1990 contributions. He further noted that unless contributions are received early in the year, we will be faced with difficulties to meet payments in the early part of 1991.

13.31 Several delegations expressed their willingness to accept the revised budget presented amounting to $1,225,000. However, other delegations agreed that while a revised budget should be adopted, they preferred a total budget less than the proposed US$ 1,225,000 budget figure.

13.32 The Assistant Executive Secretary indicated that if a lower budget is adopted and there are no reserve funds included, then it should be agreed that if the dollar continues to decline, funds from extra-budgetary income and, if necessary, from the Working Capital Fund can be utilized to compensate staff for any loss.

13.33 The Delegate of Portugal suggested that if the $40,000 allocated for "contingencies" in the new $1,225,000 budget proposal were removed, then his country could easily accept the total budget (i.e. a total budget of US$1,185,000). This view was supported by France, U.S.A., Spain, Venezuela, Japan, Korea, Gabon, South Africa, U.S.S.R., and Angola.

13.34 With the above adjustment, the 1991 budget, amounting to US$ 1,185,000, was formally adopted by the financial committee and is attached herewith as Table 1.

13.35 However, it was stressed again that unless the member countries meet their financial obligations to the Commission, any budget approved by the Commission would face difficulties.

13.36 The Secretariat thanked the delegates for their consideration of the increases in staff salaries in approving the 1991 budget. However, it was reiterated that contingency funds were removed, if the dollar drops further, extra-budgetary income and/or some funds from the Working Capital Fund may have to be utilized, pending prior consultation with the STACFAD Chairman.

Item 14. PANEL MEMBERSHIP

14.1 The Committee was referred to the Administrative Report (COM/90/8). There were no changes in panel membership during the 1990 meeting.

Item 15. MEMBER COUNTRY CONTRIBUTIONS TO THE 1991 BUDGET

15.1 Since a newly revised budget of US$ 1,185,000 was adopted at this session, a table showing the member country contributions based on this budget was prepared by the Secretariat and distributed to the delegations.

15.2 The Executive Secretary urged that the 1991 contributions be paid as early in the year as possible in order to meet expenditures in January and February, since our Working Capital Fund is at a low level. This was reiterated by the Committee Chairman.

15.3 In reviewing the new contributions table, the Delegate of Morocco noted the marked increase in his country's contribution for 1991 and asked for clarification on the catch and canning figures used in the calculations. He was informed that these figures were based on 1987 information provided by the national office of Morocco, which were the latest data available when the budget for the 1990-1991 biennial period was adopted originally.

15.4 The member country contributions corresponding to the 1991 revised budget of US$ 1,185,000 were adopted by the Committee and are attached herewith as Table 2 to the 1990 STACFAD Report.

Item 16. OTHER ADMINISTRATIVE AND FINANCIAL MATTERS

16.1 Prior to the adjournment of the second session of STACFAD, the ICCAT Executive Secretary made the following declaration:

> "I have been serving the Commission since it was created, when I was named to the position of Executive Secretary, in virtue of Article VII of the Convention (date hired: July 1, 1970).
>
> "Logically, we started from scratch. Today, the Commission has adequate office space, modern equipment and a highly qualified staff. During all this time, the Commission has come to occupy a relevant position among international fisheries organizations. It has gained in prestige and has served as a model for other organizations. I believe that the Commission has completed a splendid stage in its development.
>
> "The Commission has celebrated its 20th anniversary, and I believe that the time has come to embark upon a new stage, and that the way should be made for someone else to occupy the position I now hold. The Commission should make the pertinent decision to name a new Executive Secretary."

16.2 While he understood the personal factors involved in such a decision, the Delegate of Portugal stated that a substitution of the Executive Secretary at this time was not in the best interests of the Commission, because of the many problems currently facing the Commission which could be best handled by someone who is as familiar with the working of the Commission as Dr. Rodríguez Martín. He asked the Executive Secretary to reconsider his position.

16.3 The Delegate of Spain expressed her understanding of the personal position of Dr. Rodríguez Martín, and cited the close collaboration maintained with him in the past few years. However, we must respect his reasons for having made this decision, and therefore, the Committee should discuss the correct procedure to follow in the substitution of the Executive Secretary.

16.4 The Delegate of Portugal reiterated that in view of the current economic condition of the Commission, the Executive Secretary should delay his decision to leave the service of the Commission.

16.5 The Delegates of France and Venezuela expressed strong support of the view expressed by the Delegate of Portugal that the Executive Secretary should postpone his decision until a later date.

16.6 The Delegate of Spain noted that finding a substitute for our current Executive Secretary would be a long and difficult process, given the efficient service of Dr. Rodríguez Martín to ICCAT, but that the personal preferences of Dr. Rodríguez Martín must be taken into account.

16.7 The Committee continued its discussions concerning the declaration made by the Executive Secretary to retire from the Commission. In returning to this item, several delegations expressed their regret that Dr. Olegario Rodríguez Martín had decided to leave the Commission and at the same time paid homage to him for his dedication to the ICCAT's work for more than 20 years.

16.8 The Committee referred to the pertinent articles of the Convention, Financial Regulations and Staff Rules which deal with different aspects of the position of the Executive Secretary of the Commission. Considerable discussion ensued on the procedures to follow in naming a successor to Dr. Rodríguez Martín. However, the majority of the delegations agreed that the procedure must be carefully studied by the Committee. There was a consensus that a "pre-selection" committee be formed to screen the applications received. Discussions then continued as to the composition of such a committee, the terms of reference of this pre-selection committee, and the meeting calendar to be followed and the deadlines to be set up.

16.9 As regards the make-up of the pre-selection committee, some delegations felt that the Commission officers should take part, while others preferred open nominations within the STACFAD. However, the majority of the delegations agreed that membership on the committee should be limited to 5 to 8 persons at most. A suggestion was also made that the STACFAD Chairman serve in a chairmanship capacity for the pre-selection committee.

16.10 The Chairman reminded the Committee that in discussing the need for one or two meetings of the pre-selection committee, the Committee should bear in mind the financial implications involved. It was also noted that if this Committee meets prior to the November Commission Meeting, that all travel/per diem expenses would be responsibility of the respective member countries.

16.11 In view of the numerous opinions and suggestions made by the committee and to expedite the work of the Committee, it was decided that a small group comprised of the Commission Chairman, the STACFAD Chairman, and the Executive Secretary would meet during the lunch break to draft a "Calendar of Events" for the Pre-Selection Committee.

16.12 The Committee reviewed the "Calendar for the Selection of a New Executive Secretary" prepared by the small group, which is attached herewith as Appendix 2 to Annex 9). Following some discussion on the make-up of this committee and taking into account the geographical distribution, it was decided that the following seven member countries would take part in the pre-selection committee: France, Spain, Portugal, United States, Japan, Venezuela, and Gabon.

16.13 It was also decided that the Executive Secretary would be in charge of calling a meeting of the pre-selection committee and that a chairman would be elected by the pre-selection committee at its first meeting.

16.14 The Executive Secretary indicated that he would write to the seven member countries on the pre-selection committee to solicit the names of the people who will be represented by those countries on the committee. It was also clarified that designated persons who will comprise the pre-selection committee should not be eligible to present their candidacy for the position of ICCAT Executive Secretary.

Item 17. ADOPTION OF REPORT

17.1 The Report of the Standing Committee on Finance and Administration was adopted with the condition that editorial changes can be presented by the member countries, by correspondence, on their respective interventions and insofar as such changes are consistent with what has actually transpired during the meeting, after the report has been circulated by the Secretariat. This adoption procedure had to be followed due to the extreme time constraints on the last day of the 1990 Commission Meeting.

Item 18. ADJOURNMENT

18.1 The STACFAD Chairman thanked the delegates, the interpreters, rapporteurs and the Secretariat staff for their efficient work during the meeting. The 1990 STACFAD Meeting was adjourned.

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The adopted report now includes all those corrections presented by the member country delegates and observers to their respective interventions.

Table 1. Revised Budget adopted for the second half of the Biennial Period (1991) - in US $

CHAPTER	*1,185,000*
1. Salaries	654,000
2. Travel	22,000
3. Annual Commission Meeting	45,500
4. Publications	25,000
5. Office Equipment	7,500
6. Operating Expenses	93,000
7. Miscellaneous	1,000
Sub-Total	848,000
8. Coordination of Research	
a) Salaries	190,000
b) Travel for improvement of statistics	12,000
c) Port Sampling	15,000
d) Biostatistical work	12,000
e) Electronic Equipment	15,000
f) Data Processing	41,000
g) Scientific meetings (including SCRS)	52,000
h) Miscellaneous	0
i) Albacore Research Program	0
j) Billfish Program*	0
Sub-total	337,000
9. Contingencies	0
TOTAL BUDGET	1,185,000

*Funded by the Trust Fund for Billfish Research.

Table 2. Member country contributions to the 1991 Regular Commission Budget (US $)

TOTAL BUDGET= $ 1,185,000

COUNTRY	A #	B %	C (MT)	D (MT)	E (MT)	F %	G $	H $	I $	J $	K $
Angola	2	4.8387	1819	1637	3456	0.6798	1,000.00	2,000.00	18,112.90	5,089.46	26,202.37
Benin	0	1.6129	97	0	97	0.0191	1,000.00	0.00	6,037.63	142.85	7,180.48
Brasil	2	4.8387	16240	2499	18739	3.6860	1,000.00	2,000.00	18,112.90	27,595.91	48,708.81
Canada	2	4.8387	1279	398	1677	0.3299	1,000.00	2,000.00	18,112.90	2,469.63	23,582.53
Cap Vert	1	3.2258	5133	228	5361	1.0545	1,000.00	1,000.00	12,075.27	7,894.85	21,970.12
Cote d'Ivoire	1	3.2258	0	0	0	0.0000	1,000.00	1,000.00	12,075.27	0.00	14,075.27
Cuba	1	3.2258	7650	1837	9487	1.8661	1,000.00	1,000.00	12,075.27	13,970.99	28,046.26
Espana	4	8.0645	155793	33500	189293	37.2344	1,000.00	4,000.00	30,188.17	278,761.56	313,949.73
France	3	6.4516	42000	29100	71100	13.9855	1,000.00	3,000.00	24,150.54	104,705.12	132,855.66
Gabon	1	3.2258	0	0	0	0.0000	1,000.00	1,000.00	12,075.27	0.00	14,075.27
Ghana	1	3.2258	33465	0	33465	6.5826	1,000.00	1,000.00	12,075.27	49,282.09	63,357.36
Guinea Ecuatorial	0	1.6129	400	0	400	0.0787	1,000.00	0.00	6,037.63	589.06	7,626.69
Japan	4	8.0645	34473	0	34473	6.7809	1,000.00	4,000.00	30,188.17	50,766.52	85,954.69
Korea	3	6.4516	7625	0	7625	1.4999	1,000.00	3,000.00	24,150.54	11,228.92	39,379.46
Maroc	2	4.8387	4993	247	5240	1.0307	1,000.00	2,000.00	18,112.90	7,716.66	28,829.57
Portugal	3	6.4516	14623	4282	18905	3.7187	1,000.00	3,000.00	24,150.54	27,840.37	55,990.91
S.Tome & Principe	1	3.2258	385	0	385	0.0757	1,000.00	1,000.00	12,075.27	566.97	14,642.24
South Africa	1	3.2258	5545	361	5906	1.1617	1,000.00	1,000.00	12,075.27	8,697.45	22,772.72
U.S.A.	4	8.0645	23865	36586	60451	11.8909	1,000.00	4,000.00	30,188.17	89,022.92	124,211.09
U.S.S.R.	2	4.8387	7840	998	8838	1.7385	1,000.00	2,000.00	18,112.90	13,015.24	34,128.15
Uruguay	0	1.6129	1194	7	1201	0.2362	1,000.00	0.00	6,037.63	1,768.65	8,806.28
Venezuela	2	4.8387	24820	7463	32283	6.3501	1,000.00	2,000.00	18,112.90	47,541.43	68,654.33
TOTAL	40	100.0000	389239	119143	508382	100.0000	22,000.00	40,000.00	374,333.33	748,666.67	1,185,000.00

A: Panel membership.
B: Percentage of payments for annual membership and panel membership (G+H).
C: Catch (live weight) - 1987.
D: Canned production (net product weight) - 1987.
E: Total (C+D).
F: Percentage distribution of E.

G: Payment of $1,000 annual membership contribution.
H: Payment of $1,000 for each panel membership.
I: 1/3 of (Total contribution less G+H) distributed percentage-wise according to column B.
J: 2/3 of (Total contribution less G+H) distributed percentage-wise according to column F.
K: Total (G+H+I+J).

Appendix 1 to Annex 9

Agenda of the Standing Committee on Finance and Administration (STACFAD)

1. Opening of the meeting
2. Adoption of Agenda
3. Election of Rapporteur
4. Administrative Report (1990 activities)
5. Auditor's Report - 1989
6. Review of the 1st half of the biennial budget - 1990
7. Member country contributions pending payment
8. Review of the Working Capital Fund
9. Review of the financial status of the Yellowfin Year Program
10. Review of the financial status of the Albacore Research Program
11. Review of the financial status of the Program of Enhanced Research for Billfish
12. Review of the financial implications of proposed 1991 Commission activities:

    a) Recommendations made in research and statistics
    b) Proposed intersessional meetings
    c) Commission publications
    d) Next Regular Commission meeting
    e) Others

13. Review of the 2nd half of the biennial budget - 1991
14. Review of Panel membership
15. Member country contributions to the 1991 budget
16. Other administrative and financial matters
17. Adoption of Report
18. Adjournment

Appendix 2 to Annex 9

Calendar for the Selection
of a New ICCAT Executive Secretary

1. Prior to April 1, 1991

The "Pre-Selection Committee", which should be comprised of 5 to 7 people (odd number), will prepare the text of the announcement of the post vacancy, which will include:

i) Candidate profile:
-- University level
-- Training
-- Experience:
Professional
In fisheries
In international organizations
In administration and finance
-- Languages
-- Nationality and residence
-- Dependents

ii) Activities he should carry out in the Commission and responsibilities

iii) Financial conditions (salary and benefits)

iv) Term of contract

The Pre-Selection Committee will work through correspondence or will hold a meeting in Madrid in March, 1991.

The out-going Executive Secretary, as well as the Secretariat, can collaborate, if the Committee solicits its help.

Post vacancy announcements of other organizations similar to ICCAT will be reviewed.

2. May 1, 1991

   i) Announcement of post vacancy: Wide distribution of announcement so that it will reach the persons interested.

   ii) The mailing list of the ICCAT NEWSLETTER can be used and wide distribution can be requested.

   iii) Resumés will be received at the Secretariat until July 31, 1991.

3. August 1, 1991

   i) All the resumés received will be mailed to the members of the Pre-Selection Committee.

   ii) In September, October or November (one week before the Commission Meeting): A meeting of the Pre-Selection will be held in Madrid to review the resumés received and decide which will be presented to the Commission at its Regular Meeting (Madrid, November, 1991).

4. For the election of the Pre-Selection Committee, it is suggested that:

   i) Volunteers be accepted from among the interested countries.

   ii) Nominations by the delegates be accepted.

5. During the Regular Meeting of the Commission in November, 1991, the new Executive Secretary will be named. He will assume his duties within approximately 3 months from that time (with some flexibility).

6. Upon the incorporation of the newly-named Executive Secretary, the out-going Executive Secretary will be relieved of his duties.

7. The Standing Committee on Finance and Administration (STACFAD) should discuss (in November, 1991) the financial implications of the change in the Executive Secretary.

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All the above concepts are outlined in the "Staff Rules" currently in effect.

The dates indicated above of an indicative nature.

REPORT OF THE STANDING COMMITTEE ON RESEARCH AND STATISTICS (SCRS)
(Madrid, November 5-9, 1990)

Table of Contents

1. OPENING OF THE MEETING

The Standing Committee on Research and Statistics (SCRS) held its 21st Regular Meeting in Madrid, Spain, at the Hotel Pintor, from November 5 to 9, 1990. During the week preceding the Committee's meeting, the species groups met, reviewed the scientific papers presented, and prepared draft reports of the stock evaluation sections for each species.

The SCRS Chairman, Dr. J. L. Cort, opened the 21st Meeting of the Committee and welcomed all the scientific delegations. He pointed out that there were several intersessional meetings in which ICCAT was directly involved in 1990, and noted that many achievements were made. The SCRS Chairman was looking forward to the reports to be presented on the progress made by the Committee since its 1989 meeting.

Dr. Cort proposed that the Committee observe a moment of silence in memory of the recently deceased Dr. John A. Gulland, who contributed so much to the scientific work of this Committee, and for the two Portuguese and two French who were killed in an accident while engaging in tuna research activities.

The Delegate of Canada asked that the record of the meeting reflect her country's concern that the choice of dates for the Swordfish Assessment Session had precluded Canada's making any input to the 1990 swordfish report thus far. The Canadian Delegate indicated that it was regrettable that the final dates for the swordfish meeting were chosen after the SCRS Chairman had been informed by letter (dated April 20, 1990) that the tentative dates were not suitable for Canada, since the Canadian scientist would be on a swordfish research cruise at that time.

The Delegate further noted that it was not until October 15, 1990, that Canada learned that there was to be no additional discussion of the draft SCRS swordfish report by the species group and that the appendix to the report (and thus the analyses) was not to be further discussed by either the species group or the SCRS plenary. The implication of this is that Canada could not make input to the analyses, but was limited only to making comments on the interpretation of the results at the SCRS.

The Delegate of Canada expressed her country's concern with the status of the swordfish stocks and noted it fully supports the need for better scientific assessments and effective management measures. Although the exclusion of Canada from the 1990 swordfish assessment was not deliberate, it is hoped that in the future the availability of Canadian scientists will be confirmed with the appropriate Canadian authorities.

2. ADOPTION OF AGENDA AND ARRANGEMENTS FOR THE MEETING

The SCRS Agenda, circulated prior to the meeting, was reviewed. Some modifications were introduced and the Agenda was adopted (Appendix 1).

The following scientists served as rapporteurs for the 1990 Report:

Agenda Item 10:	
Tropical Tunas	General: A. Fonteneau, YFT: P. Pallarés, BET: J. Pereira, and SKJ: J. Ariz
ALB: Albacore	F. X. Bard
BFT: Bluefin	West: D. Clay, East: B. Liorzou
BIL: Billfish	E. Prince
SWO: Swordfish	Z. Suzuki
SBF: Southern bluefin	Y. Ishizuka
SMT: Small tunas	A. Delgado de Molina
All other items:	P. M. Miyake

3. INTRODUCTION OF DELEGATIONS

A spokesman from each member country introduced the members of his respective delegation. The List of Participants is attached as Appendix 2.

4. ADMISSION OF OBSERVERS

The observers from the non-member countries and international organizations listed in the List of Participants (Appendix 2) were introduced and admitted.

5. ADMISSION OF SCIENTIFIC PAPERS

The Committee reviewed the papers submitted to the 1990 meeting. It was pointed out that several papers presented this year did not have the required number of copies, and as such, did not satisfy the criteria for late documents. However, there were just enough copies so that they could at least be distributed among the scientists attending the species groups on the first day of the meetings, so the Committee accepted these papers. The List of Documents is included as Appendix 3.

6. REVIEW OF NATIONAL FISHERIES AND RESEARCH PROGRAMS

In addition to the National Reports, included in Chapter III of this volume, the member countries and observers were asked to present a short summary of tuna fishing activities to be included in this chapter.

6.1 CANADA

The Canadian nominal catch in calendar year 1989 of bluefin tuna and swordfish as 633.6 MT and 1,243 MT, respectively. These species are regulated by the Department of Fisheries and Oceans with respect to both catch and effort.

A limited experimental offshore longline fishery has been conducted from 1987 to 1989 and continues in 1990.

The number of bluefin licenses issued in 1989 was 747 while 67 sword fish longline licenses were issued. A traditional harpoon fishery for swordfish has 900 licensed fishermen; although many licenses are issued, only a limited number of fishermen are active (harvesting about 10 per cent of the catch).

Fisheries for these two species are in progress in 1990 at approximately the same levels as 1989.

The only tuna cannery along Canada's east coast closed in 1990. There is little optimism regarding the possible re-opening of this plant.

6.2 COTE D'IVOIRE

Côte d'Ivoire has no purse seiners and the only Ivorian fisheries are artisanal (canoes operating from Abidjan).

Nevertheless, the port of Abidjan is one of the most important tuna ports in the Atlantic. More than 70,000 MT of tropical tunas are landed or transshipped every year.

The tuna vessels which frequented Abidjan in 1989 were purse seiners flying flags of Spain, France, Japan and Norway. The Ghanaian baitboats which frequently unloaded at Abidjan since 1984 left the port in October, 1989.

The Centre de Recherches Océanographiques of Abidjan carried out the following scientific research:

- Collection and validation of logbooks of all tuna vessels unloading in Abidjan.
- Multi-species size sampling of tropical tunas landed or transshipped. More than 60,000 tunas per year are measured.
- Possible recovery of tags. The CRO of Abidjan has also recovered two new tags on large yellowfin applied in the United States. This makes seven observed transatlantic migrations.
- Special sampling of billfish and swordfish landed by the canoe fleet operating with driftnets. This sampling is for the ICCAT Program of Enhanced Research for Billfish.
- Collaboration and support to the Fisheries Research Unit of Ghana for baitboat fishery statistics.
- Collection and analysis of biological samples (stomachs, gonads) of yellowfin processed at the canneries.

The results of this research are presented in three documents: SCRS/90/67, SCRS/90/68 and SCRS/90/70.

6.3 GHANA

The Fleet: The fleet consisted of 33 baitboats in 1989, which was an increase of 4 from 29 in 1988. They were all Ghana flag vessels. The gross registered tonnage ranged between 250 and 500.

The Fisheries: Skipjack continued to be the dominant species caught, followed by yellowfin and bigeye. The total landings of tunas for the year were 32,294 MT, which showed a reduction from the 33,465 MT caught in 1988. The catch for 1990 is projected to be 33,207 MT.

Research and Statistics: From March 1984 to September 1989 when most of the landings by Ghana flag vessels were made in Abidjan, most of the normal port sampling for multi-species composition of the catches including initial processing of the Ghana statistical tuna data was carried out by the kind cooperation of the Centre de Recherches Océanographiques (CRO) in Abidjan. However, since October 1, 1989, when the Ghana flag vessels resumed transshipment of export tuna from Tema, the research and statistics work has been carried out by the Fishery Research Unit in Tema.

The Fishery Research Unit has continued to sample the billfish landings in accordance with the Enhanced Billfish Research Program. This fishery is entirely artisanal.

6.4 KOREA

The 1989 total catch of tunas and tuna-like fishes amounted to 12,507 MT, taken by 33 longliners, which showed an increase of 60 percent compared to the 1988 catch. Bigeye and yellowfin catches amounted to 7,896 MT and 2,535 MT, respectively. Bigeye tuna remained one of the major species in 1989 and comprised 63 percent of the total catch. There have been no changes in fishing strategy and grounds for the Korean tuna longliners in recent years.

The National Fisheries Research and Development Agency (NFRDA) collected catch and effort data as well as size data on tuna and tuna-like fishes from the fishing vessels as in the past. Catch and effort data, and size frequency data for 1989 were submitted to ICCAT.

6.5 PORTUGAL

Portuguese tuna fishing takes place mostly in the Azores and Madeira, where the local baitboat fleets seasonally catch tunas. In continental Portugal, tunas are taken incidentally by different gears, such as longline, purse seine and gillnets.

Catches of tunas and tuna-like species in 1989 were 13,344 MT, of which 4,947 MT were bigeye, 7,696 MT were skipjack, 170 MT were albacore and 531 MT were other species.

After the high catches observed in previous years (17,736 MT in 1988), the total catch declined in 1989, mainly due to the low catch of skipjack in the Azores fishery.

Preliminary estimates of catches made during the first three quarters of 1990 were of 3,688 MT in Madeira and 6,716 MT in Azores. An important decrease in skipjack catches has also been observed in 1990 in the Azorean fishery.

Since 1984 many new baitboats have entered the Azorean and Madeiran fisheries, and 13 boats were incorporated during 1989-1990.

Research, sampling activities and the collection of statistics continued as in the past, with an increase in the sampling coverage in the Azores.

In 1989 and 1990, an experiment with a longliner targeting swordfish took place in Madeira. Monitoring this experiment by Madeiran scientists included collection of biological data on the species caught and the catch rates for the fishery.

6.6 SAO TOME ET PRINCIPE

Status of the fishery: Sao Tomé et Principe does not have an industrial or semi-industrial tuna fleet. Tuna catches landed at its national ports are by-catches of the artisanal handline fishery.

Tuna fishing in Sao Tomé waters is carried out by purse seiners and baitboats pertaining to the EEC, as well as to the Soviet Union, under license by the government of Sao Tomé et Principe.

It is very difficult to provide information on tuna catches, by gear, species and fishing effort, due to the partial or total lack of these data at the Fishery Directorate.

However, the EEC and Sao Tomé signed a new fishing agreement last May, allowing fishing vessels to operate in the economic zone of Sao Tomé et Principe. It should be noted that during that meeting, at the proposal of the European Community, the two parties agreed to increase the number of fishing licenses.

Legislation: Updating of the maritime legislation is being concluded. The legislation which under study by the government should be approved and published in a few months.

Research: In Sao Tomé et Principe, information on fisheries is generally processed after some time. A small marine biology laboratory has been installed at the Fishery Directorate. At present, the Sao Tomé authorities in charge of fishing are seeking financial resources for the existing programs, notably research on billfish, crustaceans, aquiculture and setting up a data center for fisheries. It should be noted that these projects, among others, have the most priority.

6.7 SOUTH AFRICA

Total tuna catches in 1989 reported in South Africa increased by 50 percent over those in 1988 to 6,669 tons. This increase resulted partially from an actual increase in catches and partially from an improvement in reporting systems. It appears that catches in past years may have been significantly under-reported.

Albacore caught on poles off the Namibian and South African west coast contributed 83 percent of the total catch. The by-catch of yellowfin tuna in this fishery increased markedly to 664 tons, while the bigeye tuna by-catch decreased to 378 tons.

Staff limitation continued to preclude the development of an increased South African tuna research program. However, catch and effort data reporting systems were improved. Length-frequency sample of foreign catches transshipped in Cape Town harbour continued on behalf of ICCAT. Limited measuring of South African catches was also conducted.

Detailed information is provided in the South African National Report, (SCRS/90/63).

6.8 SPAIN

The Spanish catches of tunas in 1989 amounted to 156,621 MT, which is around a 4 percent decrease from 1988 although the average level of previous years was maintained.

By species, yellowfin is the main component of the catches (39.4 percent), followed by skipjack (22.5 percent), albacore (16.2 percent) and swordfish (10.5 percent); the catches of other species (bluefin tuna, bigeye and small tunas) do not reach 5 percent of the total catch.

By fleet, the freezer purse seine fleet which operated in the eastern tropical Atlantic with 35 vessels made more than 60 percent of the total catches.

In general, the combined effort for all Spanish fisheries has remained stable, although there has been a shift in effort (more than 30 percent) of the swordfish longline fleet from the North Atlantic to the south Atlantic; and in the tropical purse seine fleet, three vessels changed flags.

During 1989, two tagging cruises were carried out in the Cantabrian Sea and another in Canary Islands waters with a total of 4,481 albacore, 973 bluefin, 2,221 skipjack and 2 yellowfin being tagged.

Eighteen documents were presented to the SCRS which summarize the results of the research carried out in 1989 on the Spanish fisheries.

6.9 U.S.A.

Total reported U.S. landings of tuna and tuna-like fishes in 1989 were 25,592 MT. This represents a decrease of 4,200 MT over 1988. This is primarily attributed to decreases of 1,980 MT in yellowfin landings to 7,381 MT, and decreases of approximately 1,450 MT in both Spanish and king mackerel landings. Landings from the U.S. longline fishery for yellowfin in the Gulf of Mexico decreased in 1989 to 6,058 MT, accounting for 79 percent of the total U.S. yellowfin landings.

U.S. vessels fishing in the northwest Atlantic landed an estimated 1,399 MT of bluefin, an increase of 109 MT over 1988. Additionally, an estimated 249 MT of bluefin were released dead by U.S. longline vessels. For the second consecutive year, skipjack landings remained very low (56 MT), far below the 1985-87 three-year average of about 1,150 MT per year. Bigeye landings increased by 60 MT to 762 MT.

Major research activities on large pelagics in 1989 and 1990 included continued monitoring of landings and size of swordfish; the initiation of an ICCAT recommended research project primarily directed at determining the reproductive biology of Atlantic swordfish; the development of a method for calculating uncertainty about the estimates of catches of large pelagic fish from the recreational fishery off the northeast U.S. coast; the first development of an index of abundance for small bluefin using catch rates from the fishery off Virginia; two bluefin growth studies using mark-recapture data and hard parts analysis; participation in the 1990 ICCAT SCRS swordfish assessment in Madrid; continuation of port and tournament sampling for billfishes and other pelagics; coordinating further increased efforts related to the ICCAT Enhanced Research Program for Billfish; bluefin larvae surveys;and the initiation of stock assessment research on sharks. The cooperative tagging program tagged and released 5,330 billfish and 536 tunas in 1989.

6.10 U.S.S.R.

In 1989, the total catch of tunas and related species amounted to 20,472 MT. The catch included: 4,246 MT of yellowfin tuna, 424 MT of bigeye tuna, 543 MT of little tunny, 5,054 MT of frigate tuna, 723 MT of bullet tuna, 5 MT of blue marlin, 4 MT of sailfish, 7,363 MT of Atlantic bonito, 195 MT of king mackerel and 1,915 MT of skipjack.

The fishery was carried out in the tropical eastern Atlantic. The purse seine catch made up 6,398 MT (yellowfin, skipjack and small tunas), the longline yielded 1,003 MT (yellowfin and bigeye tunas, sailfish and blue marlin) and the trawl catch amounted to 1,307 MT (Atlantic bonito, bullet tuna, frigate tuna and king mackerels).

The research work involved age determinations of main commercial species, the analysis of bio-commercial statistics and the study of conditions of formation of commercial tuna aggregations, the target species in the purse seine, longline and trawl fishery. Two observers worked on board commercial vessels.

6.11 VENEZUELA

In 1989, the catch of tuna by the Venezuelan fleet in the Atlantic Ocean remained relatively stable compared to the previous year (28,200 MT in 1989 compared to 26,700 MT in 1988). This situation compares to that observed in the eastern Pacific (66,300 MT in 1989, compared to 46,000 MT in 1988).

As regards the collection of data and research, it should be noted that at the end of 1989, the creation of a special commission to improve tuna statistics by the director of fisheries, as well as the adoption of a logbook system and multi-species sampling recommended by SCRS scientists in previous years.

From the first results obtained in 1990, a clear increase in the number of port sampling and the computerization of tuna statistics should be noted.

After an active participation in the Yellowfin Year Program, Venezuela made a special effort for the Billfish Program. Thus, in addition to the study of sport fishing, four trips were made on longliners with observers on board in 1989 and six in 1990.

In 1990, this program extended to the collection of statistics of an artisanal driftnet fishery targeting these species. Finally, in 1989, an exploratory fishing program for swordfish was begun in the Venezuelan EEZ with observers on board.

For the various ICCAT programs, Venezuela collaborates with the French ORSTOM.

The results of research done in 1990 are found in documents SCRS/90/65 and SCRS/90/100.

6.12 LIBYA (Observer)

In 1989, the Libyan trap fishery took 84 MT of bluefin tuna. In addition, 162 MT of tuna species (small tunas) were taken by vessels and trap.

A decrease in the catch of bluefin tuna was observed, due to the following: a) fewer numbers of traps in operation than before because of the high costs of labor in preparing the traps; b) fewer catches in the traps than before, perhaps due to the changes in the routes of the tuna inside the Mediterranean.

Libya has begun building some vessels and five tuna vessels are now under construction and are planned to be put into operation in 1991.

6.13 SENEGAL (Observer)

The Senegalese tuna fleet is comprised of: a) a Dakar-based fleet, comprised of French, Spanish and Senegalese purse seiners. This fleet landed 11,000 MT in 1989, as compared to 11,700 MT in 1988. This decrease of 700 MT is due in part to the decrease in effort. b) a foreign fleet not based in Dakar, comprised exclusively of French and Spanish purse seiners which land half of their catches at Dakar. The total landings of this fleet amounted to 16,000 MT in 1989.

In addition, a very active artisanal fishery exploits small tunas as well as sailfish. The catches are 6,000 MT and 500 MT, respectively, in 1989.

There is also a sailfish sport fishery in Dakar, which lands 50 MT per year.

Senegal participates actively in the Billfish Research Program and has obtained many results in tagging, and the collection of biological data and size sampling.

6.14 TAIWAN (Observer)

The Taiwanese longline catch of tunas in the Atlantic in 1989 amounted to 25,109 MT, of which 1,520 MT with 3.6 million nominal hooks were from the North Atlantic and 23,589 MT with 68.7 million nominal hooks were from the South Atlantic. The total amount showed a slight decrease from 28,137 MT in 1988. Of the species caught, albacore still remained the dominant species with 85.2 percent (1,295 MT) and 78.0 percent (18,390 MT) of the catches of the north and south Atlantic, respectively. The next most important species in the catches are bigeye tuna (15 MT north and 1,209 MT south). The decrease in nominal effort from 5.2 million hooks in 1988 to 3.6 million hooks in 1989 in the North Atlantic may be due to economic factors which would have discouraged fishermen. Catch statistics and research activities were carried out by the Institute of Oceanography, National Taiwan University, sponsored by the Council of Agriculture and National Science Council, for the assessment of albacore.

7. REPORT OF THE ALBACORE WORKSHOP

Dr. F. X. Bard, Convener of the Albacore Workshop, presented the report of the 2nd Albacore Workshop (Collective Volume XXXIV), which had been held at the ICCAT Secretariat from October 3 to 9, 1990. The Workshop reviewed all the information available on the Atlantic albacore fisheries. The Atlantic fisheries (including traditional and newly developing ones) were reviewed. The statistics were examined and catch-at-size tables were created for the North Atlantic and for the longline fisheries in the South Atlantic. An age table was created for the North Atlantic; nominal catch per unit effort were broken down into ages corresponding to the catch-at-age table.

Virtual Population Analysis (VPA), standard for stock assessment work of the International Commission for the Exploration of the Sea (ICES), was used for the ICCAT stock assessment on albacore. The results show that the North Atlantic stock has been moderately exploited. The recruitment level shown by the results of the VPA has been fluctuating, without any trend. Yield-per-recruit analysis also showed that the present effort is below the level which produces the maximum yield.

Fisheries interaction was also examined and it was found that baitboat is most efficient gear, followed by trawl. The effect of a hypothetical 10 percent increase in any one gear over other fisheries is negative, but very minor.

It was pointed out that some significant errors in the catch-at-age table for the longline fishery for 1981-1985 were found after the meeting had concluded. These may have a significant effect on the conclusions, since the number of large fish are considerably under-estimated. The Committee agreed that the existence of such errors would be footnoted on the pertinent tables.

The Committee agreed that the Final Report circulated at this time will be published in the "Collective Volume of Scientific Papers" series, including all the 1990 SCRS scientific papers pertinent to albacore research.

8. REVIEW OF THE PROGRESS MADE BY THE ALBACORE RESEARCH PROGRAM

The Albacore Research Program was adopted at the 1989 SCRS and Commission meeting. The Program Coordinator, Dr. F. X. Bard, presented a report on the progress made by the Albacore Program so far this year. The scientists involved met for a short period during this meeting and reviewed the progress and found it, in general, to be satisfactory. The data and samples collected in the field this year will be analyzed. It seems that no additional funds will be required at present. However, there could be second albacore research program within a few years. The 1990 Progress Report is attached as Appendix 12.

9. REPORTS OF THE MEETINGS IN WHICH ICCAT SCIENTISTS WERE DIRECTLY INVOLVED

a) Report of the GFCM/ICCAT Joint Meeting on Stock Assessments of Large Pelagic Fish in the Mediterranean

The results of the meeting were presented by Dr. P. Miyake, the ICCAT Assistant Executive Secretary. This meeting was held jointly with the General Fisheries Council for the Mediterranean on June 21 to 27, 1990 at Bari, Italy, and was hosted by the University of Bari. The Joint Consultation reviewed all the Mediterranean statistics for bluefin, swordfish and albacore, as well as the biological parameters and stock structure information. Data substitutions were agreed upon to create the catch-at-size files for these species. The catch at size for bluefin has been improved to a great extent, due to the availability of new size and catch data; the catch at size for swordfish since 1985 was created for the first time for the Mediterranean.

The report of the Joint Consultation and the scientific papers presented have been published in Volume XXXIII of the "Collective Volume of Scientific Papers", which was available for the species group meetings and the SCRS plenary sessions.

b) World Bluefin Meeting

The results of the World Bluefin Meeting were presented by Dr. R. Deriso of the Inter-American Tropical Tuna Commission (IATTC). The Draft Report was presented as SCRS/90/12. The meeting, co-sponsored by IATTC and the Australian Government, was held on May 25-31, 1990, in La Jolla, California. The meeting was attended by many scientists from various countries, working on North Pacific and North Atlantic bluefin and southern bluefin tunas. Review papers were presented by the scientists attending the meeting for each of these stocks. The methodologies applied for the stock assessments of these species were reviewed and compared.

The Group established a Working Group on Assessment Methods as well as subsidiary groups on the conversion of length composition data to age composition, and standardization of catch rates.

It was proposed that those scientists involved in these working groups meet informally during this session, to keep the momentum going.

10. REVIEW OF CONDITIONS OF STOCKS

YFT -YELLOWFIN TUNA

YFT-1. DESCRIPTION OF FISHERIES

Yellowfin are distributed in tropical waters between 45°N and 40°S in the entire Atlantic. The major portion of yellowfin catches, more than 80 percent, come from the surface fisheries (baitboat, purse seine, handline). The rest of the catches of this species come from longline.

The baitboat fisheries are found in coastal areas, of the Gulf of Guinea and along the coast of Senegal, in the east Atlantic, and along the coasts of Venezuela and Brazil in the west Atlantic. These fisheries are directed at juvenile yellowfin which occur in schools mixed with skipjack, small bigeye and other small tunas in the east Atlantic and skipjack and small tunas in the west Atlantic.

Purse seine fisheries exploit the same concentrations of juveniles as the baitboat fisheries, although in the east Atlantic, since 1975, they extended their fishing area towards the offshore areas where large yellowfin are caught.

The traditional longline fleets mainly fish in the inter-tropical area between 15°N and 10°S. Catches of yellowfin from these fleets have been decreasing since the introduction of the deep longline and the change in target species towards bigeye tuna.

Along with these traditional fisheries there is a new U.S. surface longline fishery developing since 1986 in the Gulf of Mexico which constituted the main component (50 percent) of the total west Atlantic longline catch in 1989. Figures 1, 2, and 3 show the areas of distribution of the main fisheries and the mean size distributions of their catches in recent years.

YFT-1.a Catches

Table 1 and Figures 4 and 5 show how the catches have changed, by gear, for the east and west Atlantic from 1960 to 1989, and from 1950 to 1989, respectively.

For the total Atlantic, a continuous increase in catch can be observed up to 1983 when catches reached a record 160,400 MT, followed by a sharp drop in 1984 and a recovery in the following years to reach a similar figure in 1989 (154,900 MT).

In the east Atlantic, the major portion of the catches came from longline until the 1970's when the purse seine fisheries began to develop. From that time, the catch trends are determined by the catches from this fleet. The changes in the catches show a continuous increase since the beginning of the 1970's, reaching 134,800 MT in 1981. In the following years, catches decreased to a low point in 1984 (75,300 MT) and then rapidly recovered with catches over 100,000 MT in later years. In 1989, a sharp increase (28 percent) occurred with a catch of 122,300 MT, nearing the level reached at the beginning of the 1980's. This significant rise is due to the increase in the purse seine catches, especially those of the FIS fleet which increased their catches by more than 60 percent in the last year.

The baitboat catches remained at the level of previous years. As regards longline, catches in the last few years have been stable, making up around 5 percent of the total catches.

In the west Atlantic, catches show a declining trend from 29,600 MT in 1962 to 7,600 MT in 1967, followed by a stable period from 1968 to 1980 with catches around 13,000 MT. Then began a sharp increase with catches higher than 35,000 MT in 1983, 1984 and 1985, which later decreased and stabilized in the three following years, then increased to 37,100 MT in 1989.

As in the east Atlantic, changes in catches in the first years up to the beginning of the 1980's were determined by the longline catches. For recent years, the major portion of the catches come from the purse seine fisheries.

YFT-1.b Effort

In the east Atlantic, fishing effort is exerted mainly by the purse seine and baitboat fleets. Table 2 and Figure 6 show the changes in nominal effort (1972-1989), expressed in fishing vessel carrying capacity, by gear.

Nominal effort shows a continuous increasing trend until 1983 which coincided with the growth of the purse seine fleet. From this time, the trend was inverted due to the movement of this fleet to the Indian Ocean which began in 1984 and continued to 1988.

In 1989, effort remained stable and in 1990 there are indications that effort is increasing with the arrival of new purse seiners in the area and the return of some of the boats that operated in the Indian Ocean in the last few years.

For the west Atlantic, available U.S. longline effort data show a slight decrease in 1989 after a strong increase experienced in the previous year; even though these data include effort directed towards swordfish, the decrease in catches of this fleet in 1989 could be due to a decrease in effort.

With respect to nominal effort for the Venezuelan purse seine fleet, there seems to have been a slight increase in the last year.

YFT-2. STATE OF THE STOCKS

The conclusions reached on Atlantic yellowfin stock structure from the data obtained during the Yellowfin Year Program (YYP) and especially from the transatlantic recoveries of large tagged yellowfin, confirmed the widely accepted hypothesis of some mixing between the stocks of yellowfin in the east and west Atlantic. However, the working hypothesis of two independent stocks in the Atlantic continued to be used.

YFT-2.a East Atlantic stock

Document SCRS/90/103 presents a production model adjusted for the 1966-1989 period.

As an abundance index, the mean CPUEs by 15-day period and 1°x1° rectangles were considered for the purse seine fleet, using searching time as a measure of effective effort and standardizing effort in units of large FIS purse seiners. Table 3 (SCRS/90/103) and Figure 7a show the results of model estimates. Various interpretations of these results are possible.

The results presented give rise to a series of doubts on the real status of the stocks.

A first interpretation leads us to think that the stock is being under-exploited with effective effort at half the optimum and with the catch near the MSY which would be due to an increase in the stock biomass as has occurred in the eastern Pacific stock, as a result of environmental conditions which are favorable to an increase in the biomass.

The other possible interpretation would be that as was suspected from the analysis of the data obtained from observers on board vessels during the YYP and in later studies (SCRS/90/68), in recent years there have been important changes in the fishing pattern of the purse seine fleet as well as technical improvements which were incorporated to the vessels (bird radar). These changes and improvements may have caused an unquantifiable increase in the individual fishing power of the purse seiners. This increase would cause the values of effective effort to be under-estimated.

Likewise, it was considered that the CPUE used at the present time, in which the fleet has reduced the fishing area by lessening the squares with low yields, could be under-estimating the effective effort. In this case, the present fishery could be near full exploitation.

The analysis of other parameters of the fishery indicated the second case.

In the first place, the CPUEs by age (Table 4) do not detect any high recruitment for the last few years. In this case, the increase in the biomass could only be explained by very favorable environmental conditions which would have affected growth. However, even though it is possible that the tropical waters are becoming warmer, the changes in mean weight of the catches do not show that significant changes have occurred in growth (Table 5).

Along with this, the high CPUE value for 1989 (5.4 MT/boat days) could be interpreted as possibly being due to changes in catchability of yellowfin by purse seine, the inverse of what occurred in 1984. In 1989 the activities of the purse seine fleets, both FIS and Spanish, were atypical, limiting the fishing area and taking the major part of the catches in an area normally not intensely exploited, between 0-5° and 10-15°W (Figures 8 and 9). Figure 10 shows the extraordinary yields obtained in this area at the beginning of the year.

The doubts arising from CPUE indices and the effective effort data used in fitting the model require a new attempt at fitting, using standardized effort in total days fishing of the large FIS purse seiners (Figure 11) and a CPUE obtained directly by dividing the total catches by this effort. With $K = 4$ and $m = 1$, the model estimates an MSY of 117,217 MT and a optimal effort of 26,557 fishing days. Figure 7 shows the fitted curve.

The estimated MSY would be near that obtained by the previous model; by contrast, the present effort would be around 75 percent of the optimal effort. If we take into account that the present effort level, due to the increase in individual fishing power of the purse seiners (bird radar), could be interpreted as a considerably higher effective effort on the stock, the situation could be similar to that in the early 1980's, with full exploitation of the stock.

In spite of not having made analytical stock evaluations, different available indices of the fishery were analyzed. The quarterly catch matrix by age showed high catches of ages 4 and 5 during the first quarter of 1989 (Figure 12) while the annual catch rates for these ages presented average values. This fact confirms that the high CPUE value obtained in 1989 is due to a temporary increase in the availability of the adult biomass of yellowfin and not to an increase in the stock biomass.

YFT-2.b West Atlantic stock

A fitted production model was presented on the standardized effort of large Venezuelan purse seiners. This is the first time that an evaluation on the state of the west Atlantic yellowfin stock has been presented.

The west Atlantic yellowfin fisheries are very old fisheries, however, the CPUE values available only allow the tuning of the model for the period 1972-1989.

The model estimates MSY and optimal effort values of 31,025 MT and 3,377 fishing days (Schaefer model, K=3) and the stock being near full exploitation. However, these results should not be considered conclusive on the state of the west Atlantic stock for various reasons: a) it is not certain that there is a single yellowfin stock unit in the west Atlantic; b) The CPUE values (Figure 13) show large fluctuations that seem to indicate changes in fishing strategy of the fleets rather than in the stock biomass; c) the abundance indices used come from the Venezuelan purse seine fleets which operate in a very limited area along the coast, which could be an index of the available biomass in the area and not of the stock biomass.

Nevertheless, this first attempt to evaluate the west Atlantic stock is very positive and has begun a discussion of the state of the stock based on fishery indices.

Figure 14 (SCRS/90/100) shows the adjusted yield curve.

YFT-2.c Single Atlantic stock

No evaluation has been presented on the yellowfin stock under the hypothesis of a single stock in the Atlantic.

YFT-3. EFFECTS OF PRESENT REGULATIONS

The establishment of a minimum size (3.2 kg) for yellowfin tuna, adopted by ICCAT in 1983, based on the results of the yield-per-recruit models, does not seem to have caused a decrease in the fishing mortality that is exerted on juveniles, which are still being caught by baitboat fleets as well as purse seine fleets.

YFT-4. RECOMMENDATIONS

YFT-4.a Statistics

i) The Venezuelan baitboat catches reported to the Secretariat have not been corrected for species composition based on sampling. It is recommended that a correction method be developed and a revision of the historical series be made available.

YFT-4.b Research

i) Since the last SCRS meeting, significant progress has been made in the study of the determining factors in the increase in individual fishing power of the purse seiners in the east Atlantic. It has been confirmed that bird radar, incorporated to the fleet since 1987, is the main determining factor in this increase and the number has been calculated by a census of the fleets. It is recommended that the data obtained be studied in order to make quantitative estimates of the increase in the individual fishing power of the purse seiners. Since IATTC is studying this, it is recommended that the research be coordinated. Also, it is recommended that possible changes in the fishing power of the baitboats be studied.

ii) The abundance indices used for the east Atlantic in estimating effective fishing effort on the stock could be causing an under-estimation of effective effort. With the incorporation of new means of detecting schools, the fleets have modified their fishing strategy, reducing the searching area without reducing yields. These indices should be analyzed and possible biases that could have originated should be evaluated.

iii) In 1989 high catch rates for purse seiners were observed, which is explained by the abnormally high yields; the highest in the historical series of this fleet was made during the second 15-day period of February in an area not normally fished. The hypothesis that there may have been an increase in the biomass is not realistic; on the contrary, the possibility that a local and temporary increase in the catchability of yellowfin by purse seine is acceptable. It is recommended that the oceanic conditions existing in the area during this period be studied.

iv) It is recommended that a detailed study be made on the species composition and size distributions of the schools associated with floating objects.

v) The Working Group on West Atlantic Tropical Tunas could not meet during the current year. It is recommended that the Secretariat make the preparations, especially in terms of participation, so that the Group can meet with full participation of the countries in the area.

vi) This year, no analytical evaluations of the stock have been made. It is recommended that analytical evaluation models be used as traditionally applied, at least for the eastern Atlantic.

vii) A LD1-FL relationship was presented for east Atlantic yellowfin. Given the fact that data used in the previous fit (Caverivière, 1976) can be made available, it is recommended that a new relationship be established for all the measurements that the SCRS uses in the future for all LD1-FL conversions.

viii) Document SCRS/90/61 presents interesting results from a comparative study of the yellowfin fisheries in the Atlantic and Pacific. Since at present there are similar fisheries with very good data bases, targeting tropical tunas, in the Atlantic, Pacific and Indian Oceans, there are numerous topics for study (growth, associations, fishing strategy, environmental interactions, etc.) which analyzed together could shed new light on questions that are difficult to explain when studied separately. Consequently, this type of joint studies should be continued.

ix) The longline effort data for the west Atlantic are presented as a total. It is recommended that methods be studied for estimating effort directed at yellowfin and effort directed at swordfish.

YFT-4.c Management

The analysis of the data from the east Atlantic fisheries in the last few years shows that major changes have occurred in fishing strategy of the purse seine fleets, which should cause an increase in their efficiency. Although this increase remains unquantified, all seems to indicate that it is important, and would convert the present effort in an effective effort on the stock presumably nearer the optimal effort. On the other hand, there are indications that in 1990, the nominal purse seine effort has increased, both by the incorporation of new units and by the return of part of the fleet that operated in the Indian Ocean.

All seems to indicate that the yellowfin stock in the east Atlantic could be near a state of full exploitation, similar to that of the early 1980's, and that increase in effort would not cause significant increase in catches.

For the west Atlantic, the analyses presented are considered as preliminary, thus they cannot infer any recommendation.

BET - BIGEYE TUNA

BET-1. DESCRIPTION OF FISHERIES

Bigeye tuna are widely distributed in the tropical and temperate waters of the Atlantic Ocean, between approximately 45°N and 45°S. Small bigeye have been observed in the only presently known nursery, which is located in the Gulf of Guinea.

The stock is exploited in the entire area of distribution by different fleets and gears: longline, purse seine and baitboat.

The main bigeye fishery is the longline fishery, which operates throughout the year in the entire area of distribution. The longline fishery exploits adult bigeye tuna (which have an approximate average weight of 40 kg). Since 1980, Japanese and Korean longliners directly target bigeye by using deep longline and by concentrating their effort in the time-area strata where the density of bigeye tuna is high.

Of the surface fisheries, various local baitboat fleets seasonally target bigeye in the area of the Azores, Madeira, and Canary Islands. These fisheries of the northeastern Atlantic islands exploit mainly pre-adult or adult bigeye tuna (approximate average weight of 30 kg).

The Dakar-based baitboats, which fish off Senegal and Mauritania, seasonally exploit medium-sized pre-adult bigeye (approximate average weight of 18 kg).

In the eastern tropical Atlantic, the purse seine and baitboat fleets take small bigeye tuna (approximate average weight of 5.5 kg for purse seiners and 2.5 kg for Tema baitboats) which form mixed schools with skipjack and young yellowfin tunas. The fisheries do not directly target bigeye tuna, but the catches of small bigeye are important, especially in terms of number of fish.

Annual catches of bigeye, for 1960-89 by country and gear, are shown in Table 6 and the total catch from 1950 to 1989 in Figure 15.

Figure 16 shows the areas of operations, size ranges characteristic of each gear, and the changes in annual catches of these gears during the period 1975-1989.

Total catches increased regularly up to 63,600 MT in 1974, and then showed a decreasing trend until 1979 (45,100 MT). In the following years, the catch gradually increased, reaching a maximum of 74,500 MT in 1985. The total catch then decreased and at present is 59,900 MT (1989).

The decrease in catch after 1985 is mainly due to a decline in the longline catch; a decrease has also been observed in the surface gears.

The fluctuations in bigeye catches between years basically reflect the longline operations, as their catches in 1989 made up 70 percent of the total. Longline has been the dominant gear catching bigeye since the beginning of the fishery in the Atlantic and also in other Oceans.

As regards surface gears, the catches show a decreasing trend after reaching a maximum in 1984 (27,300 MT). The 1989 catch, 17,900 MT is at the lowest level recorded in recent years. This reflects the fluctuations in the catches of Portuguese and Canary Island baitboats and also a decrease in the purse seine catches.

The decrease and the high between-year variability observed in the Portuguese and Canary Island baitboats are most likely related to the variations in local hydrological conditions, rather than to changes in stock abundance.

The decrease in purse seine catches observed in the recent period reflects the decrease in effort which occurred since 1984, following the departure of part of the purse seine fleet to the Indian Ocean.

A decrease in longline catches observed after 1985 reflects the departure of part of the Japanese and Korean fleets from the Atlantic in 1986 and 1987. This situation reversed in 1988, and in 1989 the number of Japanese longliners operating in the Atlantic was the highest in the last six years.

BET-2. STATE OF THE STOCKS

The state of the bigeye stock was analyzed based on the hypothesis of a single stock in the entire Atlantic. The single bigeye stock hypothesis seems the most likely, according to the fisheries data, the geographic distribution of the species and the results of tagging, the known spawning areas located in the tropical area between 15°N and 15°S, and the fact that the only nursery of small bigeye in the Atlantic Ocean exists in the Gulf of Guinea.

The only abundance indices used for the bigeye stock are those calculated from the catch rates of the longline fishery, which directly targets bigeye tuna in the entire Atlantic. In fact, since the surface fisheries only catch bigeye seasonally or incidentally, and since they only catch certain sizes, their CPUE indices are not considered representative of the total stock abundance.

The CPUE of the seasonal fisheries of the northeastern Atlantic islands reflects the local abundance of a fraction of the stock, and is subject to variations caused by local hydrological conditions. This situation is illustrated in Figure 17, which shows the changes in CPUE of Azorean baitboats from 1979 to 1989, during the second quarter, when this species is fished. The fluctuation of the CPUE has no trend.

As concerns the FIS baitboat fishery, its CPUE, although seasonal, is less influenced by environmental changes and could provide a measure of abundance of medium-sized bigeye (Figure 18). The observed increase since 1984 is related in part to a change in the fishing strategy. It has been more or less stable during recent years, with a slight decrease in the last two years.

The CPUE of the tropical purse seiners, which can be interpreted as an abundance index for small bigeye, has no marked trends in recent years. An abundance index calculated for juvenile bigeye less than 70 cm, from FIS and Spanish purse seine data, also shows fluctuations without trends in recruitment for the 1980-1988 period (Figure 19).

Adult stock abundance, calculated from the Japanese longline CPUE after adjusting for the use of deep longline, continues to show relative stability in recent years, with a slightly increasing trend, compared to the period before the introduction of deep longline. However, this increasing trend could be explained by the introduction of bias in adjusting the effort for the deep longline to that of the traditional longline.

The presently estimated abundance index from the average longline CPUE for the 1984-89 period represents 82 percent of the CPUE calculated for the initial phase of the fishery (1961-1965) which can be interpreted as an index for a low exploitation rate (Figure 20).

An updated production model analysis, adjusted for the 1961-1988 data, indicates MSY values from 66,700 MT (m = 2) to 74,900 MT (m = 1). This analysis suggests that the current catches are lower than those of the MSY (Figure 21).

The production model analysis also indicates that fishing effort on bigeye tuna is at a level lower than the optimal fishing effort (f-opt) estimated by the model to reach MSY; this was always the case in previous analyses.

BET-3. EFFECTS OF CURRENT REGULATIONS

The bigeye minimum-size regulation of 3.2 kg has been in effect since 1980; it was adopted to reinforce the yellowfin regulation. It has been reported in recent years that the tropical surface fleet (purse seine and baitboat) continues to land a large number of small bigeye tuna.

Under the present condition of reduced effort, the size regulation of 3.2 kg would not provide any possible gains in yield per recruit for bigeye tuna. Nevertheless, if the effort on juveniles returns to the levels of the 1980-84 period of high exploitation, the current regulation would still be useful in improving the yield per recruit of the stock.

BET-4. RECOMMENDATIONS

The Committee recommends:

BET-4.a Statistics

i) That ongoing multi-species sampling of the surface catch in the eastern tropical Atlantic be continued to resolve the species composition problem in the reported catch which mixes small bigeye, yellowfin and skipjack tunas.

ii) That the efficiency and the statistical validity of multi-species sampling methods and extrapolation procedures used in for the Atlantic be compared with those developed in other areas, such as the Indian Ocean.

iii) That species and size sampling of catches transshipped to Puerto Rico be continued. Sampling on eastern and western Atlantic catches at Puerto Rico is useful to complement sampling in African ports, by which the extent of bias due to size sorting of catches for different markets can be investigated.

iv) That all countries which fish bigeye tuna with longline send ICCAT the proportion of deep longlines in operation by five-degrees per month strata.

BET-4.b Research

i) That an abundance index be generated that encompasses information on the bigeye surface fisheries. This should include analyses on the apparent variability of recruitment from the CPUE of age-classes 1 and 2 from FIS and Spanish purse seiners in the coastal areas, and from the CPUE by size class and by limited time-area strata, for purse seiners as well as for longliners.

ii) That research on changes in gear efficiency between traditional and deep longline operations be continued in order to calculate the effective effort on bigeye tuna.

iii) That the species composition of the schools and the sizes of fish associated with aggregating devices be studied in detail from observer and logbook data.

iv) That studies be developed on the influence of the environment on bigeye CPUE.

v) That state of the stock analyses be done by analytic model and updated each year.

BET-4.c Management

The reduction in effort in the recent period modified the yield per recruit. According to the available evaluations, the potential gains of a change in age at first capture are, in the present situation, unforeseeable. However, the Committee recommends maintaining the regulations currently in effect, taking into account a possible increase in effort.

SKJ - SKIPJACK TUNA

SKJ-1. DESCRIPTION OF FISHERIES

Skipjack is a cosmopolitan species which is distributed in the tropical and subtropical waters of the three oceans.

Skipjack tuna are caught almost exclusively by surface gears in the entire Atlantic, although some minor by-catch of skipjack is taken by longline. In the east Atlantic, the major catches are taken by purse seiners, mainly by the Spanish and FIS fleets, followed by those taken by baitboats from Ghana, Portugal, Spain, FIS and Cape Verde. In the west Atlantic, the baitboat fishery is major fishery, comprised of Brazilian, Cuban and Venezuelan vessels. The main component of west Atlantic purse seine catches is taken by the Venezuelan fleet.

Figure 22 shows skipjack size distribution for the major Atlantic fisheries.

SKJ-1.a Catches

Catches, by gear type, in the east and west Atlantic are shown in Table 7 and Figures 23 and 24.

In the east Atlantic, catches in the last year were similar to those of 1985 to 1987, and slightly less than those of 1988, a year of record catches, due to the high catches of the Ghanaian and Portuguese baitboat fleets. The decline was mainly in catches by the purse seine fleets and, to a lesser degree, by the baitboat fleets. Catches by the major east Atlantic fisheries are shown in Figure 25.

As regards the west Atlantic, there has been a slight increase in the overall catches, due to the increase in the skipjack catches taken by the Brazilian baitboat fleet. Purse seine catches continued the downward trend which started in 1985 when the major component of the Venezuelan fleet moved to the Pacific Ocean. Catches by the principal west Atlantic fisheries are given in Figure 26.

SKJ-1.b Fishing effort

There are no estimates available on effective effort exerted on skipjack. Therefore, as in other years, vessel carrying capacity has been considered as a measure of nominal effort for the east Atlantic. Vessel carrying capacity is not an ideal measure of effort, since it does not take into account the increase in fleet efficiency, fleet interaction, etc. However, since there are no other estimates of effective effort available, vessels carrying capacity has been used. Table 2 and Figure 6 show the total carrying capacity, by fleets, for the east Atlantic for 1972 to 1989. During the last year, the decreasing trend started in 1983, showed a change. Purse seine effort has remained at the same level as the previous year, whereas baitboat effort increased slightly.

Due to the lack of available data, estimates of nominal effort could not be carried out for the west Atlantic.

SKJ-2. STATE OF THE STOCKS

Up to now, studies carried out on skipjack stock structure in the Atlantic have not provided definitive information to divide the resource into smaller units. There could be two management units, in the east and west Atlantic, and there could be some minor mixing, judging by the absence of transatlantic recoveries of tagged fish, (particularly in the east).

SKJ-2.a East Atlantic stock

The last detailed skipjack stock assessment for the east Atlantic was carried out in 1984 by the Working Group on Juvenile Tropical Tunas. For these analyses data and parameters obtained mainly during the International Skipjack Year Program were used. The results of this evaluation showed a state of under-exploitation of the stock, as the Group and, later the SCRS, had assumed.

In observing the changes in total nominal effort, it is noted that at the time of the assessment, the fishery supported the highest effort levels of the historical period. Vessel carrying capacity in 1983 was 81,800 MT, while it is currently 44,300 MT, which represents a 46 percent drop in nominal effort. This significant drop in nominal effort in recent years, as compared to the time when the assessment was carried out (1984), might not have been accompanied by a similar drop in effective effort, due to the increase in individual fishing power of the purse seine vessels. However, it was considered that this increase would not be equivalent to the decline in nominal effort.

Therefore, although no new stock assessments have been carried out, it seems reasonable to consider that if the analyses done in 1984 were repeated at the present time, they would show similar results as regards the under-exploitation of the stock.

Figures 27 and 28 show the changes in the fishery, in which the two periods of effort and their relation to the catches can be clearly observed.

Inasmuch as parameters such as CPUE are concerned, the Committee did not advise interpreting their evaluation as indicative of skipjack stock abundance.

In recent years there has been a change the fishing strategy of the FISM purse seiners (concentration of the fleet in time-area strata of high skipjack concentrations), which has resulted in important skipjack catches, which have remained stable for a five year period (1984-1988) (Figure 29), whereas catches by the Spanish fleet have shown continuous fluctuations with no trend.

In the baitboat fishery of the Azores Islands, the northern limit of the skipjack fisheries, the fluctuation of the CPUE, with no trend, is more marked, due probably to the influence of environmental changes (Figure 30).

SKJ-2.b West Atlantic stock

Document SCRS/90/100 explains how, for the first time, an assessment of the west Atlantic skipjack was carried out using production models from catch and effort data of the Venezuelan purse seine and baitboat fleets, raised to the total skipjack catch of the west Atlantic. The CPUE, contrary to what is usually normal for this species, suggests a trend with little fluctuation (Figure 31).

Figure 32 shows the fitted production model. The values estimated by the global model are an MSY of 33,058 MT and an optimum effort of 4,449 fishing days.

Since catches from the logbooks were used (with no modification of the species composition) and since it is impossible to discern between the effort exerted by the baitboats (concentrating the schools) which support the purse seiners and those directly involved in skipjack fishing, the CPUE indices could show some bias. On the other hand, because of the distance which separates the fishing zone of Venezuela from that of Brazil (about 2,700 miles), the index of apparent abundance of the former fishing area may not reflect the variations in abundance of the latter fishing area. Therefore, the global production model may only show an image of local exploitation of the resource in the Venezuelan fishing zone.

SKJ-3. EFFECTS OF CURRENT REGULATIONS

There is no regulation of any type in effect for skipjack. The current regulations for yellowfin and bigeye have no effect on skipjack.

SKJ-4. RECOMMENDATIONS

The Committee recommended:

SKJ-4.a Statistics

i) Continued improvement in the collection of catch and effort data for the purse seine and baitboat fleets which operate in the west Atlantic.

ii) Increasing the multi-species sampling coverage of Venezuelan landings and stratifying it by fishing gear.

iii) That synoptic maps be prepared which show the location of the major skipjack fisheries and the size distributions of the catches, as are already available for yellowfin and bigeye.

iv) That the Secretariat update and improve the existing tables on the carrying capacity of purse seiners and baitboats in the west and east Atlantic.

v) That the Brazilian sampling regain the level achieved prior to 1987, since the quality of the sampling has declined there.

SKJ-4.b Research

i) That the estimates of effort directed at skipjack be updated according to the scheme developed during the Skipjack Year Program. These calculations should be made using the current species compositions (which were not available during the Skipjack Year Program).

ii) That complementary research be carried out on maturity, fecundity and spawning of the west Atlantic skipjack stock.

iii) That studies be continued on the effect which changes in fishing strategy of the purse seiners, brought about by the decrease in the number of vessels, has on skipjack fishing.

iv) That studies continue on the effect which floating objects have on skipjack catches.

v) That research continue on the effect of environmental factors on skipjack abundance, recruitment and availability. Such studies would lead to carrying out new stock assessments on skipjack, particularly from an analytical standpoint.

SKJ-4.c Management

There are no apparent reasons to advise management measures on Atlantic skipjack tuna.

ALB - ALBACORE

ALB-1. DESCRIPTION OF FISHERIES

ALB-1.a The fisheries

It is generally agreed that the stock structure of Atlantic albacore is composed of a north stock and a south stock, separated at 5°N latitude. This hypothesis was maintained by the Second Albacore Workshop, (October, 1990) which also noted that the GFCM/ICCAT Expert Consultation considered the Mediterranean stock as a third separate stock.

The main albacore fisheries in the Atlantic are shown in Figure 33.

North Atlantic

The trollers and baitboats are mainly Spanish and fish in summer in the northeast Atlantic, principally in the Bay of Biscay and in the open water adjacent to the Bay of Biscay. In some years, some of the Spanish baitboats fish in the winter in the Canary Islands and Azores. The French fleet, after a period of sharp decline, has two new gears in operation since 1987, the driftnet and the paired pelagic trawl. These gears are used by vessels which have as their main activity either driftnet fishing (gillnet vessels) or pelagic trawling (paired trawls) at night, and, as a secondary activity, trolling during the day. Size frequencies of fish caught by each gear are shown in Figure 34. These surface fisheries generally catch juveniles and pre-adults (2-15 kg), except in the Canary Islands and Azores where the baitboats exploit pre-adult or adult fish (15 kg or more).

The longline fleet in the North Atlantic is mainly Taiwanese. It has suffered a heavy reduction since 1987, due to economic factors. The longliners mainly exploits a fraction of the adult stock.

The Workshop also noted that vessels have been sighted in the northeast Atlantic fishing with large driftnets. However, the nationality of these vessels has not been formally identified. It was reported that experimental fishing using gillnet by two Irish vessels in 1990, off the Bay of Biscay.

South Atlantic

The south Atlantic albacore stock has been mainly exploited by longliners for 30 years. Taiwan presently has the main fleet of longliners, after having succeeded Japan at the beginning of the 1970's. There are also Brazilian and Uruguayan longline fisheries of lesser importance.

The surface fishery is made up by the South African baitboat fleet which took 22 percent of the total south Atlantic catches in 1989. However, information is still lacking on this fishery (origin of the catches, size distribution). Nevertheless, the baitboats are known to fish in the areas indicated in Figure 33. Their activities are sporadic and alternate with other activities (fishing for squid, etc.).

Mediterranean

Various small fisheries operated along the Italian and Greek coasts, using baitboats and longline or other gears. The use of driftnets is prohibited by Italy after 1990. In addition, the sporadic presence of Spanish baitboats in the Mediterranean is noted.

ALB-1.b Catches

Table 8 shows the historical series of catches for the north and south stocks and for the Mediterranean, and by gear, 1960 to 1989.

North Atlantic

Figure 35 shows the historical series of the catches of this stock. In general, the total catch is following a decreasing trend over 1960-1989. In 1989, the total catches in the North Atlantic were 32,000 MT, which are less than the previous years' catches since 1986. This recent decrease is mainly due to a very sharp reduction in longliners beginning in 1987 due to the departure of the Taiwanese fleet.

The surface fisheries caught 29,800 MT in 1989. They are made by the Spanish troll (10,500 MT in 1989, compared to 11,000 MT in 1988) and baitboat (14,900 MT, compared to 16,600 MT in 1988) fisheries. The new French gears catches were: 750 MT in 1988 and 1,400 MT in 1989 for the driftnet fishery, 1,700 MT in 1988 and 2,240 MT in 1989 for the pelagic trawl fishery.

South Atlantic

Figure 36 shows the historical catch series for the south Atlantic stocks. In 1989, the south Atlantic catches decreased slightly by 600 MT (25,300 MT compared to 25,900 MT in 1988). The longline catches decreased from 21,900 MT to 19,400 MT, while the South African surface fishery increased from 3,700 MT to 5,500 MT. This is a recently developed fishery which began in 1980. However, because of the lack of detailed statistics, it is not yet known if these catches come in part from the albacore stock in the Indian Ocean.

In general, the south Atlantic albacore catches showed relatively strong fluctuations between 10,000 and 38,000 MT per year during the last three decades. The decrease in catches in 1983-1984 could be explained up to a certain point by a decrease in longline fishing effort.

Mediterranean

The catches of albacore in the Mediterranean reached 4,100 in 1989. They seem to have been increasing since 1980, but this increase, in part, may be an improvement in the statistical coverage.

ALB-1.c Fishing effort

Table 9 and Figure 37 shows the changes in nominal fishing effort for surface gears in the North Atlantic. A continuous, significant decrease in nominal fishing effort was noted for trollers from 1967 to 1975, then a moderate decrease from 1976 to 1984. From 1985 to 1989 effort was stable at a slightly higher level than the previous one. The general decrease over the years 1967-1984 is explained mainly by the decline in the French fleet. In 1989, troll effort was 21,899 fishing days.

Nominal fishing effort for baitboats decreased slowly over the 1967-1977 period, then was rather stable from 1978-1989, reaching 9,501 fishing days in 1989. Nominal effort of the new French gears (driftnet and pelagic trawl) increased since their appearance in 1987. In 1988 and 1989, nominal effort for the driftnet vessels was 1,200 and 1,450 days fishing, respectively. Effort for the trawlers was 754 and 2,908 days fishing for 1988 and 1989, respectively.

Fishing effort for longliners in the North Atlantic (Table 9 and Figure 38) showed two periods of high effort (1976-1977 and 1983-1986). Since 1987, effort dropped sharply to a very low level. This is due to logistical difficulties encountered by the Taiwanese longliners which had to leave the North Atlantic.

In the south Atlantic the general trend in longline effort by Taiwan remained rather stable (Figure 39), but an abrupt increase to the historical highest point occurred in 1987, when the abrupt decrease in Taiwanese longline effort occurred in the North Atlantic. Subsequently, effort has been sustained at a high and slightly declining level since 1987.

In the Mediterranean, trends in fishing effort cannot be calculated due to the absence of a sufficiently long series of statistics.

ALB-1.d Catch rates

For the North Atlantic, the nominal catch rates of the surface fisheries (troll and baitboat) were reviewed by the Workshop and are shown in Figure 40a. The catch rate trend for the trollers is relatively stable from 1960 to 1989. The baitboat catch rate trend shows an increase since 1974, which could be explained by an increase in fishing power of the baitboats, particularly due to a technological advancement (adoption of sonar).

The new gears have been developing since 1987 and their catch rates are in the same range as those of traditional gears. The nominal catch rate of the longline fishery in the North Atlantic is given in Figure 40b. It remained rather stable over 1973-1983, then decreased.

For the south Atlantic stock, Figure 41 shows the standardized Taiwanese longline catch rates which were stable from 1969 to 1986, then decreased.

ALB-2. STATE OF THE STOCKS

ALB-2.a North stock

The North Atlantic albacore stock was analyzed using a VPA method (which is the standard method used by ICES) at the Second ICCAT Albacore Workshop in October, 1990.

The Workshop report completely describes the data available, the choices made for generating the catch-at-age tables and the abundance indices by age used. The series of years used is 1975-1989.

The abundance indices used come from either the Spanish troll and baitboat fisheries for age classes 1 to 6, or the Taiwanese longline fishery for age classes 4 to 6.

These data sets are affected by several defects, such as:

--The catch-at-age table was made by the slicing method. This separation does not seem very realistic, especially for the age classes over 3 years.

- The abundance indices used are the nominal CPUE by age class, for the surface fisheries (troll, baitboat) as well as the longline fishery. These indices could not be standardized and there are doubts on the values for some years.
- The abundance indices for older age classes (over 3 years) are affected by the same defect as the catch-at-age table by using the slicing method.

Moreover, the VPA method (ICES standard) used is affected by another uncertainty. This uncertainty comes from the constraint imposed which fixes the fishing mortality (F) on the older ages at 0.4 times the mean of that of the four youngest age classes. This leads to consider that longline is less efficient than surface gears. This corresponds to the present opinions on the efficiency of the longline, but the VPA is sensitive to this parameter.

Inconsistency in the longline catch at age used by the group was detected for the years 1981-1985. These catches at age were also corrected (Table 10), as were the longline abundance indices (Table 11). These corrections were adequate for the present state of the analysis. However, they should be verified by the Secretariat.

Consequently, the species group proceeded with supplementary Ad Hoc VPA runs under the following conditions:

- The figures in Table 10 and 11 were used to replace the data used by the 1990 Workshop.
- The baitboat catchability can follow a trend (hybrid method).
- The proportion of fishing mortality of older ages on the mean of the four youngest age classes was fixed successively at 0.4, 0.5, 0.6, and 1.0, to explore the sensitivity to this parameter.

The results obtained are consistent. Catchability of baitboats increased slowly over the years. The average fishing mortality coefficient calculated for the years 1975 to 1989 increase as the proportion goes from 0.4 to 1.0, as shown in Figure 42.

The conclusions of the Workshop remain valid. However, this new analysis indicates that the fishing mortalities of the stock during 1975-1989 were perhaps underestimated by the Workshop.

Whatever the set of parameters used, estimated recruitment fluctuates moderately without noticeable trend, at a level consistent with the ones computed previously for years 1963-1976 (Figure 43).

The yield-per-recruit analyses indicate that during recent years (1987-1989), the exploitation rate is below the point of maximum sustainable yield with a range of uncertainty, however (Figure 44), according to the hypothesis used.

In conclusion, the overall analysis indicates that the North Atlantic stock seems to be moderately exploited at the present time. Nevertheless, the uncertainties underlined could introduce some changes in that conclusion if they are further corrected.

ALB-2.b South stock

The only abundance index for this stock is the standardized CPUE of the Taiwanese longline fishery operating in the south Atlantic on the adult stock; still no applicable abundance indices have been proposed for the juvenile stock.

Adjusted longline CPUE trends have generally fluctuated downward from 1967 to 1989; while the overall longline catch tended to fluctuate steadily around 20,000 MT throughout the time series, except in 1983 and in 1984 when low catches were observed. Since 1979, the catch of juvenile albacore noted in the surface fishery has increased to over 6,000 MT in 1987, and a slight decline to 3,700 MT occurred in 1988, then increased again to 5,500 MT in 1989.

The generalized production model was updated using standardized catch and effort data of the Taiwanese longline fishery from 1967 to 1988 (Figure 45). The MSY obtained by the model was estimated at 27,300 MT, corresponding to an optimal effective effort of 13.4 x 10^7 effective hooks. Catches in 1986 (34,600 MT) and in 1987 (37,500 MT) were above the MSY values of the model; on the other hand, catches in 1988 (25,900 MT) and in 1989 (25,300 MT) were slightly below the MSY. Effective effort estimated in 1986 (12.5 x 10^7 effective hooks) and in 1987 (16.8 x 10^7 effective hooks) was alternately equally likely equivalent to and above the optimal effort corresponding to the MSY; but effective effort estimated in 1988 (13.9 x 10^7 effective hooks) and preliminary estimates for 1989 (12.3 x 10^7 effective hooks) have significantly declined and have been slightly below the optimal effort. However, in order to ensure whether or not the south stock is in a strongly exploited condition, further research has to be carried out, and careful monitoring should be continued.

ALB-2.c Mediterranean

No evaluation of the state of the Mediterranean stock has yet been possible because of the lack of sufficient statistics.

ALB-3. EFFECTS OF CURRENT REGULATIONS

No regulations are presently in effect for albacore in the Atlantic Ocean.

ALB-4. RECOMMENDATIONS

ALB-4.a and 4.b Statistics and Research

The Second Albacore Workshop drew up twelve recommendations regarding statistics and research. Some were referred to the Albacore Research Program (PSG) which has planned its activities based on these recommendations in 1991 and 1992. This concerns items 2 and 3 of the Workshop recommendations. All the recommendations were supported by the SCRS.

In addition, the SCRS recommended that close attention be paid to the possible development of fishing with large driftnets which could target Atlantic albacore. In fact, the fleets operating in the past in the Pacific Ocean or presently in the Indian Ocean are capable of moving rapidly into the Atlantic, because of the mobility of the vessels doing this fishing.

As a priority, the Workshop evaluated the state of exploitation of the north stock according to the recommendations of the 1989 SCRS. It should proceed with a similar evaluation of the south stock. Participation by scientists from all countries significantly exploiting this stock is essential for the success of such an evaluation.

ALB-4.c Management

No management measures were proposed.

BFT - BLUEFIN TUNA

The scientists involved in Atlantic bluefin tuna stock assessment, following the 1989 SCRS recommendation to provide a more timely report for review, has adopted a new work and report format. All documents were reviewed and all parameter decision-making was done jointly. However, the scientists were separated into two groups to complete analysis and prepare documentation for review of the bluefin stock. Although the groups worked separately, there was a continued interaction of individual scientists between the two stocks. To reflect this more efficient system, the documentation is now split into BFT-WEST and BFT-EAST to provide single continuous record of the assessment process for each stock.

A section following the two reports deals with recommendations and discussions of a general nature that involve both stocks.

Description of Atlantic bluefin fisheries

There are fisheries for bluefin tuna in the east and west Atlantic Ocean and in the Mediterranean Sea. Many different gears are used and the size of fish caught varies depending on the gear and location.

Table 12 and Figure 46 show the Atlantic bluefin catch in weight separated into west Atlantic, east Atlantic and Mediterranean Sea. The provisional 1989 catches are 2,800 MT in the west Atlantic, 5,300 MT in the east Atlantic, and 13,000 MT in the Mediterranean Sea. (All these values assume the same landings as in 1988 for any non-reported catch: 23 percent for the Mediterranean.)

The Committee conducted its investigations using a two-stock working hypothesis with limited intermixing (west Atlantic and east Atlantic/Mediterranean) (Figure 47). This hypothesis has been used for many years, because of the evidence of limited mixing from tag releases and hard part analysis. For management purposes SCRS considers Atlantic bluefin to be composed of an eastern and a western stock.

BFT-W - WEST ATLANTIC BLUEFIN TUNA

BFT-W1. DESCRIPTION OF FISHERIES

West Atlantic catches of bluefin tuna were restricted by catch limits of 1,160 MT in 1982 and 2,660 MT between 1983-1990; the catch limit of 2,660 MT represents about half of the average catch between 1973 and 1981. Three nations share this catch allocation (Figure 48). The catch of the calendar year 1989 was 2,800 MT, this is the second highest since 1981 and is 200 MT less than 1988. Landings by longliners declined by 40 percent while purse seiners remained stable. Landings by rod and reel increased about 20 percent to 1987 values and of other unclassified gear (mainly Canadian tended line) increased about 64 percent from 1988 values.

In recent years catches in the west Atlantic have demonstrated a moderate increase. Longline catches comprise 32 percent of the harvest. Canada's landings, specifically by tended line gear, exhibited the only relatively large change from 1988, total catch increasing from 394 to 633 MT for the calendar year 1989.

BFT-W2. STATE OF THE STOCK

Details of assessment parameters used and the derivation of catch tables are presented in Appendix 4.

BFT-W2.a Natural mortality and growth

The natural mortality rate used by the 1990 SCRS was the same for both stocks, a value of 0.14 was adopted from the previously utilized range 0.1 to 0.18. New growth information was available to the 1990 SCRS for both stocks (SCRS/90/66 and SCRS/90/78) and new growth models incorporated into the 1990 SCRS assessments. The length at age for the youngest ages varied little from those obtained from the earlier model (SCRS/78/37).

BFT-W2.b Catch at age

Catch at age from 1970 to 1989 (Table 13) was available for analysis. The catch composition (Table 14) was used to determine the relative importance of the various age groups. Consideration should be given to the new von Bertalanffy growth model (Figure 49) which implies slightly faster growth and thus slightly larger length at age than the previous model. Use of the new curve has resulted in some changes in the age allocations to the various size groups. Each size grouping is the same as used in previous years, however, the large fish that were aged 10+ are now considered ages 8+, the medium fish have changed from ages 6 to 9 to ages 6 to 7 and the small fish have not changed their grouping of ages 1 to 5.

A comparison of the catch at age for 1985 to 1989 for the western and eastern stocks is provided in Figure 50.

BFT-W2.c Abundance indices

Eleven abundance indices were examined this year (Table 15). Six of the eleven indices were used for calibration of the VPA (Figure 51). The five age-specific indices of the Japanese longline fishery within the U.S. EEZ were not used. These data were already represented in the two longer time series of age aggregated indices of the Japanese fishery, which includes a larger geographic area than the U.S. EEZ. The indices representing large fish were the Gulf of Mexico larval bluefin index (ages 8+), the Gulf of St. Lawrence tended line index (ages 10+) and the U.S.A. Atlantic coast rod and reel and hand-line index (ages 8+). Three indices representing small and medium fish included the Japanese longline CPUE indices of the west Atlantic for ages 3 to 5 and ages 6 to 7 and the U.S. small fish rod and reel index for ages 1 to 3.

The calibration indices were weighted using the inverse of their contribution to the variance of the estimate of stock size. The better the agreement between the index and the estimated stock size the greater the importance of that index in the calibration process.

BFT-W2.d Partial recruitment

The Committee selected the partial recruitment pattern using separable VPA (SVPA). The PR estimated in this manner was similar in shape to that used by the SCRS in previous years (Table 16). It should be noted that the PR for young ages has varied from year to year. The resulting F table estimated with VPA contained some anomalies that were considered to be due to relatively poorer ageing in the older age groups. Compensation for this was attempted by pooling the catch at age to 10+. Thus, the above PR was then truncated at age 9 and re-standardized.

The results of this re-analysis remained unsatisfactory to the scientists. In previous years such unexplained variability in the PR has been handled in a variety of ways, including discarding of suspected anomalous years and smoothing. This year the ADAPTive model was used to calculate the population for all ages. This provided a PR for 1989 that best combines all the various data sources including the catch at age and the many abundance indices. The working group selected this PR, despite its lack of precision and possible lack of accuracy, as best representing the stock in 1989 (Figure 52). The difference in PR estimates between last year and this is largely due to the different methodology used. The SVPA averages several years while the ADAPTive process used only the current (1989) year's data.

BFT-W2.e Interpretation

Although a number of refinements to the bluefin assessment methodology were made for the 1990 SCRS, the relative pattern of abundance in the most recent years was largely unaffected by these changes (Figure 53). This figure demonstrates the effect of changes in the model assumptions used by the 1990 SCRS. The relative stock sizes derived from the two sets of parameter estimates (years) utilizing the updated catch and CPUE data are compared.

The results of this year's assessment indicate trends similar to those of the 1989 SCRS assessment and earlier analyses, especially in the most recent years (Figure 54). Prior to 1978, some divergence from previous analyses in the historical abundance patterns of large and medium fish were noted. The estimated terminal F's (Table 17) applied to our catch-at-age table (Table 13) indicate the January 1, 1990, large fish abundance (ages 8+) is about 10 percent of the 1970 value; ages 6 to 7 approximately 50 percent; ages 1 to 5 for 1987 (last year with useful estimates of young fish) approximately 20 percent of the 1970 value (Table 18, Figure 55).

The population of small fish (ages 1 to 5) in the most recent years is not well estimated. The best estimates of recruitment (age 1) in recent years (1983-1987) appear to be approximately the same as those of earlier years (1979-1982).

The estimates of medium size fish in recent years have increased from the low value of 1983 (Figure 55). The estimates of abundance of large fish have continued to decline since 1970.

BFT-W3. EFFECTS OF CURRENT REGULATIONS ON WEST ATLANTIC BLUEFIN TUNA

A regulation prohibiting the catching and landing of bluefin tuna less than 6.4 kg for the entire Atlantic went into effect in August 1975; an exemption allowed incidental catches of 15 percent (by number). Some of the variability seen in Table 19 may be due to sampling deficiencies as well as changes in the fisheries. After the regulation went into effect, the percentage of individuals less than 6.4 kg in the catch was low in the western Atlantic from 1976 to 1981 (1.7 to 7.2 percent), but it increased to 23.2 and 18.2 percent in 1982 and 1983 (Table 19). The percentage declined to low levels (2 to 5 percent) between 1984 to 1987 and increased to 10 percent in 1988 and dropped to 2.3 percent in 1989.

An additional regulation limited catches in the western Atlantic in 1982 to 1,160 MT and 2,660 MT each year from 1983 to 1990, and prohibited fishing directed at the spawning stock in the Gulf of Mexico. As a result, catches have been below or slightly above the catch limits set for scientific monitoring since that date; during calendar year 1989 the catch is estimated to be about 2,800 MT (Figure 48). This contrasts with catches that have averaged approximately 6,100 MT from 1976 to 1981. In the face of these catch restrictions our analyses indicate that fishing mortality rate on large size bluefin (ages 8+) since the inception of these regulations has increased to values as high or higher than before 1982 (Figure 56). A portion of this increase is due to the increase allowed for by the ICCAT regulations (doubling of the catch from 1982 to 1983). Other factors include increased efficiency among the fisheries and the effect of a constant TAC on a declining population.

For medium fish (ages 6 to 7) no effect of the fishing mortality regulation can be detected. The purse seine fishery on ages 1 to 5 ceased after the imposition of catch restrictions. The resulting decrease in fishing mortality rate can be seen in Figure 56.

A third regulation for the west Atlantic limited catches of bluefin tuna less than 120 cm straight fork length (SFL) to no more than 15 percent of the catch (by weight) after 1983. The percentage (in weight) of bluefin less than 120 cm SFL steadily decreased from 1975-1983, and since 1979 less than 15 percent of the total west Atlantic catch has been below 120 cm (Table 19). The percentage was 11 percent in 1988 and 6.6 percent in 1989.

BFT-W4. RECOMMENDATIONS FOR WEST ATLANTIC BLUEFIN TUNA

BFT-W4.a Statistics

i) Based on the information received by the Secretariat, the bluefin species group concluded that the reported tuna landings from the Dominican Republic were most likely not bluefin and thus removed these landings from the data base. It is not clear what species are represented in the reported catch. Thus, the Committee recommends that the Secretariat obtain official confirmation from the government of the Dominican Republic as to the species and size composition of their reported landings.

ii) The Committee recommends that data on all Japanese imports from the west Atlantic be provided by country of origin. The Committee also recommended that information on national consumption and transshipments also be provided by participating nations.

iii) In the future the working group should consider including plots of estimated stock size with the observed indices of abundance on the same scale so they can be compared.

BFT-W4.b Research

i) Members of the working group recommended that improved methods for estimating bluefin partial recruitment be developed and incorporated into the assessment process. The design of experimental approaches for the use of information independent of the catch at age is encouraged, e.g., tagging.

ii) The Japanese longline and the U.S. small fish rod and reel indices used for tuning the VPA should be developed as age-specific indices.

BFT-W4.c Management

In 1984, it was advised that the monitoring catch levels were "likely to stop the decline of the stock as well as allow stock increases in the long-term (30 years)". The SCRS further noted in 1984 that following confirmation that the stock was responding to the present management regime, it would be possible to gradually increase the allowable catch in proportion to the recovery rather than to hold the catch constant for the recovery period (30 years).

This year's analysis is generally compatible with recent assessments (Figure 54). It continues to indicate that increases in allowable catch are not advisable at this time. The downward trend in the abundance of the younger age groups (ages 1 to 5 and ages 6 to 7) in the 1970's appears to have stopped after the program began in 1982. However, the most likely estimate showed little change in the abundance of small fish (ages 1 to 5) in recent years (1983 to 1987).

Since implementation of catch limits in 1982, fishing mortality rates of large fish have increased to values greater than those immediately prior to 1982 (Figure 56). Therefore, the 2,660 MT of the recommended catch for monitoring will cause the decline of the age 8+ group to continue for at least the near term, given the various assumptions of the analysis. Deterministic projections to 1992 conducted by the working group indicate the continued harvest of 2,660 MT is expected to result in an increase in the estimated fishing mortality rate and a corresponding decline in the estimated stock size of large and medium fish.

Because of the Committee's concern regarding the lack of improvement in stock abundance, and given uncertainties associated with these estimates, monitoring catches should not be increased at this time.

BFT-E - EAST ATLANTIC BLUEFIN TUNA

BFT-1E - DESCRIPTION OF FISHERIES

BFT-1E.a East Atlantic

The majority of the landings reported in 1989 in the east Atlantic (Table 12 and Figure 46) are made by baitboats (51 percent), traps (28 percent) and longline (16 percent). The baitboat catches remained stable (2,683 MT), compared to 1988. The slight increase in Spanish baitboat catches was compensated for by a decrease in French baitboat catches. The number of French baitboats continued to decline. The Spanish trap and Japanese longline catches decreased by 51 percent and 29 percent, respectively.

BFT-1E.b Mediterranean

The data quality from Mediterranean fisheries has been much improved, especially for the period 1984 to 1988. This is mainly due to the success of the joint GFCM/ICCAT meeting where scientists of several non-ICCAT member countries presented their statistics on landings and size composition of large pelagic fishes. Reporting of data for 1989, however, is not satisfactory; 24 percent of the catches have been assumed to be equal to those of 1988. The French, Italian, Turkish and Yugoslavian purse seine catches made up 63 percent of the landings (8,219 MT). The unclassified gears of Algeria, Italy and Spain represent 25 percent of the catches. The main changes in data compared to 1988 include a decrease in Yugoslavian purse seine catches (1,523 MT to 562 MT) and French purse seiners (4,400 MT). The Moroccan trap fishery has resumed after three years of no reported activity.

BFT-2E. STATE OF THE STOCK

The Committee modified the natural mortality and growth parameters used for bluefin of the east Atlantic and Mediterranean, as a result of a new study on growth of bluefin caught by baitboats in the Bay of Biscay and traps in southern Spain (Table 20, Figure 57). The value of natural mortality (M) was changed from 0.18 to 0.14, for consistency between the analyses of the two Atlantic stocks. Details of the parameters used and the reasons for modification of past values are presented in Appendix 5.

There is still concern that despite improved data collection, serious difficulties remain in under-reporting small bluefin catches (ages 0 and 1). There is also uncertainty regarding under-reporting of catches of ages 2 and 3 in the Mediterranean.

In 1989, two additional years of catch at age (1987 and 1988) were made available to the SCRS for the first time. This allowed the catch at age of the eastern stock to be prepared including data from the year prior to the meeting. This improved status was maintained in 1990 and will allow more timely advice to the SCRS. The catch at age (Table 21) was available for analysis through 1989. Taking into account the serious under-reporting of age 0, this age was eliminated from the catch at age. Similar though less severe concern exists about the reporting of age-1 fish.

Eight abundance indices were available to the group for examination (Table 22, Figure 58). Two of them (a Japanese longline index for the east Atlantic and one for the Mediterranean) were updated and standardized by GLM analysis by the working group. A new index of Italian purse seine CPUE for the Tyrrhenian Sea was available (GFCM/ICCAT meeting, Col. Vol. XXXIII). Because two size groups of fish were identified in the catch at size, an index for small fish and another for large fish were developed using the original data on catch and effort. The other indices were updated to 1989. Three indices representing age 2 and age 3 were available for small fish; from the Spanish baitboat index for age 2 and French purse seine index for ages 2 and 3.

The Committee noted that, as with last year's analysis, only two of the eight indices of abundance were developed using statistical standardization methods. Standardization of the remaining indices may change perception of trends.

The Laurec/Shepperd VPA calibration program was used in this year's analysis (software version 2.1 from MAF, U.K.). All eight indices were used in the analysis. The indices representing large fish were the east Atlantic Japanese longline fishery (ages 5+), the Japanese longline fishery in the Mediterranean (ages 7+), the Tyrrhenian Sea purse seiners (ages 8+) and Spanish traps (ages 6+). The four small-fish indices include the French purse seine CPUE for age 2 and age 3, the Italian purse seine CPUE from the Tyrrhenian Sea (ages 3 to 7) and the Spanish baitboat CPUE for age 2.

Using these eight abundance indices and catch-at-age data for 1970 to 1989 for ages 1 to 15+, fishing mortality rates were estimated for ages 2 to 13 in the terminal year (1989). Natural mortality (M) was set at 0.14. The partial recruitment curve indicated fish over 13 years of age were equally selective (Table 23, Figure 59). The abundance indices of ages 2 and 3 contribute significantly to the calibration of the VPA. These ages are the same ages for which many data substitutions were required to develop the catch at age for the Mediterranean. Fishing mortality of age 1, which was not calculable by the Laurec/Shepperd method, was set to the value estimated from separable virtual population analysis (SVPA).

The fishing mortality estimated for the terminal year was used to conduct a VPA. The fishing mortality on the oldest age groups were estimated by the F-ratio method (SCRS/89/43).

The results of the analysis this year show a trend similar to that of the analysis made by the 1989 SCRS. The value estimated for terminal F (Table 24) applied to the catch-at-age (Table 21) indicates that the size of the stock of medium-sized fish (ages 5 to 9) in 1989 was approximately three-fourths the 1970 value while that of ages 10+ (large fish) was a little more than half. Recent estimates of the stock size of ages 2 to 4 indicate an increasing trend since 1970 with large annual fluctuations over time (Table 25, Figure 60). This implies high variability in recruitment of the east Atlantic bluefin stock.

Fishing mortality generally increases for small fish through the time series. For larger fish there is no apparent trend (Table 24, Figure 61).

BFT-3E. EFFECTS OF PRESENT REGULATIONS ON EAST ATLANTIC AND MEDITERRANEAN BLUEFIN TUNA

The ICCAT recommendation limiting fishing mortality of bluefin tuna in the entire Atlantic and Mediterranean went into effect in August, 1975. If this is interpreted as a limitation of catches, the effectiveness of the recommendation could be observed by studying the catch trends after this date.

The east Atlantic catches decreased from 10,000 MT in 1975 to 5,200 MT in 1976, then increased to 7,000 MT in 1977, decreased regularly to 3,300 MT in 1981, then increased again during the three following years to around 7,000 MT (Table 12). From 1985 to 1987, the catch averaged around 4,500 MT; and in 1988, it increased to 6,700 MT and decreased slightly to 5,300 MT in 1989.

In the Mediterranean, the catches varied between 1974 and 1989, with landings going from 11,000 to 17,000 MT, except for 1978 to 1981 where they were less (7,300 to 7,900 MT), and for year 1985 where the catches reached a peak of 19,000 MT.

A regulation prohibiting the catch and landing of bluefin tuna less than 6.4 kg in the entire Atlantic went into effect in August, 1975, with a 15 percent (in number) tolerance for incidental catches. Part of the variability observed in Table 19 could be due to gaps in sampling, as well as to changes in the fisheries. After this regulation went into effect, the percentage of fish less than 6.4 kg remained high in the east Atlantic and Mediterranean, at an average of around 50 percent and 30 percent, respectively in 1976-1988, and 51 percent and 26 percent in 1989.

A study of the percentages of under-sized fish in the Mediterranean (SCRS/84/43) indicates that landings of these small fish may be under-estimated. Countries which fish in the east Atlantic and Mediterranean continue to target small fish. The group concluded the regulation is largely not enforced.

BFT-4E. RECOMMENDATIONS FOR EAST ATLANTIC BLUEFIN

BFT-4E.a Statistics

Many times the Committee has expressed serious concern about the lack of basic information on the catch and size composition. Significant progress was made at the GFCM/ICCAT meeting. The Committee recommended the Secretariat and scientists continue this process so that the scientists can exchange data and coordinate research. This collaboration is essential for providing timely advice, especially concerning the younger ages which make up the largest part of the catch in number.

This is the second year that the SCRS tried to make parallel analytical assessments on two stocks, east and west, of bluefin tuna. This has created two problems, one which concerns the preparation of statistics, and the other the analytical capacity of the SCRS.

If the countries which take part in this fishery do not contribute to the analytical process, the SCRS might not be able to provide advice on the east stock. The Committee has greater uncertainty about the status of eastern Atlantic bluefin due in part to the time limitations which prevented a thorough review of the analyses and methods used for the east. Other factors which contributed to this uncertainty include the lack of standardized indices, incomplete reporting from the nations involved in fishing this stock and the general lack of participation by scientists with knowledge of the fisheries.

The small number of scientists dedicated to the assessment of the eastern stock have difficulty acquiring timely information on the logistics of the diverse fisheries, especially of the Mediterranean. The complexity of the analysis and volume of work requires a team approach. In recent years the Committee has not had sufficient participation of scientists to prepare a balanced and timely report.

BFT-E4.b Research

Catch at length

A problem exists in converting various sample measurements to length. Countries which are unable to sample whole fish should attempt to obtain factors to convert more accurately landing lengths to fork length or convert weight to length.

Catch at age

The procedure used to convert numbers at a given length in numbers at age for both stocks is based on averaged annual growth equations. A new growth equation was used this year for the east stock. Analyses of probable changes in seasonal growth are encouraged.

Assessment methodology

The Committee recommended continued examination of assessment methodology and the effects of changes in this methodology. Some studies should be carried out, especially on the methodology of obtaining estimates on fishing mortality of older fish and the sensitivity to change in the inputs.

Abundance indices

In order to evaluate the quality of the abundance indices, the data, in general, should be presented at the lowest level of the aggregation. Research to develop additional indices of the abundance especially from the Mediterranean are encouraged. In particular, the Committee recommended statistical standardization of the Spanish baitboat and trap catch rates and continued work to revise the French purse seine indices.

The Committee recommended that the cooperative work using the Japanese longline index to develop an abundance index incorporating hydrographical data of sea surface temperature be continued.

BFT-E4.c Management

This year's analysis shows trends similar to the 1989 SCRS assessment of bluefin tuna in the east Atlantic and Mediterranean. Due to the uncertainty surrounding previous assessments of the eastern stock, the Committee advised no change in the existing management measures. There still exists a great deal of uncertainty. However, it can be said that the population of older fish (age 10+) (Figure 60) is now lower, at about half the 1970 value. The medium fish (ages 5 to 9) also show a downward trend in the population of approximately 25 percent (Figure 60). The stock size of ages 2 to 4 is highly variable. Uncertainty about the youngest ages not only comes from the analytical technique and the variance in the abundance indices but also the high degree of uncertainty of the sampling of catches in the Mediterranean. For this reason, only limited confidence can be placed on the apparent upward trend.

The SCRS wishes to stress that the high catch of small fish (Tables 19 and 21) indicates a lack of compliance with the minimum size regulation. This problem may become crucial for the future of this stock.

BFT - GENERAL RECOMMENDATIONS AND DISCUSSION

i) Proposal for alternate-year assessments

The Committee noted that for bluefin the Commission has begun to provide management advice for two-year periods. The Committee further noted that the biology of bluefin tuna and the nature of the management advice resulting from bluefin assessments is unlikely to change over such a short period, especially for the west Atlantic stock. Therefore, the Committee recommended conducting alternate-year east and west stock assessments.

ii) Proposal for an "ICCAT Bluefin Year Program (BYP)"

Improvements in biological data and basic fisheries statistics of all Atlantic bluefin tuna are needed to reduce uncertainties in the current stock assessment. There is serious concern over the status of Atlantic bluefin stocks, especially for the west Atlantic. Additional biological information and statistical data are necessary to improve the analytical aspects of the assessment. For this purpose, a steering committee has been appointed to investigate applicable scientific studies, coordination with other agencies (especially GFCM) and possible sources of funding with the aim of determining the feasibility of an "ICCAT Bluefin Year Program".

The SCRS proposed two Co-Coordinators: Mr. Z. Suzuki for the west Atlantic and Mr. B. Liorzou for the east Atlantic. The results of their work will be presented at the 1991 SCRS meeting.

iii) Proposed research

In the meantime, studies of reproductive biology should be conducted on spawning time/area and an age-specific basis.

iv) Studies on the growth of bluefin that incorporate experimental design which increases pertinent information from the tagging

These studies should examine stock structure, possible inter/intra annual changes in growth ratios, and independent estimates of population size.

BIL - BILLFISHES

BIL-1. DESCRIPTION OF FISHERIES

Billfishes are distributed throughout the tropical and temperate waters of the Atlantic Ocean. Blue marlin, white marlin, sailfish, and longbill spearfish are caught by many fisheries, both directed and incidental, throughout their ranges. Black marlin landings from the Atlantic, if any, are negligible. Major catches of billfishes are incidental to the tuna and swordfish longline fisheries of many countries.

Other major fisheries are the directed recreational fisheries of the United States, Venezuela, Dominican Republic, Senegal, Costa Rica, Mexico, Jamaica, Bahamas, and Brazil. Smaller recreational fisheries also exist in Cuba, Bermuda, Portugal (Azores, Madeira), and numerous other countries in the Caribbean Sea and eastern Atlantic. Artisanal fisheries for sailfish along the west African coast are becoming increasingly important, especially in Ghana and Senegal, but also in the Caribbean island country of Grenada. Artisanal fisheries for marlins and sailfish also exist in Côte d'Ivoire, Barbados, Brazil, Aruba, Curaçao, and in most other Caribbean island countries.

In addition, the recent development and geographical expansion of longline fisheries in the Gulf of Mexico for tuna, Caribbean Sea for swordfish, and geographical expansion off Africa for swordfish have been reported by various nations (mainly Spain and the U.S. for the east and west Atlantic, respectively). Other countries that are expanding longline fisheries for swordfish in the Caribbean include Venezuela, Barbados, and Grenada. Because these regions are known to have significant concentrations of billfishes, incidental catches of these species can be expected to increase in areas of concentrated fisheries. The incidental nature of some billfish catches (mainly for the U.S. and Spanish longline fleets) also results in discards which are difficult to document and result in uncertainties in these catch statistics.

BIL-2. STATE OF THE STOCKS

The most recent analysis of the status of the eastern Atlantic stock of sailfish was presented to the SCRS in 1988; however, no other analyses on the status of stocks of other species have been presented to SCRS since 1982. This is due largely to deficiencies in landings and size data, and basic biological parameters which are needed for definitive stock assessment. Consequently, only summaries of the state of the stocks based on analyses presented in previous years are provided. The ICCAT Enhanced Research Program for Billfish was established in 1986 and initiated in 1987 in an effort to resolve data deficiencies for all billfishes in the Atlantic Ocean.

BIL-2.a Blue marlin

Total Atlantic landings of blue marlin (Table 26, Figure 62A) increased rapidly from 1960, reaching a peak of more than 9,000 MT by 1963. Landings generally declined until 1967 and remained relatively stable through 1977, fluctuating between 2,000 and 3,000 MT. From 1977 to 1989, landings declined to a somewhat lower level, fluctuating between 1,300 and 2,700 MT. The North and South Atlantic regions show trends similar to those for the total Atlantic. Much of these catches are incidental to the longline fisheries for tuna and the general trends in catches have followed the intensity of these fisheries. Major revisions in Korean longline landings for blue marlin, as well as other billfishes, were estimated based on Task II data by the national scientist for 1984-1989. In addition, landings of billfish species from the Venezuelan recreational fishery were estimated for 1961-1989 by the billfish rapporteur based on a 1990 SCRS document.

Japanese CPUE indices, 1962-80, were presented at the 1982 SCRS meeting. Catch-per-unit-effort increased slightly during 1977-80, but only to a level well below the 1965-75 average. Production model results based on these indices (SCRS, 1982), indicated that some over-exploitation may have occurred during the early to mid-1970's. Analysis of Japanese CPUE data was presented to the SCRS in 1988 but was limited to the years 1977-1986 because the fishing gear, fleet deployment pattern and target species was significantly different in earlier years. Catch-per-unit-effort has stabilized since 1977. The same series of the CPUE (1977-1986) by North and South Atlantic indicated higher values in the North Atlantic (Figure 63A).

An analysis of the Venezuelan recreational fishery was presented to the SCRS in 1988 and again in 1990. Standardized CPUE from 1961-1989 (Figure 63B) declined from an historic high in 1962 to its lowest level by 1978. After 1978, CPUE increased somewhat but to a level below previous highs until 1984 and has declined through 1989. This pattern is similar to that discussed above for the Japanese longline fishery from 1977 to 1986 (Figure 63A and B). However, it is recognized that the Japanese longline CPUE for this period is not completely standardized for the change in target species and gear deployment. Cuban longline CPUE (nominal) for blue marlin increased three-fold from 1970-1984 due to improved fishing methods (SCRS, 1987). In the central tropical Atlantic, Cuban longline CPUE for blue marlin declined for 1982-1987, while these data were stable during the same years, but at a much lower level, in the Cuban economic zone (SCRS, 1990). Standardized CPUE (1972-1986) from the U.S. recreational fishery for 1972-1978 was at or below the 15-year average (except for 1974), and from 1979-1986 was at or above this average. Recreational CPUE (nominal) for blue marlin in the U.S. Virgin Islands, which is primarily a catch and release fishery, increased from 1983 to 1989 (SCRS, 1990). The blue marlin landed in the U.S. Virgin Islands fishery has declined steadily from 16% in 1983, reaching a historic low of 3% in 1989. An analysis of nominal CPUE from the Jamaican recreational blue marlin fishery presented to the SCRS in 1989 showed an increase from 1976 to an historic high in 1986, and fluctuations below this level in 1987-89.

The Committee had previously (1982) expressed concern about any increase in effort on the stock because of the relatively low longline CPUE levels (through 1978) and the production model results discussed above. The Committee is encouraged by the apparent slight increase and stabilization in standardized recreational CPUEs over the past decade (U.S. and Venezuela). However, the recent expansion of longline fisheries, as well as recreational fisheries by countries previously not fishing in areas of blue marlin abundance (Gulf of Mexico and Caribbean Sea) reinforce the concerns expressed by past Committees. In particular, the Committee is concerned about the continuing uncertainty and lack of new information regarding the status of the blue marlin stocks.

BIL-2.b White marlin

Landings from the total Atlantic (Table 27, Figure 62B) increased rapidly from 1960 to almost 5,000 MT by 1965. Landings generally declined since then, fluctuating between 900 and 2,200 MT thereafter.

It was noted that Japanese CPUE indices of the total Atlantic had declined rapidly through 1980, since the initial peak in the mid-1960's (SCRS, 1982). The Japanese longline CPUE indices from 1977-86 indicated relatively stable CPUE levels for the total Atlantic during the period but because of changes in fishing practices, the levels of these values cannot be compared to earlier series. The same series of the CPUE (1977-1986) in the North Atlantic has been stable, but that in the South Atlantic indicated a sharp decrease and then levels off (Figure 64A). Standardized CPUE from the U.S. recreational fishery previously reviewed by the 1987 SCRS had indicated a continuous decline since 1980. Standardized recreational CPUE for white marlin in Venezuela has declined since 1971, reaching one of its lowest levels in 1989 (Figure 64B). The decline of this CPUE for 1971 to 1989 occurred while recreational fishing effort during this period continually increased (SCRS 1990). The Venezuelan recreational CPUE for white marlin is also very similar to the Japanese longline CPUE (South Atlantic) for the period 1977 to 1986. However, Japanese longline CPUE for this period is not completely standardized for changes to deep longline methods.

Although the Committee remains unsure of the exact status of white marlin, the declining recreational CPUEs (U.S. and Venezuela), as well as the decline of Japanese longline CPUE in the south Atlantic in recent years continue to reinforce the concerns expressed by previous Committees. As with blue marlin, the Committee is particularly concerned about the continuing uncertainty and lack of new information regarding the status of white marlin stock(s).

BIL-2.c Sailfish/spearfish

Landings for the total Atlantic (Table 28, Figure 62C) increased from about 300 MT in 1960 to almost 3,000 MT by 1965. Landings fluctuated between 1,900-2,500 MT through 1969, increased to over 2,700 MT the next two years, and then declined to less than 2,000 MT through 1977. Landings increased to about 3,300 MT by 1979, fluctuated between 2,000 to 2,500 MT in 1980-82, and then ranged from 2,500 to 3,600 MT in 1983-1989. An analysis of eastern Atlantic sailfish presented during the 1988 SCRS strongly suggests that Task I data are underestimating landings for several important longline fleets. Conversely, the national report of Ghana presented to the 1989 SCRS indicates potential over-estimation of landings from this major artisanal fishery. These landing statistics should therefore be considered provisional until problems are clarified.

West Atlantic

Standardized CPUE from the Venezuelan recreational fisheries indicate a decline, with fluctuation since 1969, and relative stability, but at low levels of CPUE from the late 1970's to 1989 (Figure 65). There were no new analyses presented on the status of the stock this year. Therefore, the Committee had no basis for changing its previous conclusion (SCRS, 1982) that western Atlantic sailfish appear to be only moderately exploited. However, the Committee again cautioned that further analysis would be needed before a more definitive assessment of the status of the stock could be made.

East Atlantic

Standardized Japanese CPUE indices (SCRS, 1988) indicated a declining trend from the late 1960's to the mid-1970's, followed by a gradual decline through 1986 which may be revised if changes in gear deployment are considered (Figure 66). Standardized recreational CPUE from Senegal was stable from 1970-1980, then declined gradually through 1986 (Figure 66). The recreational and artisanal fisheries for sailfish in Senegal occurs simultaneously in a very restricted corridor 200 km long and 10 km wide. The decrease in the recreational CPUE (Figure 66) may be overestimating the real decrease of abundance in this area because of the increased competition with the artisanal fishery operating in the same area or because of the number of tourists participating in the recreational fishery. Preliminary production model results established for the coastal eastern Atlantic on a revised data base (Figure 67) suggested that the stock is not yet fully exploited. Results of a cohort analysis were not conclusive because of uncertainties with recruitment trends. The quality of the data needs to be improved before more definitive stock evaluations can be made.

BIL-3. EFFECTS OF CURRENT REGULATIONS

No ICCAT regulations are currently in effect for billfishes. However, two ICCAT member countries (U.S.A. and Venezuela) established domestic regulations involving Atlantic billfishes in 1988. Venezuela established stricter regulations on Atlantic billfishes in 1990. In addition, Mexico prohibits commercial longliners within 50 miles of her coast. The regulations in the U.S.A. have affected billfish landing statistics (number and size of fishes landed) in the commercial longline fisheries for tuna and swordfish, as well as recreational fisheries. These changes are presented in the U.S. National Report and in various SCRS documents in 1990.

BIL-4. RECOMMENDATIONS

BIL-4.a Statistics

The Committee recommends:

i) That accurate estimates of total landings (Task I data) for all types of gear be made, by species, for Atlantic blue marlin, white marlin, and sailfish. In addition, billfish landing records from non-member countries, who do not normally report to ICCAT, should be obtained.

ii) That catch, effort, and size statistics, and if possible, landings by sex from all countries be reported by five-degree area and by month, as outlined in the ICCAT sampling instructions for billfish (SCRS/88/28).

iii) That catch statistics for sailfish and spearfish, in particular, be reported separately in order to facilitate stock assessment of both species.

iv) That descriptions of the billfish fisheries and methods of estimating landings be continued in the eastern Atlantic, initiated in other locations, and summarized in ICCAT documents.

v) That sailfish/marlin discards for historical longline and purse seine fisheries as well as more recently developed fisheries be evaluated and updated, especially for those fisheries catching swordfish in the Gulf of Guinea.

BIL-4.b Research

The 1991 Program Plan for the Program of Enhanced Research for Billfish (Appendix 11) describes recommended research. General recommendations of the Committee are:

i) That age and growth studies of marlins and sailfish be continued. Active sampling of juvenile marlin and sailfish should be initiated.

ii) That commercial and recreational fisheries data for billfishes be collected and analyzed to develop standardized abundance indices so that relationships between present abundance of billfish and that in the period 1960-75 can be evaluated. In this analysis, gear type, gear deployment, and target species should be taken into account.

iii) Full implementation of the ICCAT billfish tagging program will require special efforts regarding tag-recaptured fish. All ICCAT members and reporting nations are encouraged to distribute tag-recapture posters, particularly to individual longline vessels, so tag recapture data and biological samples can be recovered by ICCAT.

iv) Expand and initiate studies on the reproductive biology of billfishes in the east and west Atlantic.

BIL-4.c Management

No management recommendations are made at this time, except to stress the need to monitor the billfish fisheries closely (particularly for blue and white marlin).

SWO - SWORDFISH

SWO-1. DESCRIPTION OF FISHERIES

Swordfish are distributed widely in the tropical and temperate waters of the Atlantic Ocean and Mediterranean Sea. They are believed to spawn in the tropical waters of the Atlantic and in the Mediterranean Sea. Swordfish have been caught by the tuna longline fishery as a by-product from west to east almost continuously. In the North Atlantic, swordfish fisheries with a long history have been operating on both sides of the Ocean. Since the mid-1980's, U.S. and Spanish swordfish longline fisheries started to extend their operations offshore, and now the fishing grounds of both fisheries overlap each other in the central North Atlantic. In recent years, and particularly in 1989, the Spanish directed longline fishery has been expanding its fishing grounds towards the south and southwest, and the fishing ground is now extended off the Gulf of Guinea (Figure 68). The landings from the tropical band (20°N-5°S) now account for 54 percent of Spanish landings (in number). In the southwestern Atlantic, longline fisheries have been taking swordfish either as target species or as by-catch, depending on the relative catch rates of swordfish to tunas. In the Mediterranean Sea, swordfish fisheries have a long history of exploitation by various countries.

The catch and effort of swordfish in the North Atlantic indicates a continuous increase since 1978 when the U.S. eased its mercury content control until 1988 (Table 29 and Figure 69). For the first time since then, the catch has declined in 1989 from the 1987 historic high of 19,959 MT to 17,592 MT, mainly due to a significant shift of Spanish effort to south of 5°N in 1989. A major portion of the catch was taken by Spanish and U.S. longline gears deployed at night.

In the South Atlantic, the catch started increasing since 1972, with yearly fluctuations and reached its first peak in 1985 when 9,475 MT were caught. The largest contributor was Japan, followed by Uruguay. Longline catches then declined in the following two years. However, due to the shift of Spanish effort to the south of 5oN, swordfish catches started increasing again very rapidly in the South Atlantic in 1988 and 1989, when the yield reached the historic high of 15,273 MT. In 1989, the Spanish longline catch reached 7,725 MT, and accounted for slightly more than 50 percent of the total South Atlantic yield. The Japanese catch of 3,792 MT follows.

Mediterranean catches showed a gradual upward trend until 1983, but were less than 6,000 MT. Catches almost doubled in value in 1984 and since then have increased continuously to the historic high of 18,259 MT in 1988. They dropped to 17,711 MT in 1989. The sharp increase observed in 1984 represents the major improvement in Italian statistics (Report of Joint GFCM/ICCAT Consultation, Col. Vol. XXXIII). The statistics for 1989 are still preliminary and include many rough estimates. About one-third of the Mediterranean catches are known to have been made by longline, but that proportion should actually be higher since many longline catches are reported as mixed gear catches. For the last several years, Italy has been the most important producer (64 percent in 1988), followed by Algeria (14 percent) and Greece (7 percent).

SWO-2. STATE OF THE STOCK

SWO-2.a Catch at size/age

The catch-at-size data base by seven major sampling areas (1-3, 4A, 4B, 6 and 7) of the Atlantic was updated to 1989. Major changes in past years are described in Appendix 6. It was pointed out that the length-weight relationship adopted for Northeast Atlantic at the 1987 Swordfish Workshop (Col. Vol. XXVII) was erroneously cited from the original literature. It was corrected as $RWT = 3.4333 \times 10^{-6} \times LJ\text{-}F^{3.2623}$ (Mejuto *et al.*, 1988). The catch-at-size base was created for the first time for the Mediterranean for the period of 1985 through 1989. Previously, due to lack of size data and accurate estimates of catches as well as to the lack of a reliable length-weight equation, this had been impossible. As a result of the Joint GFCM/ICCAT Consultation, (Bari, Italy - June, 1990, Col. Vol. XXXIII), many new materials became available on catch, size and biological parameters. These made it possible to create the catch at size for this area (see Appendix for detailed procedures).

The catch at size was converted into catch at age, by the procedures used at the 1989 meeting. That is, using the mark-recapture growth equation employed at the 1988 Workshop. This is a generalized growth equation and does not involve separate functions for males and females. The catch-at-age data thus created are attached as Table 30 for four scenarios of stocks later agreed upon (see "stock structure"). Annual age composition shows a relatively small variation during the period analyzed. This might be derived from usage of a single growth equation which tends to smooth out annual variation in growth.

SWO-2.b Catch rates

The Committee examined catch rate information from the Argentinean, Uruguayan and Brazilian fisheries (SCRS/90/35), the Japanese longline fishery (SCRS/90/39), the U.S. longline fishery (SCRS/90/31) and the Spanish longline fisheries using data provided by Spanish scientists. It was noted that the treatment of the Japanese longline data for developing the indices had been improved by aging the nominal catch rates prior to standardization.

The Committee welcomed the data from the South American fisheries, which had not been available in the past and which was from an area for which little catch rate information has been available. Although the Committee found the information to be interesting, it was thought that nominal catch rates presented in the paper were not suitable for VPA analysis, because of possible differences among years and various influences on catch rates such as target species, the seasonal and geographic distribution of fishing, and environmental effects. No attempt was made to develop standardized catch rates from these data, because the SCRS scientists were uncertain about details of the data.

The Committee agreed that these data appeared to be quite promising and recommended that scientists familiar with the data develop standardized catch rates preferably by age. The Committee also recommended that the set-by-set data be submitted to the Secretariat.

The Committee developed several indices of abundance for use in the VPA. From the Spanish catch rate data, separate indices were developed for ages 1, 2 , 3, 4 and 5+ and for each of the stock hypotheses considered (total Atlantic, total North Atlantic, eastern North Atlantic, and western North Atlantic). In addition to the standardized indices from the Japanese longline fishery for ages 5+ presented in SCRS/90/39, two additional indices were developed for that age range in the total Atlantic and in the entire eastern North Atlantic.

The Committee was pleased to note that for the first time all the analyses to derive standardized indices were conducted with the same software.

In addition to the indices mentioned above which were derived at the meeting, there were Japanese longline index for ages 5+ from the eastern North Atlantic and for the entire North Atlantic, and there were indices for ages 1, 2, 3, 4, and 5+ from the U.S. longline fishery in the western North Atlantic. All the standardized indices considered for use in the VPAs for each of the stock hypotheses are shown in Table 31. As the trends of these indices are very similar among the four different area scenarios, those for the entire North Atlantic are plotted in Figure 70.

SWO-2.c Population parameters

The Committee agreed to age the current catch using the Gompertz growth equation as in the previous two assessments. The Committee further agreed to draw upon the results of SCRS/90/26 in order to express the range of uncertainty in absolute estimates of fishing mortality rate and stock size due to various possible sources of error including aging error from the age slicing process when assuming one growth curve while sexually dimorphic growth may occur. The Committee recognized the result of SCRS/90/26 showing that although bias in estimates of stock size and fishing mortality rates can result from ignoring sexually dimorphic growth, if it occurs, estimates of current fishing mortality rate relative to reference points commonly used in assessing the current status of the stock (e.g., $F_{0.1}$, F_{max} or some measure of reproductive potential), are less sensitive to errors in analysis due to dimorphic growth.

The Committee discussed incorporating the available sex ratio at size data into the VPA model and conducting sex-specific analyses. It was agreed that the available sex ratio at size data by year was not sufficient to allow separation of the catch except by applying the aggregated sex ratio data from the period 1978-1989 to the entire catch. The Committee noted that applying aggregated data in this fashion may smooth over variability between years and may mask important dynamics in catch at age. The Committee also considered the need to produce sex-specific CPUE indices for this form of analysis. The Committee agreed that this form of analysis could not be accomplished with the available time for this year's assessment. The Committee recommended that in addition to the current procedure of presenting standardized indices for both sexes combined, sex-specific indices should be presented.

The Committee was presented results of preliminary analyses conducted by the U.S., applying the observed sex ratio data (pooled over years and areas) to the North Atlantic stock hypothesis catch-at-size data used at the 1989 ICCAT swordfish assessment (1978-1988 data). The results of these analyses showed the same trends as the 1989 ICCAT assessment: 1) the estimated number of recruits has increased, except perhaps in the last year: 2) the estimated population size of age 5+ fish has been decreasing, especially for females; and 3) estimated fishing mortality has increased, especially since 1985.

SWO-2.d Stock structure

Stock structure was reviewed from the point of view of whether or not to conduct the assessment of the stock(s) like it was done last year, and with a view towards defining analysis priorities to be carried out on the different proposed hypotheses, based on the information available.

Information presented previously was reviewed, as was information contained in this year's papers and that generated by the group itself at this session as regards CPUEs (nominal and standardized) for wide areas and for more restricted fisheries, mark-recapture data (SCRS/90/41) (from the west and from the east), area-time distributions of the size classes, sex ratio by size class, and other biological information available (Table 32).

The group also studied and took into account oceanographic conditions which are considered fundamental to the behavior of this species (SCRS/90/33, 35 and 43).

Taking into account all the information and in order to carry out a comparative analysis with the stock trends obtained for the North, NE and NW stock at the 1989 SCRS, the following assessment priorities were established by the group:

1. North Atlantic (latitude > = 05°N).
2. Total Atlantic (North + South).
3. NW - NE (latitude > = 05°N (separated by the hypothetical 30°W line).

The GFCM/ICCAT Joint Consultation was inclined to consider the Mediterranean swordfish separate from the North Atlantic stock(s). However, based on the limited information available, the possibility of mixing between the North Atlantic and the Mediterranean (and also between the South Atlantic with the Indian Ocean) could not be discarded.

Additional information considered by the Committee for stock structure is provided in Appendix 6.

SWO-2.e Virtual Population Analysis (VPA)

Virtual population analyses were conducted for the four stock options: North Atlantic, Total Atlantic, Northwest Atlantic and Northeast Atlantic. The VPAs were calibrated with the CPUE indices using the ADAPT methodology. The ADAPT methodology allowed considerable flexibility to formulate the VPAs as appropriately as possible for the swordfish assessment. It also allowed the problems to be easily re-formulated to conduct sensitivity analyses for examining assumptions in the assessment.

North Atlantic

The Committee examined eleven standardized CPUE indices for tuning the VPA. These were U.S. and Spanish longline indices for ages 1, 2, 3, 4 and 5+ and a Japanese longline index for ages 5+. Partial recruitment of small fish was estimated from a separable (SVPA) with partial recruitment (PR) = .109 for age 1, .334 for age 2, .602 for age 3, and .896 for age four and 1.0 for age 5. Partial recruitment for older fish cannot be determined from available data. An equal selection pattern was assumed. However, a declining recruitment pattern with age was examined, as well. VPAs were conducted using M = 0.2 and grouping ages at 9+. The estimates of stock size in number and fishing mortality rate (F) is given in Table 33A and 33B. But, after an initial examination of results, the analyses were conducted, grouping at ages 5+ because no significant information was available within older ages in the analyses.

Abundance indices generally showed an increasing trend for ages 1 and 2, little or no trend for age 3 and a decreasing trend for ages 4 and 5+. These patterns were consistent among all of the indices.

Results of the VPA indicated that:

1) Stock Size (Table 34A) - estimates of age-1 abundance (recruits) increase gradually from the year at which the catch-at-age data became available (1978). (See APP-Figure VPA-1 and 3A). Abundance of age-1 fish in 1987 appeared to be more than one and a half times the level in 1978. Age 2 to 4 juveniles increased during the early part of the series and has begun to decline since 1986. Adult fish (5+) levels have declined continuously throughout the series. (APP-Figure VPA-3B).

2) Fishing Mortality Rate (F) (Table 34B) - The fishing mortality rate of age 1 and 2-4 fluctuated, but with a general increasing trend (APP-Figure VPA-5A). Fishing mortality rates on fish 5 and older appears to have increased significantly during the period.

   Additional sensitivity analyses were conducted to test partial recruitment patterns, age groupings, catchability changes, alternative weighting methods for indices and effects of individual indices. Results of these VPAs did not change the pattern of abundance and fishing mortality trends. Results of these arbitrary sensitivity tests indicated similar trends (APP-Figure VPA-1 and 2).

SWO-2.f Yield per recruit

Yield-per-recruit analysis (Y/R) was carried out as described in the Appendix. Estimates of current F relative to common reference fishing mortality rates ($F_{0.1}$, F_{max}) showed a narrow range (see APP-Figure YPR-1, and 2). SCRS/90/46 recommended "that $F_{0.1}$ is an appropriate target fishing mortality rate for swordfish, as it is a robust [conservative] estimate of F-MSY." Although widely used, $F_{0.1}$ is only one arbitrary reference value for realizing long-term yield of stocks; the current F level was reviewed in relation to these reference points. In general, the $F_{0.1}$ reference rate ranges from 13 percent to 28 percent of the estimated 1989 F while the F_{max} reference rate ranges from 28 percent to 57 percent of current F over a wide range of analytical assumptions. Yield-per-recruit analyses were also carried out within the simulations used to quantify uncertainty about the VPA results for North Atlantic and Northwest Atlantic stock hypotheses. These results demonstrated that the F values required to reach $F_{0.1}$, expressed as a fraction of the current F, have less uncertainty than do those required to reach F_{max} (APP-Figure YPR-1, 2, and 3). A reduction in the fishing mortality of juveniles would allow more fish to survive to the older age-classes and result in a higher yield per recruit.

The Committee considered that the analyses conducted in 1989 on the effects on yield per recruit of elimination of fishing mortality on ages 1 and 2 are applicable to this year's results.

In particular, the Committee was concerned that the sex-pooled growth curve may cause upward bias of fishing mortality rate estimates. While this may be the case, the degree of bias is unlikely to change the relations given above.

Northwest Atlantic

Eleven CPUE indices were included in the Northwest Atlantic analysis: the U.S. age 1, 2, 3, 4, and 5+ indices from the western North Atlantic, Spanish indices for the same ages (standardized in the western North Atlantic area 4A) and a Japanese index of age 5+ in the western Atlantic. Partial recruitment of the young ages was estimated to be .125 for age 1, .384 for age 2, .668 for age 3 and .920 for age 4. As with the North Atlantic analysis, the partial recruit for ages 5 and older was assumed to be one. VPA analyses were then conducted using the same methods as the North Atlantic.

The CPUE indices (Table 31) show increasing trends in ages 1 and 2 and decreasing trends for ages 5+. There was no consistent trend in CPUE indices for ages 3 and 4.

The VPA estimates (Table 35A, 35B, APP-Figure VPA-4) indicated similar results to those of the North Atlantic analysis: there has been an increasing trend in the abundance of recruits at age one, and a decreasing trend in the abundance of ages 5 and older. Fishing mortality rates on recruits (age 1) and on young fish (age 2-4) have also been increasing to high levels, especially since 1984. Fishing mortality rates on adult fish (5+) fluctuated at moderately high levels during the early years (1978-84) and then increased, thereafter (APP Figure VPA-6A).

Yield-per-recruit analysis showed that current (1989) fishing mortality rates was greater than F_{max} and considerably greater than $F_{0.1}$. The proportional reduction in F needed to reach F_{max} and $F_{0.1}$ are similar to those for the North Atlantic analysis (APP-Figure YPR-3).

Northeast Atlantic

Six CPUE indices were standardized to the eastern North Atlantic area: Spanish indices for ages 1, 2, 3, 4, and 5+ and a Japanese index for ages 5+. The partial recruitment vector estimated was .092 for age 1, .277 for age 2, .523 for age 3, .852 for age 4 and 1.0, thereafter. VPA analyses were conducted as in the other stock assumptions.

The indices (Table 31) show a pattern consistent with the North Atlantic and Northwest Atlantic analyses: increases in ages 1 and 2, decreases in ages 4 and 5 with a transitional pattern for age 3.

The VPA results (Table 36A and 36B) show fishing mortality rates fluctuating at moderately high levels, then increasing since 1984. However, there appears to have been a decrease in 1989, reflecting the shift of the Spanish fishery to more southern areas. Trends in abundance from the VPA are similar to the CPUE indices and to the North Atlantic and Northwest Atlantic analyses, except the decline in abundance of age 5+ fish is not so sharp as with the northwest Atlantic analysis.

As with the previous VPA analyses, the current (1989) fishing mortality rate is greater than that which would produce a maximum yield per recruit (F_{max}) and substantially greater than $F_{0.1}$.

Total Atlantic

The Committee felt that the catches reported and available size frequency data in the areas south of the North Atlantic were sufficient to allow analyses of these data in conjunction with the North Atlantic data. Additionally, the distribution of much of the catch and sampling in the south was near the 5°N line which is the present boundary between north and south areas. Therefore, analyses were conducted combining the north and south data into a Total Atlantic analysis. However, the Committee notes that the precision and accuracy of the southern data are not equal to that of the north. The Total Atlantic analysis could be interpreted as a predominately North Atlantic analysis with some additions for the south.

Eleven CPUE indices were utilized in the analyses: the Northwest Atlantic U.S. indices for ages 1, 2, 3, 4 and 5+; the Spanish indices for ages 1, 2, 3, 4 and 5+ which included a small portion of data from the southern area; and the Japanese age 5+ index which included data from the south, as well.

The estimated partial recruitment vector for the Total Atlantic was .086 for age 1, .271 for age 2, .514 for age 3, .797 for age 4 and 1.0 for age 5+.

The CPUE indices (Table 31) show trends similar to other analyses, above: Increases in ages 1 and 2, decreases in ages 4 and 5 with a transition for age 3.

Estimated fishing mortality rates (Table 37B) from the VPA analysis show an increasing trend in fishing mortality rate, especially in the latest years (since 1986). Stock sizes of age 5+ fish have declined, whereas recruitment levels have increased. The fishing mortality rate in the most recent year (1989) is larger than that estimated from the other analyses for the North Atlantic (Table 37A).

The yield-per-recruit analyses of the Total Atlantic indicated that 1989 F levels are greater than F_{max} and substantially greater than $F_{0.1}$. Reductions in 1989 F levels needed to reach these reference points are similar to those for the North Atlantic.

SWO-2.g Projections

The Committee conducted two-year forward projections applying the methods described in SCRS/90/28 for the North Atlantic and Northwestern Atlantic stock hypotheses to compute catches (in weight) in 1991, relative to the current year. Results for the North Atlantic stock hypothesis indicate that 1991 catches resulting from current estimated F levels (F-SQ) could range from 80 percent to 120 percent of current catches. Fishing at $F_{0.1}$ levels in 1991 could result in catches between 10 percent and 50 percent of the 1989 catches (APP-Figure YPR-2B). For the Northwest Atlantic stock hypothesis, the catches could be similar to 1989, ranging from 60 percent to 130 percent when fishing at F-SQ and from 10 percent to 40 percent at $F_{0.1}$ levels (APP-Figure YPR-3B).

SWO-2.h Production models

SCRS/90/30 described preliminary experiments to examine the adequacy of fitting stock production models to the 1981-1988 data for the North, Northeast, and Northwest Atlantic swordfish stock assumptions. Estimates of optimal catch (MSY) and effort (F-MSY) varied, depending on the model used and the underlying assumptions. Simulation results showed that production model analysis of a short catch and effort time series with characteristics like the swordfish data base analyzed may give spurious results and can form a poor basis for management decisions.

Appendix 7 presents preliminary production model calculations based on 1950-1989 catch and effort information. The calculations indicate that this approach should be further investigated.

SWO-2.i Uncertainty in Assessment Results

Uncertainty in inputs to the VPAs for the North Atlantic and Northwest Atlantic stock hypotheses was incorporated into the VPA analyses with the method described in Document SCRS/90/28. Uncertainties which might arise when assuming sex-pooled growth curve, when the underlying growth was actually sexually dimorphic were not included in the simulations. In general, the coefficients of variation of the estimates of F at age by year are larger than those for the estimates of abundance (APP-Table VPA-7). For both hypothesized stocks, the estimates of abundance indicate clearly increasing trends for age 1 fish (APP-Figure VPA-3 and 4). The fishing mortalities estimated for 1989 include the values obtained with the deterministic VPAs and range from 0.45 to 1.0 for the North Atlantic stock and from 0.5 to 1.15 for the Northwest Atlantic stock (APP-Figure VPA-5 and 6). For both stocks, fishing mortality rate on large fish shows increasing trends over the period 1978-1989 (APP-Figure VPA-3 and 4).

SWO-2.j Other fishery indicators

Average weights (kg round) are plotted in Figure 71 for the three ICCAT swordfish reporting areas in the North Atlantic and for two reporting areas in the South Atlantic. For the North Atlantic the trends were very similar with the NE and NC trends parallel to the NW trend but consisting of larger fish. Greater variability was noted for the early years of the time series particularly prior to 1982. This variability was thought to result from lower sampling levels that may not have provided coverage proportional to landings in all areas. After 1982 the sampling of the major fleets improved and the trends are less variable. Concern remains about the influence of increased fishing effort in tropical areas which has been noted in recent years.

SWO-3. EFFECTS OF CURRENT REGULATIONS

There are no recommendations made by ICCAT concerning regulation for swordfish.

Several national regulations have been adopted by different countries, mostly for the regulation of the gear and for licensing control. Recently, drift-nets have been banned by Spain and by Italy. A minimum 140 cm size regulation (actually interpreted as UJFL), allowing only for a maximum of 10 percent per trip in weight of swordfish with a length less than 140 cm, has been adopted so far by Italy. Canada has limited entry into the swordfish fishery (1984), has strict vessel replacement regulations and does not permit gill netting of swordfish.

SWO-4. RECOMMENDATIONS

SWO-4.a Statistics

i) All countries should report swordfish catch and effort statistics by five-degree squares, or smaller areas, by month. Such data are missing, in particular, for the Mediterranean countries.

ii) All countries catching swordfish (directed or by-catch) should carry out an adequate level of size sampling, when possible, sample for sex, preferably by month and five-degree squares. Especially, the data from coastal countries of the south-west Atlantic are scarce and they should be collected. Also, the data are not available for some drift-net and trawl fisheries and these data should be collected.

iii) All countries which have swordfish fisheries should submit by August of each year, the previous year's catch-at-size data.

iv) The ICCAT/GFCM (General Fisheries Council for the Mediterranean Sea) Joint Consultation held in June, 1990, was very successful in collection of catch and biological data. However, the Consultation recommended that coordinated data collection for the stock analysis of the Mediterranean is urgently needed. ICCAT reiterated this recommendation and the committee further recommended that such coordinated efforts be extended to the data analyses and that ICCAT assist this coordination.

v) Catch, effort, CPUE and size measurement data from the Mediterranean fisheries should be collected by gear and reported in detail.

vi) In the last few years, some swordfish boats re-flagged their nationalities and/or unloaded their catches in foreign ports without being covered in the ICCAT statistical system. The ICCAT Secretariat has been successful in obtaining some of these data. Efforts along this line should be continued with the assistance of national scientists.

vii) Information on swordfish fisheries in the Black Sea should be collected.

viii) A significant discrepancy has been observed for some countries between catches estimated from Task II (catch and effort) and those from Task I (nominal catch). The Committee agreed to use the estimates derived from the Task II statistics for stock assessment and recommended that the national scientists investigate the sources of discrepancies and try to eliminate such deficiencies in the future.

SWO-4.b Research

i) In order to increase the yield per recruit, among others, the following control measure might be explored:

a) controls on effort - limited entry and vessel replacement restrictions, seasons, reduce overall catch;

b) measures to avoid small fish - time-area closures, gear restrictions.

ii) The ICCAT/GFCM Joint Consultation on stock assessment should be held at an appropriate time in the future.

iii) Scientific tagging should be intensified to refine the growth model and to help resolve the question of stock structure. Tagging by commercial fishermen should be encouraged. Usage of tetracycline in tagging and collection of hard parts from any recovered fish are also recommended.

iv) Emphasis should be placed on developing validated growth models. It was also recommended that the development of a growth equation by sex should be pursued.

v) Research should be conducted on maturity and fecundity at age.

vi) Biological studies, which give pertinent information on partial recruit patterns of Fs, especially for older fish, should be conducted.

vii) Sensitivity analyses:

a) Research is needed on VPA and analytical assessment techniques or models that will allow evaluation of mixing rates for stocks exploited by wide-ranging fisheries.

b) The sensitivity of VPA techniques to different natural mortality rates by age and changes in age-specific catchability through time should be evaluated.

c) The sensitivity of the VPA results to the dome-shaped partial recruitment curve should be further conducted.

viii) All techniques to identify stocks(s) and quantify mixing rates should be explored, including age-, growth-, maturity-, and genetic-based methodologies. Detailed size composition and effort records should be investigated for patterns in distributions which might provide information on mixing. In addition, in conducting n-DNA stock identification studies, countries should contribute in proving the samples.

ix) More comprehensive and detailed analyses on sex ratio should be conducted using all the data available.

x) Further evaluation of application of production models should be conducted.

xi) Time and area difference in selectivity among various longline gears should be studied with respect to CPUE and the size of fish taken.

xii) Detailed study to assess the impact of increasing the age at first capture on yield per recruit should be conducted.

SWO-4.c Management

Stock assessments were conducted for the total North Atlantic, the northwest Atlantic, the northeast Atlantic and the entire Atlantic. It should be noted that all VPA analyses showed similar results. The comments and management recommendations in the following three paragraphs apply generally to the Northern stock units hypothesized. The Total Atlantic is considered in the last paragraph. Recruits at age 1 continued to increase. Juvenile stock size (ages 2-4) have shown a general increasing trend from 1978 to present. A consistent decreasing trend in stock size of adults (age 5+) has been observed from 1978 to the present. There has been a consistent trend of declining average weight in the catch.

Additional VPA analyses were conducted testing a number of possible scenarios including different partial recruitment patterns, weighting and nonweighting of the CPUE series, differential grouping of older ages, and selection of specific CPUE series. All results showed high Fs for adults in the most recent years. The sensitivity analyses indicated that results were relatively insensitive to values of present exploitation in relation to biological reference points ($F_{0.1}$, F_{max}) from yield-per-recruit analysis. The Committee believes that the VPA analyses conducted provide trends in abundance and fishing mortality rates, but that the absolute values should not be interpreted literally.

Present yield cannot be maintained over the long-term without either a decreasing fishing mortality or continued increases in recruitment. It is unlikely that recruitment will continue to increase.

The analysis conducted by the Committee indicated that there is a high likelihood (90 percent, Figure 72) that the reduction needed to reach optimum is in excess of 50 percent. Despite uncertainties in the analyses which cause the working group to believe that the absolute values estimated for fishing mortality on age 5+ fish are higher than probably occurred, the group concluded that without decreases in fishing mortality over the next few years, there is a significant probability of detrimental effects on future yield. The Committee noted that such a reduction has begun in the North Atlantic for some countries (particularly in the Northeast Atlantic). The Committee recommends that fishing mortality be reduced below the 1988 level. At the same time, because of the high catches of small fish, the decline in mean weight of the catch and the high recruitment, the reduction of fishing mortality on juvenile fish is recommended. This reduction in the catch of juveniles allows more fish to survive to be adults and thus increase the yield per recruit.

The working group also made an analysis of the total Atlantic stock. Other than catch there was very limited information from the southern area. Never the less the analysis indicated that fishing mortality on age 5+ fish in the Total Atlantic was increasing to high levels. Therefore, the Committee recommends that the current increase in fishing effort in the southern area be monitored closely.

Appendix 6 documents the assessment methods used by the 1990 SCRS swordfish working group. Appendix 7 contains alternative calculations presented to the SCRS, but not available to the working group for discussion. The calculations presented in Appendix 7 are based on different hypotheses than those used by the working group. These alternative hypotheses need further evaluation. However, both approaches lead to similar management advice.

SBF- SOUTHERN BLUEFIN

SBF-1. DESCRIPTION OF FISHERIES

Southern bluefin tuna are distributed exclusively in the oceans of the southern hemisphere. The only known spawning ground is located in the waters off Java and northwestern Australia. The habitat of young fish is located in the coastal waters of western and southern Australia, and as they grow, they migrate circumpolarly throughout the Pacific, Indian and Atlantic Oceans.

Historically, the stock has been exploited by Australian and Japanese fishermen for more than 35 years. During the course of this period, the Japanese longline fishery taking older-aged fish recorded its peak catch of 77,927 metric tons (MT) in 1961 and the Australian surface catch of young fish peaked at 21,500 MT in 1982. In recent years, New Zealand has participated in harvesting this species by handline gear in its coastal waters, although the catch amount has been very small. In 1989, catches by these three countries were 6,118 MT, 8,800 MT (preliminary) and 424 MT for Australia, Japan and New Zealand, respectively. As far as the Atlantic Ocean is concerned, southern bluefin tuna are caught by the longline fishery mostly in the area off the southern tip of Africa. The Atlantic catch has varied widely between 400 and 6,200 MT during 1978 and 1989 (Table 38 and Figure 73), reflecting the shifts of the Japanese longline fishery between Atlantic and Indian Oceans.

SBF-2. STATE OF THE STOCKS

At the Ninth Tripartite Scientific Meeting of Australia, Japan and New Zealand held in Hobart, Australia, in September 1990, the status of the stock was re-evaluated on the basis of the updated catch at age, fishing effort and tagging data. Fishery modeling results from sets of VPAs showed that:

- -- the biomass of the parent stock (age 8 and older) is at historically low levels;
- -- under the current catch levels (11,750 MT), all deterministic projections show that the parent stock should reach its lowest point in 1990 or 1991, then increase;
- -- under higher catch levels (up to 20,000 MT) than current ones, many deterministic projections suggest recovery;
- -- under the current catch levels, most stochastic projections, except one, predict stock recovery to 1980 parental biomass levels by 2010.

Accumulated experience with the use of VPAs for the southern bluefin fishery has highlighted several factors which contribute to the variability in estimates:

- catches not fully accounted for;
- uncertainty in the age composition of the catch;
- uncertainty in the relationship between CPUE and abundance;
- unknown stock-recruitment relationship;
- time lag in estimation of recruitment;
- uncertainty in the value of the instantaneous coefficient of natural mortality (M);
- present stock projections require prediction of recruitment outside the range of existing estimates.

In addition to the modeling results, the fishery indicators were examined to provide a description of events in the fishery. The indicators showed:

- a continuous decline from 1980 to 1988 in the parental stock;
- a sharp decline from 1980 until 1986 or 1987, and thereafter a slight increase, in the pre-adult stock;
- an increase in small fish availability in many fishing grounds.

Taking into consideration both the good signs of stock recovery and the uncertainties in the estimates, the Tripartite Scientific Meeting recommended that there be no increase in present catch levels until there is clear scientific evidence of a recovery in the parental stock.

SBF-3. EFFECT OF CURRENT REGULATIONS

Since 1971, as a first stock management action, Japanese longline fishermen have adopted a voluntary measure of restricting southern bluefin fishing in areas where young fish are abundant, to increase the age at first capture so as to expect a better yield per recruit. Since the 1984 fishing season, Australia has maintained a national quota of 14,500 MT and a seasonal-area closure of its fishery off western Australia. Japan and New Zealand introduced national quotas of 23,150 and 1,000 MT, respectively, for the 1985 fishing season. Recently, Australia and Japan reduced their catch limits to 11,500 MT and 19,500 MT, respectively. In 1989 the Tripartite Administrative Meeting decided to reduce their catch limits to 6,065 MT for Japan, 5,265 MT for Australia and 420 MT for New Zealand. In 1990, as of now, the administrative meeting has been reviewing the possible revision of the present catch limits taking into account the discussion made at this year's scientific meeting and the socio-economic factors in the three countries.

SBF-4. 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.

The Committee made no recommendation for management of southern bluefin tuna in the Atlantic Ocean, since the stock in the Atlantic is a part of the total population and it has been monitored by the other international body.

SMT - SMALL TUNAS

SMT-1. DESCRIPTION OF FISHERIES

Small tunas are mainly exploited by coastal artisanal fisheries, although substantial catches are made either directly or as by-catch by coastal purse-seiners. About ten species make up the small tuna category, but only four of them account for about 80 percent of the total weight; they are Atlantic bonito, Atlantic black skipjack, frigate tuna, and spotted Spanish mackerel (Figure 74). The total catches, all species combined, were relatively stable in the 1960's and 1970's (around 70,000 MT), but increased rapidly since 1980, reaching 130,000 MT in 1982. This increase is mainly due to an increase in catches reported by Turkey of Atlantic bonito, increases in the catch of Atlantic black skipjack reported by Ghana, and frigate tuna by Spain. Increases in recent years are also reported for Spanish and king mackerels from surface gears from Mexico and the United States. Since 1984, the catches have been relatively stable at around 100,000 MT (Table 39).

It should also be noted that there has been an improvement in statistical coverage, due to an increase in the number of countries which report their catches as well as to an improvement in the catch coverage and species identification of the reported catch.

SMT-2. STATE OF THE STOCKS

Current available information generally does not allow an evaluation of the status of the stocks of most of these coastal species. It is felt, however, that some of these stocks are under-exploited. The results obtained in document SCRS/90/67 on feeding of yellowfin tuna seem to indicate a significant biomass of frigate tuna in the east Atlantic. Annual stock evaluations of spotted Spanish and king mackerels are carried out for coastal areas of the eastern United States. The results of these assessments show an overfished condition, with rebuilding occurring under management quotas.

SMT-3. EFFECTS OF CURRENT REGULATIONS

A "U.S. Fishery Management Plan for Coastal Migratory Pelagic Resources (king mackerels) in the Gulf of Mexico and South Atlantic Region (of the United States)" is in effect in the U.S. Exclusive Economic Zone (EEZ). It provides a total allowable catch (TAC) for spotted Spanish and king mackerels, divided by area and between the commercial and recreational fisheries. The TACs and allocations are adjusted annually, based on the most recent assessment. These regulations appear to be effective in rebuilding the stocks to provide yields at full exploitation levels.

SMT-4. RECOMMENDATIONS

SMT-4.a Statistics

Catch and effort statistics of small tunas are very incomplete for most of the coastal and industrial fishing countries. Therefore, the Committee recommended:

i) That special efforts be made to improve the catch data by species and gear of small tunas by the different fisheries (artisanal, industrial, sport), as well as the corresponding effort, as far as possible.

ii) That discards off the African coasts, unreported marketing of purse seine catches, and the size of individuals of the species involved be estimated.

SMT-4.b Research

Biological studies have not been greatly advanced, and there is a general lack of information on the status of stocks of the small tunas. Therefore, the Committee recommended:

That studies related to the stock evaluation of small tunas be carried out as far as possible, and that the results be communicated to ICCAT. These studies should address the development of: biological data such as growth rate, maturity, fecundity, and natural mortality; stock structure, distribution, and size; the ecology of small tunas and their association with schools of juveniles of large tunas; and the development of effective effort data for the small tunas.

SMT-4.c Management

The Committee has no recommendation for management of the small tuna stocks. It is recognized that the stocks of small tunas are generally coastal, and that management of the stocks at the local level is easier than managing stocks of large, deep-water tunas, or other species fished by high-seas fisheries of several nations. Nations that have implemented management regulations for coastal small tuna species are encouraged to report these regulations and to describe their effectiveness to ICCAT.

11. ESTABLISHMENT OF SUB-COMMITTEE ON ENVIRONMENT

Mr. J. Pereira, Convener of the Working Group on Environment which was established during the 1989 SCRS, presented a report on the activities of the Group during the inter-sessional period (SCRS/90/22) (Addendum 1 to Appendix 9). After his presentation, the Working Group met to discuss in detail the many points highlighted in the report.

The Working Group later presented a report of its discussions. After reviewing this report, it was adopted by the Committee and is attached as Appendix 9.

The Committee reiterated the recommendation made by the Group to create a Sub-Committee on Environment. The SCRS Chairman nominated Dr. J. Pereira as Convener of this newly formed Sub-Committee.

The Sub-Committee should monitor the environmental conditions and study the effects of these conditions on tunas and tuna fisheries.

12. REVIEW OF SPECIES AND GEAR INTERACTION

12.a Species interaction

The Committee noted that the interaction of tunas with porpoises is an important area to be investigated. Although it seems that the association of tuna with porpoises in the Atlantic is not as strong as in the case observed in the eastern Pacific, this interaction should be studied in greater depth. The Committee also recognized that such interaction is not limited to the porpoises or to the tropical area, but that it could occur with other marine mammals or even with sharks and in the temperate waters.

The Committee discussed the importance of the study on the association of tunas and other tuna-like species with flotsam. It is well known that in the tropical area, about 20 percent of the tuna catch is taken from schools associated with flotsam, particularly where the sea is influenced by the large rivers. A study of flotsam in terms of its distribution, abundance and association with tunas is important for an understanding of tuna ecology and dynamics. The Inter-American Tropical Tunas Commission (IATTC) has been carrying out studies on flotsam. ICCAT should initiate efforts to investigate this aspect in collaboration with other agencies in the Indian and Pacific Oceans.

12.b Driftnets

The Committee reviewed document SCRS/90/18 which assembled all the formal correspondence received to date by the Secretariat concerning the U.N. resolution adopted on large-scale pelagic driftnet fishing. It was confirmed that the large-scale monofilament drift gillnet is of uppermost concern, since the effect of this gear on fish and on by-catch is much more serious than with traditional multi-filament driftnets.

The Committee reviewed this document and at the same time discussed at length the scientific recommendations which the SCRS could make to the Commission.

The French scientists considered that the situation in the Atlantic is much less complicated than that in the Indian and South Pacific Oceans. The activity of large-scale driftnets is not yet well developed. Traditional driftnets have been used by coastal fisheries, particularly along the African coast, and the small-scale French driftnets in operation in the North Atlantic are well monitored. On the other hand, the French scientist observed that a new, large-scale driftnet fishery of an unknown country has been recently observed in the North Atlantic Ocean.

The scientist from the U.S. informed the Committee that there has been small-scale driftnet fisheries along the U.S. East Coast, but that they are under strict observation and are proposed to be terminated in 1991. On the other hand, he found it difficult to give specific scientific advice on the effect of large-scale driftnet fishing at this time, since there is no information on those fisheries in the Atlantic. The U.S. scientist proposed that the SCRS get all possible information on these fisheries and their catches.

The French scientist agreed with the proposal made by the U.S. and added that the information to be gathered on this fishery should include by-catches as well as target species. He suggested that an observer program might be needed in the future to collect such information.

The Spanish scientist expressed her country's concern that a driftnet fishery by boats without national identification is developing in the Atlantic. She noted that in the Pacific and Indian Oceans, the commissions in charge of the tuna management have taken very restrictive measures to control this fishery and she considered that similar measures may help in preventing further development of this fishery.

The EEC observer supported the proposal of the United States and pointed out that due to the lack of information, the EEC could not take a firm position on this question. He added that considerable attention was being paid to this problem and very detailed analyses will be conducted in the near future. He observed that the EEC had financed a French-Spanish research program in 1989 on this subject. The final report of this research will be made available for analyses by ICCAT scientists, as was formally requested by ICCAT.

The South African scientist noted that at the 1989 Commission Meeting in Madeira, his country expressed concern at the apparent deployment of large-scale pelagic driftnets in the Atlantic Ocean. This concern has increased during the past year in the face of increasing indications that such nets are being used in the ICCAT Convention area. While acknowledging the lack of documented information on such developments, he is concerned about the potential threat that such large-scale driftnet fisheries pose to international stocks of highly migratory tuna species. The United Nations General Assembly Resolution 44/225 calls upon regional fisheries organizations to consider urgently various aspects of data collection and cooperation in order to assess the current or potential effects of driftnet fisheries. South Africa considers it to be a responsibility of the SCRS to formulate a statement to the Commission supporting those aspects of Resolution 44/225 that call for the urgent investigation of all sources of information on driftnetting in order to review such information by 30 June, 1991.

The Japanese scientist also expressed his country's concern on the effects of driftnet fishing and he proposed that solid scientific information be collected and documentation of various fisheries be made. For example, the amount of gillnet aboard a fishing boat should be estimated, and gear specification should be documented. He believed that the SCRS can study the matter only after this documentation becomes available, rather than base its conclusions on rumor. This view was supported by France.

The Observer from Taiwan noted that in 1989 Taiwan had 280 vessels operating with large driftnets, both in the Pacific and Indian Oceans, which have been reduced to about one-third. He noted that concern of the scientists as regards the Atlantic Ocean. The Taiwanese government permitted driftnet fishing at first only in the Indian Ocean and for squid. However, they are fishing for squid in the area near the Falkland Islands (South Atlantic) and in the North Pacific. Thereafter, the driftnet has moved into the Indian Ocean for tuna fishing. Part of the tuna caught in the Indian Ocean are unloaded at Cape Town. Also, some squid drift-netters move from the Atlantic into the Pacific through the Panama Canal. Therefore, it is not surprising that these driftnet vessels have been observed at various locations.

Taiwan prohibited the use of driftnets in the Atlantic on February 16, 1990. In the South Pacific, the number of drift-netters was reduced from 64 in 1989 to 11 in 1990, and the fishery will cease operations by July 1, 1991. Taiwan has been dispatching three patrol boats to implement these regulations. Taiwan has also initiated many international cooperative research projects to study the effect of driftnet fishing. There is even a comparative study currently being carried out between a drift-netter and a longliner.

The Observer from Taiwan noted that he would welcome a report if any Taiwanese vessel is observed driftnet fishing in the Atlantic Ocean, so that his government can take the necessary action towards these boats.

The South African scientist congratulated the prompt and thorough actions being taken by Taiwan, in accordance with the U.N. Resolution. This view was shared by all the scientific delegations.

The Spanish scientist stated that a regulation was recently put into effect to ban all swordfish driftnet fishing near Gibraltar. Italy is also known to have banned all driftnet fishing. Consequently, the number (about 750) of drift-netters of the EEC member countries that used to fish in that area has been reduced by 85 percent.

The Canadian scientist stated that driftnet fishing has never been permitted for swordfish. The Korean scientists also stated that there has been no driftnet fishery in the Atlantic.

The Japanese scientist noted that there has been no driftnet fishery in the Atlantic and Indian Oceans. Driftnet fishing in the South Pacific has been stopped, starting with the 1990 fishing season, with consideration given to the coastal countries socio-economic status, and not because it considers that driftnet has a reverse impact on the stock.

The Spanish scientist proposed a draft resolution. After a short debate on the draft resolution, the Committee decided to form a small editorial group, open to all the scientists, to finalize a resolution. The group's resolution follows herewith:

THE SCRS RESOLVES:

- Taking into account the various statements presented to the Committee referring to the presence of vessels, often unidentified, fishing with large driftnet in the north as well as in the south Atlantic; and

- In view of the Committee's concern about the possibility of a rapid escalation in fishing mortality on certain Atlantic tuna resources if large-scale driftnet fisheries develop in the Atlantic Ocean;

- That such developments should be studied from the onset, so that environmental impacts can be determined and effects compared with assessments for other fishing methods.

13. REVIEW OF THE PROGRESS MADE BY THE PROGRAM OF ENHANCED RESEARCH FOR BILLFISH

A small group was formed, and Dr. B. Brown was nominated Convener to evaluate the progress made by the Enhanced Research Program for Billfish and to develop the Program Plan for 1991. Dr. Brown later presented the report of this small group to the SCRS.

The progress made and all the activities carried out by the Billfish Program in 1990, as well as the achievements made in sampling, collection of statistics, species identification kits, observer program on fishing boats, preparation of tagging kits and publicity posters, as well as the financial aspects of the Program are reported in SCRS/90/14, SCRS/90/20 and SCRS/90/106.

The group prepared a detailed Program Plan for 1991 including funding requirements for each activity. The Committee recognized that the Program Plan now includes organization of a special Workshop on Billfish in 1992 to summarize the research carried out. The Committee reviewed the proposed Program Plan for 1991 and after introducing some modifications, adopted it together with the budget for 1991, with the understanding that the meeting proposed for 1992 be subject to further discussion at the 1991 SCRS meeting.

It was confirmed that all funding of the Billfish Program is covered by private contributions which are deposited to the ICCAT Billfish Trust Fund. The Program Plan for 1991 is attached as Appendix 11 to this SCRS Report.

14. REPORT OF THE SUB-COMMITTEE ON STATISTICS AND REVIEW OF ATLANTIC TUNA STATISTICS AND DATA MANAGEMENT SYSTEM

The Report of the Sub-Committee on Statistics was presented by its Convener, Dr. S. Turner. The Committee adopted the Report together with its recommendations. It is attached as Appendix 8.

15. REVIEW OF EDITORIAL AND PUBLICATION POLICY

The statistical publications were discussed under Agenda Item 14 and by the Sub-Committee on Statistics. Reference was also made to the publishing of four volumes of Collective Volume of Scientific Papers. Regarding special publications, the following comments were made.

15.a Field Manual

The Committee noted the great effort made by the Secretariat in producing this manual in spite of the very limited funds and means available. However, it noted that the quality of printing of the Third Edition of the Field Manual in English is much lower than previous editions. The Committee recognized that this reflects the economic situation of the Commission and that this is the best the Secretariat could do within the Commission's normal publication budget and using all in-house equipment.

Spanish scientists expressed the wish that a better printing-quality publication could be made available and a higher number of volumes printed. It was also noted that the very small letters appearing in some of the figures of the English version are very difficult to read with the present quality of printing, and this should be avoided in future publications. The Secretariat will wait until the end of 1990 before continuing with the printing, in the hope that an offer to provide professional-quality printing will be received from outside the Commission.

15.b Yellowfin Year Program Report

The Final Draft of the Report of the Yellowfin Year Program was presented to this meeting (SCRS/90/6). The Secretariat explained that some of the contribution papers have not yet been submitted in the final form and it will communicate with the authors to find out when they will be submitted. At the same time, the Committee recommended that original figures be sent to the Secretariat for all these papers, if this has not yet been done.

15.c Resources, fishery and biology of tropical tunas in the Central East Atlantic (FAO)

The translation of this volume into Spanish is almost finished and printing is expected in the very near future.

16. REVIEW OF FUTURE SCRS RESEARCH PROGRAMS AND CONSIDERATION OF SCRS MEETING PROCEDURES

16.a Organization of SCRS Meeting

The Report of the Working Group on SCRS Organization, created at the 1989 session, was presented by the Group's convener, Ms. P. Pallarés (SCRS/90/21). It presented some definite recommendations, such as holding stock assessment sessions separately from and well in advance (September) of the SCRS meeting.

Stock assessment session

The Group first discussed the possibility of having stock assessment sessions for more than one species in September. The U.S. noted that the key element is the preparation of a data base two weeks ahead of the meeting time. If this can be achieved, more than one analytical assessment could be made in advance.

The suggestion was made of holding two meetings for different species consecutively. The Secretariat stated that the three stock assessment sessions held during the 1990 inter-sessional period posed serious difficulties for the Secretariat's work schedule and that in the future it may not be able to keep up with the extra workload caused by this scheduling. It was suggested that if two species have to be assessed, the meetings could be held at the same time but with two or three days difference in starting date.

Japan referred to the recommendation made that bluefin stock assessments be made in alternate years for the west and east stocks. The Committee could consider the possibility of conducting analytical assessments every two years for other major species, if it was felt that the stock status would not undergo important changes or if no significant improvements would be made in the data base.

There was a consensus on the advantages in holding the major stock evaluation separately from the SCRS at an earlier date. The Committee agreed that the species to be analyzed each year will be decided on yearly basis according to the analyses needed.

The Committee recognized that west Atlantic bluefin assessment has to be made next year, since the Commission has requested management recommendations on west Atlantic bluefin in 1991. The swordfish assessment was also identified as being needed next year. All the other species would require only a normal review. It was agreed that swordfish assessment be made in September and west Atlantic bluefin assessment be made one week before the Committee meeting in 1991.

Meeting venue and other arrangements

The recommendation of the Working Group on the meeting venue was that it should be limited only to Madrid. The Committee agreed that, in principle, the stock assessment session would meet at the Commission Headquarters, but that this decision should be flexible.

It was also confirmed that the stock assessment meetings could be carried out and the report could be written in any of the official languages; no interpreters will be provided and the report will be translated to the other official languages after the meeting.

Computer software to facilitate scientists' work

The Working Group recommended that an interactive, menu-driven package of assessment computer software be developed at the Secretariat with a proper manual so that even scientists that are not very experienced with computers could use this software. The Committee agreed that this should be the final goal. On the other hand, the Committee recognized that documentation is the responsibility of writers of the program and recommended that the Secretariat request the collaboration of various scientists who provided the programs which are now available at the Secretariat to document the programs and make this documentation along with the software available to the scientists during the assessment session.

Function of the SCRS

The desirability of establishing a separate workshop for stock assessment was discussed. It was pointed out that such a group may duplicate much of the species stock assessment group's work and if the work later undergoes substantial changes before the Committee, the value of giving early advice to the Commissioners would be reduced. On the other hand, any new additional information could be added at the time of the SCRS meeting. The Committee considered that the stock assessment session should draft the SCRS report, pending modification by the species group at the time of the SCRS. In any case, the results of the stock assessment will not be the formal view of the Committee until the Committee has had the opportunity to review and approve it.

Format of SCRS Report

The usefulness of background document (so-called "Report A") was questioned. Most of the scientists felt that the background document is repetitive from year to year, that writing it during the meeting is an extra burden, and it is not even published. Since the publication of the background document was abolished, some species groups started attaching an appendix to be included in the Biennial Report, which makes that publication more voluminous and less understandable for the Commissioners.

A solution might be to revive the publication of background documents which will be limited only to new findings and to an explanation of the assessment made, and keeping the Biennial Report as a summary. In this respect, the format of the SCRS report could be improved so that the report will be more attractive for non-scientific readers. The suggestion was made that two rapporteurs be selected for these purposes.

It was proposed that discussion of this matter be referred to the 1991 species groups and that a definitive decision be made during the SCRS session.

16.b 1991 Intersessional Meetings

Working Group on West Atlantic Tropical Tunas

The Committee confirmed that the Working Group would meet in April, 1991, and the NMFS Southeast Fisheries Center, Miami, extended an invitation to hold this meeting. The Committee accepted this invitation with pleasure. A small group studied the Agenda, working schedule and tasks to be done by the scientists and Secretariat from now until the meeting. This schedule and Agenda is attached as Appendix 10.

Swordfish stock assessment meeting

The Committee previously decided to hold the swordfish stock assessment in September, 1991. Canada extended an invitation to hold this assessment at the Biological Station in St. Andrews, New Brunswick, Canada, for about one week sometime after September 15, 1991. The Committee accepted this invitation with pleasure, and asked the Secretariat to contact the Canadian Government concerning the conditions and availability of computer facilities. The final decision should be taken in consultation with the SCRS Chairman.

16.c Research in countries which have no tuna fisheries

Scientists from Sao Tomé and Principe and Gabon expressed their concern for the absence of research programs in their countries and called the attention of the Committee to this matter, especially as regards training courses for national officials and technical assistance.

The Secretariat explained that, in the past, several training courses were organized by the Commission to train scientists and technicians from developing coastal countries on statistics and stock assessments. Unfortunately, the Commission's difficult financial situation during the last several years has prevented these courses.

There have been some cases where scientists from neighboring countries have assisted in establishing local sampling and data compilation systems. However, in most cases, the cost has to be borne by the countries sending the experts.

The Committee placed great importance on these positive activities for the developing countries and called upon the Commission, especially in 1991, to take note of this situation, particularly in the field of finances.

16.d Other matters

No other matters were discussed.

17. COOPERATION WITH OTHER ORGANIZATIONS

The observer from IATTC invited all ICCAT members to use their laboratory in Panama which was built to study the early life history of tunas. It has small research boats to obtain larvae and an aquiculture system. Description of the laboratory is seen in the IATTC Annual Report. This laboratory will provide people with the opportunity of understanding the biology and dynamics of the early life of tuna.

The Committee thanked IATTC for this invitation.

18. RECOMMENDATIONS

The Committee wished to draw the attention of the Commission to the various recommendations made in the species section (Agenda Item 10) and those contained in Report of the Sub-Committee on Statistics. Other recommendations which may have immediate financial repercussions include the two intersessional meetings scheduled during 1991 (see Section of 16.c).

19. OTHER MATTERS

No other matters were discussed.

20. ADOPTION OF REPORT

The Report was adopted with some changes.

21. ADJOURNMENT

The meeting was adjourned.

Table 1. Yellowfin tuna catch (1,000 MT) by gear and for east and west Atlantic - as of November 2, 1990

	1960	1961	1962	1963	1964	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
TOTAL	68.9	59.1	58.1	64.9	69.3	68.1	58.8	60.2	83.0	92.7	73.4	73.2	93.5	94.7	106.8	124.6	123.1	128.7	130.5	124.8	125.5	151.2	159.8	160.4	111.7	149.9	135.5	137.8	127.5	154.9
E. ATL.	52.0	51.0	28.3	42.3	47.3	54.4	43.3	52.6	73.7	80.4	59.2	57.5	78.2	79.8	92.2	108.1	109.3	115.3	115.7	111.7	112.4	134.8	134.3	123.4	75.3	112.6	107.4	113.3	101.3	122.4
-SURF	11.4	10.0	10.8	19.1	28.4	26.8	30.7	35.5	51.9	59.9	43.1	42.8	60.1	59.3	72.8	92.7	96.6	99.7	104.5	105.0	99.9	126.9	124.4	117.3	66.6	105.0	103.4	108.7	93.9	116.2
BB	11.2	9.8	10.6	17.8	21.1	18.5	15.1	16.8	22.1	15.6	9.6	10.6	13.1	14.7	19.7	9.6	12.8	10.9	9.0	13.7	7.6	9.8	13.2	11.5	13.7	16.1	15.1	16.5	15.9	13.0
ANGOLA	2.3	2.0	1.8	2.1	3.6	1.9	1.3	0.9	1.1	0.4	0.3	0.5	0.6	0.6	0.8	0.1	1.0	1.9	2.0	0.8	0.5	0.7	1.4	0.7	0.2	0.3	0.1	0.1	0.2	0.1
CAP VER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.5	0.4	0.4	0.4	0.1	0.1	0.5	0.6	0.9	0.6	0.8	0.9	0.9	0.7	1.3	0.9	0.5	0.9
FIS	8.9	7.8	6.1	12.3	13.2	12.7	13.1	14.4	18.6	14.0	7.4	7.4	7.4	5.5	6.3	2.9	3.7	3.4	2.8	2.2	2.1	2.9	3.0	2.7	3.4	2.9	3.8	3.8	4.4	2.6
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	++	0.1	0.3	0.7	0.8	0.6	0.3	1.2	1.7	2.5	5.6	5.0	5.5	8.9	8.2	8.9	8.4	7.6
JAPAN	0.0	0.0	1.2	0.9	2.1	1.3	0.5	1.3	2.2	1.0	0.8	2.0	3.5	6.5	7.1	1.1	4.9	2.6	1.4	1.0	0.5	1.7	1.2	1.0	0.1	0.0	0.0	0.0	0.0	0.0
KOREA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	1.7	2.7	1.0	1.2	1.4	3.9	1.4	1.0	0.4	0.1	0.2	0.1	0.0	0.0	0.0	0.0
PANAMA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.1	1.1	0.8	1.0	0.9	0.4	0.2	++	0.1	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0
S.AFR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	++	0.0	0.0	0.0	3.8	0.3	0.1	++	0.3	0.7	0.3	++	++	0.1	0.6
ESPANA	0.0	0.0	1.5	2.5	2.3	2.6	0.2	0.2	0.2	0.3	0.7	0.4	0.7	0.8	2.0	1.0	0.2	0.3	0.2	0.1	0.1	0.1	0.4	0.7	2.5	2.9	1.7	2.7	2.3	1.2
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	0.0	0.0	++	++	0.0	0.0	++	0.0	0.0	++	++	0.2	++	++	++	0.1	++
PS	0.0	0.0	0.0	1.3	7.2	8.3	15.7	18.7	29.7	44.3	33.4	32.2	46.9	44.5	53.1	83.0	83.6	88.3	94.6	89.9	91.8	111.7	107.9	101.9	50.5	87.4	86.0	89.3	75.6	100.9
CAYMAN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	1.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FIS	0.0	0.0	0.0	0.8	5.8	6.5	8.9	9.0	12.7	14.4	16.6	18.6	23.8	26.2	31.9	43.8	46.3	44.3	48.9	43.2	47.0	48.9	39.5	36.1	4.4	9.5	13.1	13.5	17.4	28.4
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	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.2	3.0	4.2	2.7	3.5	3.7	3.6	1.0	0.0	0.0
JAPAN	0.0	0.0	0.0	0.0	0.5	1.1	4.8	5.2	7.5	4.7	1.1	2.0	2.5	1.2	0.8	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.2	1.3	2.6	2.3	2.8	2.2	2.1
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	0.0	0.0	0.3	1.0	1.6	2.2	3.4	3.0	3.2	4.8	4.5	2.3	0.6	2.3	2.3	1.5	0.0	0.0
PORTUG	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.2	0.9	1.3	0.3	0.0	++	0.0	0.0	0.0
ESPANA	0.0	0.0	0.0	0.5	1.0	0.6	1.3	2.9	3.1	5.4	6.4	7.4	8.6	13.3	14.0	23.7	33.2	35.3	33.4	39.9	38.7	51.3	53.8	51.1	37.5	64.0	61.8	66.7	49.9	60.5
USA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	5.8	18.8	9.0	3.8	12.0	3.0	5.6	14.0	1.7	6.4	8.1	2.9	1.6	1.5	0.6	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	++	0.1	0.9	1.2	1.8	3.4	1.4	0.7	2.2	3.7
NEI*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	5.4	0.8	0.0	0.0	2.1	3.0	5.4
OTHERS	0.0	0.0	0.0	0.0	0.0	++	0.6	0.7	0.7	0.9	0.2	0.4	0.1	0.8	0.4	0.3	0.6	0.2	0.5	0.6	0.3	0.5	0.1	0.3	0.3	1.8	1.5	1.0	0.9	0.9
SURFACE	0.1	0.2	0.3	0.1	++	++	++	++	0.0	++	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.4	0.9	1.4	0.6	5.3	3.2	3.9	2.4	1.5	2.3	2.9	2.3	2.4
CAP VER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.6	2.7	3.4	2.0	1.2	2.0	1.8	1.8	1.9
OTHERS	0.1	0.2	0.3	0.1	++	++	++	++	0.0	++	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.4	0.9	1.4	0.6	0.7	0.5	0.5	0.4	0.4	0.3	1.1	0.5	0.5
-LL	40.6	40.9	17.4	23.2	18.9	27.6	12.5	17.1	21.9	20.4	16.1	14.7	18.1	20.4	19.4	15.4	12.8	15.6	11.3	6.8	12.5	7.9	9.9	6.1	8.7	7.6	4.0	4.6	7.5	6.2
CHI.TAI	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.9	6.6	7.0	3.9	3.4	3.5	1.5	1.0	1.3	0.6	0.2	0.2	0.2	0.1	0.4	0.2	0.4	0.1	0.1	0.2	0.2	0.2	0.1
CUBA	0.0	0.0	0.0	0.0	0.0	0.5	0.4	2.4	1.2	0.9	1.1	1.4	3.2	4.5	3.0	1.7	1.8	2.9	1.9	2.6	4.9	2.5	2.1	1.6	1.2	1.1	0.7	0.8	1.4	0.4
JAPAN	40.6	40.9	17.4	23.1	18.5	26.5	10.6	10.1	9.8	6.4	2.5	1.6	2.3	1.3	0.7	1.7	0.3	0.1	0.3	0.3	1.7	1.2	2.8	0.9	2.9	3.1	1.3	1.7	3.6	3.6
KOREA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	4.2	8.0	6.9	7.8	8.3	10.1	7.6	6.6	9.8	7.3	2.6	3.9	3.3	3.6	1.5	1.7	1.6	1.0	1.2	1.2	1.5
PANAMA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	3.6	2.1	1.2	1.9	0.9	1.1	0.5	1.6	0.3	1.1	1.6	2.2	1.3	0.3	0.2	0.0	0.0
USSR	0.0	0.0	0.0	0.0	0.1	0.5	0.8	2.7	2.7	1.9	0.5	1.4	1.1	1.2	2.5	1.9	1.6	1.8	0.5	0.5	0.1	0.2	0.1	++	0.3	0.3	0.4	0.6	1.0	0.6
OTHERS	0.0	0.0	0.0	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	0.0	0.0	0.0	0.0	0.0	0.1	0.1	++	++	0.1	0.2	++	++	0.0	0.0	++
-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	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++

Table 1. Continued.

	1960	1961	1962	1963	1964	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
TOTAL	68.9	59.1	58.1	64.9	69.3	68.1	58.8	60.2	83.0	92.7	73.4	73.2	93.5	94.7	106.8	124.6	123.1	128.7	130.5	124.8	125.5	151.2	159.8	160.4	111.7	149.9	135.5	137.8	127.5	154.9
W. ATL.	16.9	8.1	29.6	22.2	21.6	13.6	15.5	7.6	9.3	12.3	14.2	15.7	15.3	14.9	14.5	16.5	13.8	13.4	14.8	13.1	13.0	16.4	25.5	37.0	36.4	37.3	28.1	24.5	26.2	32.5
-SURF	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.0	3.4	2.3	1.6	2.0	0.7	1.4	4.7	3.6	5.7	4.8	15.1	29.4	27.1	25.8	14.5	14.4	11.5	19.6
BB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	1.3	0.4	0.0	0.0	1.0	0.6	0.4	1.9	3.0	3.6	3.7	4.3	2.3	3.6	3.6	5.3
BRASIL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.9	1.0	1.8	1.3	2.2	0.7	1.3	1.6	1.5
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	++	1.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VENEZUE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	1.0	1.9	1.8	2.4	2.1	1.7	2.3	2.0	3.8
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	0.0	0.0	0.0	0.0	++	0.2	0.0	0.0	++	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PS	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.0	3.4	2.3	0.3	1.6	0.6	1.1	3.7	1.0	5.1	2.8	12.1	25.7	23.2	21.0	10.7	8.4	6.9	13.2
FIS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	1.7	0.3	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.5	0.0	0.0	0.8	0.0	0.3	1.0	0.8	0.0	0.0	0.0	2.0	4.0	1.0	0.0	0.0	0.0	0.0
USA	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.3	0.6	0.0	0.4	0.5	0.8	1.6	0.3	0.5	0.3	0.1	0.1	1.1	4.4	0.6	0.1	0.0	++
VENEZUE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4	2.5	12.0	23.5	17.8	15.6	10.1	8.3	6.9	13.2
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	0.0	0.0	0.0	0.2	0.0	1.0	0.0	0.3	0.0	0.0	0.2	0.3	0.0	0.0	0.0	0.0	0.0
SURF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	0.4	++	2.0	0.1	0.1	++	0.1	0.1	0.6	1.5	2.4	1.1	1.0
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	0.0	0.0	0.0	0.0	0.0	0.0	++	++	0.0	++	0.1	0.2	1.3	2.2	0.9	0.9
VENEZUE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	0.4	++	0.2	0.1	++	++	++	0.1	0.3	0.2	0.1	0.1	0.1
-LL	14.9	6.1	26.0	18.8	19.2	11.4	13.0	4.9	7.7	10.4	13.9	15.4	11.6	12.4	12.6	14.2	12.6	11.4	9.5	9.0	6.6	11.4	9.9	6.6	7.9	10.5	12.2	9.6	13.9	12.0
BRASIL	4.7	4.4	1.4	2.4	1.6	0.7	0.5	0.8	0.8	0.5	0.8	0.3	0.3	0.1	0.2	0.5	0.7	0.9	0.8	0.9	0.5	1.3	1.0	0.8	0.5	0.5	0.8	0.4	0.7	1.0
CHI.TAI	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.8	1.3	3.8	3.2	1.0	1.2	1.2	1.3	1.1	1.1	0.1	0.2	0.8	0.5	0.4	0.4	0.1	0.5	0.6	1.0	0.6	1.2	0.5
CUBA	0.0	0.0	0.0	1.7	0.9	0.2	0.4	0.6	0.7	0.6	0.5	0.3	0.4	0.0	0.4	0.6	1.2	0.9	0.7	0.2	0.7	2.0	1.5	0.8	2.5	1.9	2.1	1.1	0.1	0.1
JAPAN	10.2	1.7	24.5	14.6	16.6	10.4	11.8	2.7	4.2	3.6	4.3	9.1	4.2	2.5	2.8	2.4	3.1	1.4	1.6	1.7	1.1	3.0	3.3	1.2	1.0	2.2	2.1	1.6	2.4	2.4
KOREA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	1.8	3.5	3.0	3.3	4.5	5.4	7.7	4.6	6.5	4.3	4.4	1.9	3.3	2.2	1.9	1.0	1.7	0.9	0.2	0.1	1.1
PANAMA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	2.0	1.1	1.2	1.3	0.6	0.7	0.0	0.8	0.3	0.7	0.1	0.2	0.0	0.3	0.1	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	0.0	0.0	0.0	0.0	++	++	0.0	0.1	0.1	1.7	3.8	4.7	8.4	6.4
VENEZUE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	1.5	1.9	1.9	1.2	0.6	0.6	0.8	1.3	1.0	1.0	1.0	0.5	1.2	1.7	1.6	0.9	0.6	0.7	0.5
OTHERS	++	++	++	0.1	0.1	0.1	0.0	++	0.1	0.1	0.0	0.2	0.4	0.1	0.1	0.1	0.1	++	++	0.0	0.0	0.1	0.3	0.4	0.4	0.4	0.3	0.1	0.2	0.1
-UNCL.	2.0	2.0	3.6	3.2	2.3	2.2	2.5	2.5	1.5	2.0	0.3	0.3	0.3	0.3	0.4	0.4	0.5	0.6	0.5	0.4	0.7	0.3	0.4	1.0	1.5	1.0	1.4	0.5	0.8	0.9
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	0.0	0.0	0.0	0.0	0.0	++	0.0	0.0	0.6	1.1	0.6	0.7	++	0.3	0.3
VENEZUE	2.0	2.0	3.6	3.1	2.2	2.1	2.4	2.4	1.4	1.9	0.0	0.0	0.0	0.0	0.0	++	0.0	0.0	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	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.3	0.3	0.3	0.3	0.4	0.4	0.5	0.6	0.5	0.4	0.7	0.3	0.4	0.4	0.4	0.5	0.8	0.5	0.5	0.5
ATL. UNK	0.0	0.0	0.2	0.4	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.2	0.4	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.2	0.4	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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 < 50 MT

* 1982 - 4 BOATS = 2 ECUADOR + 1 VENEZUELA + 1 MEXICO
1983 - 5 BOATS = 2 ECUADOR + 1 CAYMAN ISLNDS + 2 MEXICO
1984 - 3 BOATS = 1 CAYMAN + 2 MEXICO
1987 - 1 BOAT
1988 - 2 BOATS = 1 MAROC + 1 VENEZUELA

Table 2. Carrying capacity (10^3 MT), by gear, of east Atlantic surface fleets.

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
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
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
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
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
SPAIN(CAN.)	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
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
CAPE VERDE									0.2	0.2	1.0	1.0	1.0	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
SPAIN TROP																		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
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
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
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			
JAPAN	1.9	1.9	0.6	0.2							0.4	0.4	0.4	0.8	0.8	0.8	0.8	0.4
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
OTHERS**	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

* Provisional

** Ghana (1982-87), Mexico (1983), Congo (1980-81), Gran Cayman (1982-83), Portugal (1979-81), Venezuela (1983)

Table 3. Results of the generalized production model applied to the east Atlantic yellowfin stock as a function of M.

a) Effort in searching time standardized in units of large FIS purse seiners. Average CPUE of the CPUEs of 1°x1° squares and 15-day periods.

b) Effort in total days fishing standardized to large FIS purse seiners and CPUE equal to the total catches divided by the total effort.

		M	MSY (1,000 MT)	F-opt (1,000 H)	Terminal F index
a)	K = 4	0	144.1	0.0	0.70
		1	123.6	51.4	0.75
		2	131.0	50.7	0.76
		1.7	128.0	50.0	0.76
b)	K = 4	1	117.2	26.6	

Table 4. Annual relative abundance indices, by age of east Atlantic yellowfin (Laurec/Fonteneau 1979 method for two fleets, FIS and Spanish purse seine, five coastal areas for ages 1-2 and six offshore areas for ages 3 and 4, on a quarterly basis).

Year	AGE 1	2	3	4+
1980	27.97	9.46	3.98	2.89
1981	39.68	5.93	3.24	2.68
1982	22.58	7.59	5.67	4.55
1983	73.83	11.05	2.86	1.64
1984	48.48	12.67	4.91	2.63
1985	20.14	8.20	5.95	3.16
1986	40.13	4.80	1.32	0.60
1987	53.86	13.97	5.29	1.77
1988	6.94	7.26	3.53	2.32
1989	14.21	6.70	5.93	2.64

Table 5. Mean weights of the east Atlantic yellowfin catch.

Year	Mean weight (kg)
1975	18.6
1976	17.9
1977	17.9
1978	18.7
1979	23.6
1980	16.7
1981	13.0
1982	15.3
1983	15.3
1984	9.2
1985	21.5
1986	21.3
1987	17.3
1988	15.8
1989	22.2

Table 6. Atlantic bigeye tuna catch (1,000 MT), by gear - as of November 2, 1990

	1960	1961	1962	1963	1964	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
TOTAL	9.1	17.0	23.1	26.0	23.5	39.2	25.0	24.7	23.0	35.7	41.3	55.0	46.4	56.4	63.6	60.7	44.6	54.1	51.7	45.1	62.7	67.1	72.9	58.4	68.8	74.3	59.1	48.9	58.0	59.9
-SURF	6.1	5.8	7.1	10.9	5.7	9.8	5.3	11.5	4.2	12.7	13.9	15.9	13.9	18.5	24.5	19.9	17.2	25.0	23.4	17.9	21.4	25.7	21.2	25.1	27.3	25.6	24.8	20.1	17.0	17.9
BB	6.1	5.8	7.1	10.9	5.7	9.8	5.3	11.4	3.8	9.7	10.5	11.8	9.3	13.6	17.9	14.6	9.9	12.8	14.6	9.5	12.1	9.7	6.9	9.8	11.1	17.6	15.0	12.3	8.9	11.2
FIS	0.0	0.0	0.4	2.4	0.8	++	++	1.7	0.2	2.3	1.4	1.3	1.1	1.2	1.0	1.3	1.4	2.6	3.6	2.0	2.4	2.2	1.8	2.1	2.1	4.0	3.2	2.7	2.5	2.1
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	0.0	++	0.1	0.1	0.1	0.2	0.1	0.2	0.3	0.5	0.4	0.3	1.1	1.4	1.2	1.3	1.1	1.0
JAPAN	0.0	0.0	++	++	++	0.1	++	0.4	0.6	0.3	0.2	0.5	0.9	1.7	1.9	0.1	0.9	1.0	0.6	0.2	0.4	1.0	0.6	++	++	0.0	0.0	0.0	0.0	0.0
KOREA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	0.3	0.2	0.5	0.5	0.7	1.3	0.6	0.2	0.0	++	++	0.0	0.0	0.0	0.0
PORTUGAL	6.1	5.8	6.6	8.0	4.7	8.7	4.1	8.1	1.6	5.6	5.1	2.9	4.0	5.9	10.9	6.8	2.9	4.5	5.3	3.3	3.5	2.6	1.8	3.8	3.9	6.4	7.0	4.5	2.2	4.9
ESPANA	0.0	0.0	0.1	0.5	0.1	1.0	1.1	1.3	1.4	1.5	3.6	7.0	3.1	4.4	3.2	5.7	4.2	3.6	3.8	3.0	4.0	2.4	1.5	2.5	2.8	5.0	3.5	3.6	2.6	2.8
OTHERS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.3	0.2	0.4	0.2	0.2	0.4	0.6	0.1	0.2	0.3	0.5	1.2	1.1	0.9	0.1	0.2	0.6	0.4
PS	0.0	0.0	0.0	0.0	0.0	0.0	++	0.1	0.4	2.9	3.4	4.1	4.7	4.9	6.6	5.3	6.9	11.5	8.6	8.0	8.7	15.2	14.0	15.2	16.0	7.9	9.4	7.3	7.8	6.3
FIS	0.0	0.0	0.0	0.0	0.0	0.0	++	++	++	1.3	2.4	2.6	2.8	3.2	4.2	3.5	4.9	6.0	4.9	4.9	3.3	5.4	4.8	5.6	2.0	1.0	1.1	1.3	1.7	1.1
JAPAN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	1.3	0.3	0.5	0.7	0.3	0.2	++	0.0	0.0	0.0	0.0	0.0	0.0	++	++	0.5	0.5	0.3	0.4	0.4	0.1
ESPANA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.5	0.4	0.9	1.3	1.3	1.6	1.7	4.8	3.0	2.4	4.4	7.6	7.5	6.2	10.8	5.4	7.6	5.5	5.6	4.9
USSR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	1.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.2	++	1.2	1.1	0.5	0.0	0.0	++	++
NEI*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	1.1	0.2	0.0	0.0	0.1	++	0.1
OTHERS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	0.1	0.2	0.5	0.2	0.1	0.9	0.1	0.3	0.7	0.6	0.6	0.6	1.1	1.3	1.1	1.4	0.6	0.4	++	0.1	0.1
SURF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.7	0.2	0.5	0.6	0.8	0.3	0.1	0.2	0.1	0.3	0.5	0.3	0.4
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	0.0	0.0	0.4	0.7	0.2	0.5	0.6	0.8	0.3	0.1	0.2	0.1	0.3	0.5	0.3	0.4
-LL	3.0	11.2	16.0	15.1	17.8	29.4	19.6	13.2	18.8	23.0	27.4	39.1	32.5	37.9	39.1	40.8	27.4	29.1	28.3	27.2	41.4	41.4	51.7	33.3	41.5	48.5	34.3	28.7	40.9	41.9
CHI.TAIW	0.0	0.0	++	++	++	0.0	0.6	2.2	5.3	7.5	7.6	5.5	5.0	3.8	3.1	4.0	3.3	3.0	2.6	2.2	2.3	1.7	1.9	1.4	0.8	1.1	1.0	1.3	1.3	0.7
CUBA	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.2	0.9	1.0	4.1	3.2	2.0	2.6	2.4	1.9	1.3	1.8	2.3	2.3	1.4	0.7	0.5	0.4	0.4	0.2	0.2	0.2	0.2	0.1
JAPAN	2.9	11.0	15.7	14.5	17.3	28.5	17.6	8.5	10.3	10.3	9.0	20.3	18.1	20.0	20.9	17.4	7.3	9.1	9.3	12.0	20.5	21.0	32.9	15.1	24.3	31.6	22.8	18.6	31.7	31.7
KOREA	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	1.9	4.1	7.4	5.7	5.8	7.4	10.2	6.7	7.6	9.2	7.3	9.0	11.7	10.6	9.4	8.9	10.7	6.1	4.4	4.9	7.9
PANAMA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	2.7	1.8	2.0	2.0	1.2	2.0	0.5	4.5	2.5	2.9	2.7	2.0	1.1	0.6	0.4	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	0.0	0.0	0.0	0.0	1.5	1.5	1.4	0.0	0.0	0.0	++	0.3	0.1	++	++	++	0.0	0.0	0.0
USSR	0.0	0.0	0.0	0.0	0.0	0.4	0.7	1.8	1.7	2.2	2.6	2.7	1.6	3.0	3.4	3.7	4.9	4.1	2.1	2.0	2.6	1.7	0.6	0.4	1.2	0.9	1.1	1.9	1.1	0.4
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	0.0	0.0	++	0.5	0.2	0.3	0.3	1.5	1.0	2.4	2.0	1.7	0.9	0.1	0.1	++
OTHERS	0.1	0.2	0.2	0.5	0.4	0.4	0.2	0.1	0.3	0.2	0.1	++	0.0	0.1	0.2	0.2	0.4	0.5	0.6	0.6	0.8	0.7	1.1	1.4	1.7	1.2	1.6	1.8	1.7	1.1
-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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	++	0.1	0.1	0.1	0.1	0.1	0.1
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	++	0.1	0.1	0.1	0.1	0.1	0.1

++ CATCH < 50 MT

* 1982 - 4 BOATS = 2 ECUADOR + 1 VENEZUELA + 1 MEXICO
1983 - 5 BOATS = 2 ECUADOR + 1 CAYMAN ISLNDS + 2 MEXICO
1984 - 3 BOATS = 1 CAYMAN + 2 MEXICO
1987 - 1 BOAT
1988 - 2 BOATS = 1 MAROC + 1 VENEZUELA
1989 - 2 BOATS = 1 MAROC + 1 VENEZUELA

Table 7. Skipjack catch (1,000 MT), by gear and for east and west Atlantic - as of November 2, 1990

	1960	1961	1962	1963	1964	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
TOTAL	4.4	5.9	11.3	20.0	18.8	24.1	22.8	24.4	48.4	29.3	50.2	78.7	78.2	78.9	117.8	57.1	68.8	108.9	106.2	88.3	108.8	129.0	153.0	133.0	126.6	118.0	117.3	111.9	144.0	118.9
E. Atl.																														
SURFACE	1.1	2.6	9.3	16.0	13.3	22.6	21.0	21.6	45.7	27.4	47.6	76.2	74.3	75.1	113.2	51.9	64.9	105.5	98.9	81.7	96.0	106.0	119.9	100.7	91.0	77.7	90.7	91.7	118.5	91.7
-PS	0.0	0.0	0.0	0.4	0.9	3.3	6.1	7.9	24.2	14.3	29.8	48.8	48.7	49.8	74.2	35.4	32.5	55.9	56.7	35.6	54.0	64.6	72.3	63.6	61.7	47.7	59.1	52.2	69.1	47.4
CANADA	0.0	0.0	0.0	0.0	0.0	++	0.0	0.6	0.9	0.1	0.6	1.2	++	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CAYMAN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	1.8	++	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.2	0.0	0.0	0.0	++	++	++	++	++
FIS	0.0	0.0	0.0	0.2	0.5	0.9	2.2	1.5	5.1	2.6	7.8	13.1	13.6	7.9	22.6	10.5	14.3	26.7	20.7	13.9	19.9	22.4	24.3	25.2	9.1	9.7	10.9	15.2	14.2	11.0
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	0.0	0.2	0.0	0.2	0.1	0.0	0.0	0.0	0.3	2.7	3.9	2.8	3.7	2.9	1.7	0.8	0.0	0.0
JAPAN	0.0	0.0	0.0	0.0	++	1.8	1.4	2.2	6.3	0.7	3.5	6.2	3.4	1.5	0.9	0.1	0.0	0.0	0.0	0.0	0.0	0.0	1.4	1.4	1.1	2.1	2.0	2.0	3.2	2.2
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	0.0	0.0	0.0	0.0	0.5	1.7	1.9	1.9	5.0	3.0	4.0	2.3	0.9	1.0	1.2	0.9	0.0	0.0
ESPANA	0.0	0.0	0.0	0.2	0.4	0.6	2.5	3.1	8.7	6.2	6.1	11.9	19.5	17.8	30.6	16.9	15.6	21.5	24.5	17.4	24.2	31.3	34.7	27.6	44.6	29.4	40.5	31.3	46.0	29.5
USA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	3.2	4.7	11.8	16.2	12.2	21.2	20.0	7.4	1.8	5.9	6.8	2.1	2.6	2.8	0.1	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	0.1	++	0.0	1.5	0.6	1.0	1.4	1.7	0.5	1.8	1.9
NEI*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	3.4	0.9	0.0	0.0	0.8	3.0	1.7
OTHERS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.1	0.3	0.2	0.1	0.5	0.2	0.4	0.3	1.0	0.3	0.4	1.2	1.1	0.7	0.9	1.1
-BB	1.1	2.6	9.3	15.7	11.9	19.2	14.9	13.6	21.5	13.0	17.7	27.2	25.3	25.1	38.9	16.4	28.7	42.5	41.4	44.6	38.1	38.9	44.5	34.9	28.0	29.8	30.0	38.4	48.1	43.0
ANGOLA	0.5	1.4	2.0	2.3	1.0	1.3	2.8	2.0	4.2	1.8	0.9	1.9	1.5	1.3	3.4	0.6	1.5	3.8	3.2	3.6	3.5	2.3	2.2	0.3	++	0.1	0.1	0.1	++	0.1
CAP VER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	1.0	1.5	1.4	1.3	1.2	0.8	0.7	1.3	1.0	2.1	1.6	1.6	1.3	1.0	2.0	0.9	2.1	1.4	0.9
FIS	0.0	0.4	1.7	2.1	1.4	2.7	3.3	3.7	7.3	3.6	4.2	5.6	3.7	3.2	4.4	1.8	2.1	2.7	3.3	3.3	3.1	2.6	4.4	2.6	3.8	3.3	1.9	2.0	3.0	4.8
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	0.0	0.1	0.7	1.3	2.1	3.5	2.9	4.0	4.7	4.9	14.3	20.5	16.2	16.2	19.2	22.8	26.0	23.5
JAPAN	0.0	0.0	1.5	4.6	3.1	6.3	4.4	3.7	7.3	4.9	7.5	11.7	10.1	13.0	18.7	3.7	15.0	16.8	14.6	14.7	12.3	12.9	8.5	4.6	0.4	0.0	0.0	0.0	0.0	0.0
KOREA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	2.1	4.5	1.9	3.6	8.1	12.0	6.7	7.5	2.8	1.6	0.7	0.2	0.0	0.0	0.0	0.0
MAROC	0.0	0.0	0.0	0.0	0.0	3.2	1.5	0.9	0.9	0.1	1.1	0.1	++	0.1	++	0.3	++	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PANAMA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.2	1.0	1.9	2.5	4.0	3.0	1.8	1.7	0.1	2.5	1.6	0.0	0.0	0.0	0.0	0.0	0.0
PORTUGA	0.6	0.8	2.3	3.4	3.1	2.2	2.3	2.5	1.1	1.7	1.0	4.2	3.7	2.2	1.9	0.6	2.1	4.4	4.4	3.0	1.7	2.7	4.8	1.0	3.8	2.4	5.4	8.0	14.1	7.7
ESPANA	0.0	0.0	1.7	3.3	3.2	3.5	0.6	0.7	0.8	0.8	1.8	2.7	4.1	2.6	5.4	0.8	0.6	0.7	0.6	1.3	2.2	4.2	3.4	1.3	2.0	5.7	2.5	3.4	3.4	5.8
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	0.1	++	0.0	0.0	0.0	0.0	++	0.1	++	++	++	++	0.1	0.1	0.2	0.1
-OTH	0.0	++	++	++	0.5	0.1	0.0	++	++	0.1	0.1	0.2	0.3	0.2	0.1	0.1	3.7	7.1	0.8	1.5	3.9	2.5	3.1	2.2	1.3	0.2	1.6	1.0	1.3	1.4
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.8	0.2	0.1	1.0	0.8	0.0	1.4	0.7	0.6	0.6
USSR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6	6.7	0.5	1.1	3.0	1.8	2.5	0.7	0.0	0.0	++	0.0	0.0	0.0
OTHERS	0.0	++	++	++	0.5	0.1	0.0	++	++	0.1	0.1	0.2	0.3	0.2	0.1	0.1	0.1	0.4	0.4	0.1	0.2	0.5	0.5	0.5	0.5	0.2	0.2	0.3	0.7	0.8
W. ATL.																														
SURFACE	3.3	3.3	2.0	4.0	5.5	1.5	1.8	2.8	2.6	1.9	2.4	2.2	3.8	3.4	3.9	4.5	3.7	3.2	6.6	6.2	12.8	22.8	32.2	31.4	34.9	40.0	26.3	20.1	25.2	27.0
-PS	0.0	0.0	0.5	3.0	4.4	0.1	++	++	0.1	0.1	0.0	0.0	1.3	0.4	0.1	0.4	0.7	0.6	3.5	1.5	3.1	4.7	9.7	11.1	18.0	11.2	6.8	6.1	2.1	1.8
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	0.1	0.0	0.0	0.1	0.0	0.3	1.0	0.8	0.0	0.0	0.0	0.2	2.6	0.5	0.0	0.0	0.0	0.0
USA	0.0	0.0	0.5	3.0	4.0	0.1	++	++	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.2	0.5	0.3	1.6	0.7	1.0	2.6	++	0.6	0.8	1.8	1.0	0.6	0.0	++
VENEZUE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	1.9	9.5	10.0	14.1	8.9	5.8	5.5	2.1	1.7
OTHERS	0.0	0.0	0.0	++	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.4	0.1	0.1	0.2	++	0.8	0.0	0.2	0.2	0.2	0.3	0.4	0.0	0.0	0.0	0.0	0.0
-BB	3.3	3.0	1.2	0.7	0.7	1.0	1.0	1.2	1.6	1.3	1.8	1.6	1.4	1.9	3.0	2.8	2.8	2.4	2.8	4.4	9.4	18.0	22.4	20.1	16.8	28.5	18.8	13.7	22.9	25.0
BRASIL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	6.1	13.9	18.2	15.6	13.1	25.1	15.2	10.5	17.2	22.8
CUBA	3.3	3.0	1.2	0.7	0.7	1.0	1.0	1.2	1.6	1.3	1.8	1.6	1.4	1.5	1.8	2.3	2.8	2.4	1.8	2.0	2.3	1.1	1.1	1.7	1.2	1.6	1.3	1.1	1.6	1.4
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	0.4	1.1	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PANAMA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	0.2	1.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VENEZUE	0.0	0.0	0.0	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	0.0	0.0	0.0	3.0	3.1	2.7	2.4	1.8	2.3	2.1	4.0	0.7
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	0.0	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	0.0	0.0

Table 7. Continued.

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
TOTAL	4.4	5.9	11.3	20.0	18.8	24.1	22.8	24.4	48.4	29.3	50.2	78.7	78.2	78.9	117.8
-OTH	0.0	0.3	0.3	0.3	0.4	0.5	0.8	1.6	0.9	0.5	0.6	0.6	1.1	1.1	0.8
BRASIL	0.0	0.3	0.3	0.3	0.4	0.5	0.7	1.5	0.8	0.4	0.4	0.4	0.9	0.6	0.5
OTHERS	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.5	0.3
ALL ATL.															
-SURF	0.0	0.0	0.0	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+TRAW	++	++	0.0	0.0	++	++	++	++	++	++	++	0.1	0.1	0.1	0.2
OTHERS	++	++	0.0	0.0	++	++	++	++	++	++	++	0.1	0.1	0.1	0.2
-UNCL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.1	0.4	0.5
OTHERS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.1	0.4	0.5

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
TOTAL	57.1	68.8	108.9	106.2	88.3	108.8	129.0	153.0	133.0	126.6	118.0	117.3	111.9	144.0	118.9
-OTH	1.3	0.2	0.2	0.3	0.3	0.4	0.1	0.1	0.2	0.2	0.3	0.7	0.3	0.2	0.3
BRASIL	1.1	0.1	0.2	0.3	0.2	0.3	0.0	0.0	0.0	++	++	++	0.1	0.1	0.1
OTHERS	0.2	0.1	++	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.3	0.7	0.1	0.2	0.2
ALL ATL.															
-SURF	0.0	0.0	0.0	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+TRAW	0.2	++	0.1	0.1	++	++	0.1	++	0.6	++	++	++	++	++	++
OTHERS	0.2	++	0.1	0.1	++	++	0.1	++	0.6	++	++	++	++	++	++
-UNCL	0.5	0.2	0.1	0.6	0.4	0.1	0.1	0.9	0.4	0.6	0.2	0.2	0.1	0.3	0.2
OTHERS	0.5	0.2	0.1	0.6	0.4	0.1	0.1	0.9	0.4	0.6	0.2	0.2	0.1	0.3	0.2

++ CATCH < 50 MT

* 1982 - 4 BOATS = 2 ECUADOR + 1 VENEZUELA + 1 MEXICO
1983 - 5 BOATS = 2 ECUADOR + 1 CAYMAN ISLNDS + 2 MEXICO
1984 - 3 BOATS = 1 CAYMAN + 2 MEXICO
1987 - 1 BOAT
1988 - 2 BOATS = 1 MAROC + 1 VENEZUELA
1989 - 2 BOATS = 1 MAROC + 1 VENEZUELA

Table 8. Albacore catch (1,000 MT), by gear and for North and South Atlantic - as of November 2, 1990

	1960	1961	1962	1963	1964	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
TOTAL	63.0	53.3	77.2	77.5	90.4	90.7	75.0	75.0	71.9	76.5	70.3	83.1	83.4	75.7	72.5	59.5	77.2	75.1	72.2	73.4	61.3	59.2	72.3	66.5	56.0	73.0	85.8	79.6	63.6	61.3
NORTH ATLANTIC	52.5	42.5	58.3	60.1	64.4	60.4	47.2	58.6	45.7	47.3	46.2	57.6	49.5	47.0	52.3	41.4	57.3	52.9	48.5	50.1	38.2	34.1	42.0	50.9	39.5	40.4	47.5	38.1	33.6	32.0
-SURFACE . . .	51.2	42.0	52.4	45.4	48.5	45.7	39.5	49.0	37.9	32.5	30.1	39.7	34.7	28.8	37.6	28.7	34.3	32.0	34.3	37.9	28.8	24.3	28.8	34.3	19.9	23.3	26.2	30.8	30.6	29.8
BAITBOAT . . .	18.1	21.1	21.5	20.7	20.4	20.1	16.8	18.3	13.9	14.6	14.4	15.7	8.2	10.1	16.7	19.2	20.4	15.6	11.7	15.8	16.2	13.4	15.9	21.1	8.3	12.6	15.2	18.8	16.8	15.4
FRANCE . . .	9.4	7.9	7.7	6.4	6.8	4.2	3.5	3.9	2.2	1.7	1.7	1.5	0.5	1.1	0.6	0.7	1.1	0.6	0.4	0.2	0.4	0.4	0.2	0.2	++	0.1	0.1	0.1	0.0	0.3
PORTUGAL . . .	0.6	0.6	0.6	1.0	0.5	0.8	0.3	0.7	0.1	0.5	0.2	0.3	0.4	0.9	1.2	0.9	0.6	0.1	0.1	0.1	0.1	0.4	0.3	1.8	0.8	0.6	0.4	0.4	0.2	0.2
ESPANA . . .	8.1	12.6	13.1	13.3	13.2	15.1	13.0	13.7	11.6	12.4	12.5	13.9	7.3	8.2	14.9	17.6	18.7	14.9	11.3	15.4	15.7	12.6	15.3	19.0	7.4	11.8	14.6	18.2	16.6	14.9
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.1	++	0.0	0.0	0.0
TROLLING . . .	33.1	20.9	30.9	24.6	28.1	25.5	22.8	30.7	24.0	17.9	15.7	24.0	26.5	18.7	21.0	9.5	13.9	16.5	22.6	22.1	12.6	10.8	12.8	12.8	11.0	10.7	10.8	11.5	11.3	10.5
FRANCE . . .	10.2	9.2	12.6	9.8	12.7	11.4	10.0	11.6	11.0	7.7	4.5	7.7	8.7	5.8	7.9	5.0	5.7	6.2	8.4	7.8	3.1	2.5	2.7	2.2	2.8	1.8	1.1	1.4	0.4	0.1
ESPANA . . .	22.9	11.7	18.4	14.8	15.3	14.2	12.8	19.0	13.0	10.2	11.3	16.3	17.8	12.9	13.1	4.5	8.2	10.3	14.1	14.2	9.5	8.2	10.1	10.6	8.2	8.9	9.8	10.0	11.0	10.5
OTHER 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	0.0	0.0	0.0	++	0.0	0.1	++	0.1	0.1	0.4	0.6	0.1	0.2	0.6	2.5	3.9
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	2.4	3.7
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.6	0.1	++	0.0	0.0	++
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	0.0	0.0	0.0	++	0.0	0.1	++	0.1	++	++	0.1	++	0.2	0.2	0.1	0.2
-LONGLINE . . .	1.3	0.5	5.8	14.7	15.9	14.7	7.7	9.5	7.7	14.8	16.1	17.9	14.7	18.1	14.6	12.7	23.0	20.9	14.2	12.2	9.4	9.8	13.2	16.6	19.5	17.1	21.2	7.3	3.0	2.2
CHI.TAIW . . .	0.0	0.0	++	++	0.1	0.1	0.2	0.8	1.9	2.4	4.7	2.9	4.4	9.5	9.5	8.1	14.8	13.7	9.3	7.0	7.1	6.6	10.5	14.3	14.9	14.9	19.6	6.6	2.1	1.3
CUBA . . .	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.3	0.1	0.0	0.0	++	0.0	0.0	0.1	0.1	0.1	0.1	0.0	++	++	0.1	++	0.1	++	++	++	++	++
JAPAN . . .	1.1	0.4	5.7	14.6	15.7	14.3	5.9	4.8	3.3	4.7	5.9	6.5	1.3	1.5	2.1	1.3	1.3	0.8	0.5	1.2	1.0	1.7	0.8	1.2	0.6	0.8	0.5	0.5	0.7	0.7
KOREA . . .	0.0	0.0	0.0	0.0	0.1	0.2	1.5	3.9	1.6	6.8	5.0	7.7	7.9	4.8	2.8	2.8	5.4	5.6	3.0	3.0	0.8	0.9	1.3	0.5	1.0	0.4	0.4	++	++	0.1
PANAMA . . .	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	2.4	0.2	0.2	1.2	0.6	0.8	0.4	0.2	0.2	0.5	0.4	2.6	0.6	0.5	++	0.0	0.0
VENEZUEL . . .	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.6	0.8	0.5	0.8	0.8	0.0	0.0	0.1	0.1	0.1	0.4	0.6	0.3	0.3	++	0.3	0.4	0.3	0.1	++	++	++
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	0.0	++	++	++	++	0.1	0.1	0.1
-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	++	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	0.0	0.0	0.0	0.0	++	0.0	++	0.0	0.0	0.0	++	0.0	++	0.0	++	++	0.0	0.0	0.0	0.0	0.0	0.0
SOUTH ATLANTIC	10.5	10.8	19.0	17.4	26.0	29.8	27.3	15.9	25.7	28.5	23.7	25.0	33.3	28.2	19.7	17.5	19.3	21.6	23.1	22.5	22.5	23.6	29.1	14.4	13.2	28.4	34.6	37.5	25.9	25.3
-SURFACE . . .	0.0	0.0	0.0	0.0	++	0.0	0.0	0.0	++	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.1	0.4	0.3	0.7	1.9	3.3	3.8	2.5	3.2	5.6	4.9	6.1	3.7	5.5
BRASIL . . .	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	0.1	++	0.1	0.1	++	0.1	0.1	0.3	0.1	++	++	++	++
FIS . . .	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	0.1	++	0.2	0.5	0.9	0.9	0.4	++	++	++	0.1	0.0	0.0
S.AFRICA . . .	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	++	0.1	0.1	0.4	1.2	1.4	2.5	1.7	2.6	5.3	4.7	5.1	3.5	5.5
ESPANA . . .	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.1	0.3	0.3	0.2	0.2	0.8	0.2	0.0
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	0.1	0.1	++	0.2	++	0.2	++	++	0.0	0.0	++	++	++
-LONGLINE . . .	10.5	10.4	17.2	17.4	26.0	29.8	27.3	15.9	25.7	28.5	23.7	25.0	33.2	28.1	19.6	17.4	19.2	21.2	22.8	21.8	20.6	20.3	25.3	11.8	9.8	22.7	29.3	30.9	21.9	19.4
ARGENTIN . . .	1.8	1.5	0.7	1.5	1.5	1.1	0.8	0.7	1.2	0.4	0.5	0.3	0.1	++	++	0.1	++	0.1	++	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	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.2	0.1	0.3	0.5	0.4	0.4	0.4	0.3	0.7	0.7	0.5	0.3	++	0.3	0.4	0.4
CHI.TAIW . . .	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	6.8	12.5	12.2	17.5	25.0	22.2	16.7	13.4	14.6	16.1	20.5	20.3	18.7	18.2	22.8	9.5	7.9	19.6	27.6	28.8	20.7	18.4
JAPAN . . .	8.7	8.9	16.4	15.1	23.7	28.3	21.0	7.7	11.9	6.3	5.9	3.2	2.1	0.3	0.1	0.3	0.1	0.1	0.1	0.1	0.3	0.6	0.6	0.2	0.2	0.6	0.7	0.4	0.4	0.4
KOREA . . .	0.0	0.0	0.0	0.0	0.1	0.3	5.3	6.4	5.7	9.2	5.0	3.8	5.7	3.7	2.4	3.2	3.4	3.8	1.4	0.9	0.7	0.7	0.6	0.6	0.3	0.5	0.3	0.4	0.2	0.1
PANAMA . . .	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.8	0.2	0.3	0.8	0.4	0.4	0.1	0.2	0.1	0.2	0.0	0.0	0.0	0.3	0.9	0.0	0.0
S.AFRICA . . .	0.0	0.0	0.0	0.7	0.6	++	0.1	0.0	0.0	0.0	0.0	0.0	0.0	++	0.0	0.0	0.0	0.0	0.0	++	0.3	0.4	0.1	0.5	0.2	++	0.1	0.0	0.1	0.0
URUGUAY . . .	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	0.2	0.4	0.5	1.5	0.3	0.2	0.1	0.1
OTHERS . . .	0.0	0.0	0.0	0.0	0.0	0.1	0.1	++	0.1	++	0.0	0.0	0.1	0.0	0.0	++	0.1	0.2	++	0.0	++	0.1	++	++	0.1	++	++	++	++	0.0

Table 8. Continued.

	1960	1961	1962	1963	1964	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
-UNCL. + TRAWL	0.0	0.4	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	0.1	0.2	0.2	0.4	0.5	0.3	0.3
ARGENTIN . . .	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	0.1	0.2	0.2	0.4	0.5	0.3	0.3
S.AFRICA . . .	0.0	0.4	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MEDITERRANEAN	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5	0.7	0.5	0.5	0.7	0.5	0.5	0.5	0.6	0.6	0.6	0.8	0.5	1.5	1.3	1.2	3.4	4.1	3.7	4.0	4.1	4.1
-SURFACE . . .	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.9	0.6	0.5	1.7	1.2	0.1	0.2	0.1	0.1
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	++	0.1	++	++
ITALY . . .	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.1	0.1	0.1	0.1
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.6	0.5	1.3	0.5	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	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-LONGLINE . . .	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	0.0	0.0	0.0	++	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.2	0.2	0.2	0.2
ITALY . . .	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.2	0.2	0.2	0.2
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	0.0	0.0	++	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. + TRAWL	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.7	0.5	0.5	0.5	0.5	0.5	0.4	0.8	0.5	0.6	0.7	0.7	1.5	2.6	3.4	3.7	3.8	3.8
GREECE . . .	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5
ITALY . . .	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.8	0.5	0.6	0.7	0.7	1.5	2.6	3.0	3.2	3.3	3.3
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	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

++ CATCHES: < 50 MT

Table 9. Nominal effort by fisheries, 1975 - 1989, North Atlantic albacore.

YEAR	SPAIN	SPAIN TROL	TAIWAN BB	FRANCE LL	FRANCE GILL	TRAWL
		Fishing days	No.hooks ($x10^3$)	Fishing days		
1975		15351	17227	15200		
1976		29902	21591	30000		
1977		20144	9960	30900		
1978		22536	10022	20000		
1979		16974	10175	9000		
1980		16739	10383	14300		
1981		17178	11547	12800		
1982		17241	10904	19800		
1983		16057	16123	26000		
1984		12428	7222	32700		
1985		23355	9936	37840		
1986		20660	12753	60100		
1987		24699	10345	23800		
1988		19733	12046	5200	1200	750
1989		21899	9501	3600	1450	2900

Table 10. Catch at age (in 1,000 fish) for North Atlantic albacore, 1975 - 1989

AGE	YEAR 1975	1976	1977	1978	1979	1980	1981	1982
1	172	242	275	2678	409	1186	690	56
2	874	2677	2356	2521	3647	1716	1467	1427
3	1311	939	1567	1315	1992	1946	1292	1781
4	457	888	668	790	515	575	500	709
5	255	508	362	298	144	159	126	136
6	247	375	320	228	103	82	79	108
7+	280	277	259	162	166	99	228	329
TOTAL NUM.	3595	5904	5806	7992	6976	5763	4382	4546
1,000MT	40	58	56	56	53	43	31	38

AGE	YEAR 1983	1984	1985	1986	1987	1988	1989
1	401	184	974	709	258	1936	886
2	1501	1167	1016	1470	1724	1836	1615
3	1749	967	1163	1247	1849	1335	1417
4	920	413	425	670	362	452	511
5	321	194	206	317	76	129	64
6	202	283	220	217	55	56	25
7+	298	557	416	323	118	48	25
TOTAL NUM.	5392	3765	4420	4953	4442	5793	4542
1,000MT	45	34	34	50	37	38	33

Table 11. Abundance indices for North Atlantic albacore. The longline indices were corrected as indicated in the text

YEAR	EFFORT	CATCH AT AGE					
		AGE 1	AGE 2	AGE 3	AGE 4	AGE 5	AGE 6
SPANISH TROLL							
1975	10235	37.4	168.2	223.0	64.4	3.0	0.0
1976	25779	64.8	824.1	187.8	85.8	5.7	0.7
1977	15854	40.0	867.2	427.2	66.3	0.0	0.0
1978	19703	668.0	1324.5	477.6	174.6	5.8	2.3
1979	15134	99.7	1727.4	614.2	79.3	4.5	2.5
1980	15165	533.5	648.5	584.1	26.4	2.7	0.5
1981	16231	198.5	408.4	563.2	64.3	1.2	0.5
1982	16286	27.1	585.7	630.2	125.5	0.7	0.0
1983	14633	9.6	531.8	698.8	137.5	1.8	.02
1984	12339	36.8	692.1	381.5	52.6	2.1	.02
1985	18825	248.9	491.0	330.4	56.1	3.1	.3
1986	16785	132.3	783.6	286.1	29.5	0.8	1.8
1987	19235	80.6	637.0	280.0	69.3	3.1	0.0
1988	14533	198.4	846.5	308.4	104.7	16.0	5.6
1989	13772	33.6	675.7	378.8	38.4	1.4	0.3
SPANISH BB							
1975	8731	8.6	454.7	502.4	142.2	6.0	0.2
1976	16260	10.6	667.3	379.9	438.2	88.7	6.0
1977	7737	12.2	423.9	530.9	184.2	10.1	0.0
1978	6898	747.5	340.5	261.2	276.7	24.6	10.0
1979	8356	57.7	713.0	627.1	295.2	10.2	4.6
1980	68566	507.4	475.0	720.3	285.5	14.9	4.1
1981	10872	371.5	453.9	479.9	294.3	5.0	0.6
1982	10022	14.6	505.5	841.2	281.4	7.6	1.2
1983	9880	186.2	434.8	559.1	388.4	12.5	5.6
1984	6183	97.2	167.2	306.8	148.8	8.1	1.1
1985	8030	278.8	465.2	409.3	135.1	7.9	1.7
1986	8509	195.9	371.5	457.6	153.9	5.8	0.7
1987	8030	47.2	670.0	958.9	116.4	3.7	0.2
1988	8069	549.7	729.9	487.2	128.6	21.5	0.2
1989	5795	120.8	590.6	402.8	140.7	4.6	0.1
TAIWANESE LL							
1975	15.2				129.4	112.7	50.7
1976	30.0				191.4	245.1	173.2
1977	30.9				158.3	185.9	172.9
1978	20.0				76.8	149.9	132.2
1979	9.0				42.8	51.8	42.2
1980	14.3				136.0	98.7	59.4
1981	12.8				87.9	74.2	41.1
1982	19.8				162.5	108.7	86.6
1983	26.0				187.0	198.0	139.0
1984	32.7				140.9	141.8	144.0
1985	37.8				131.4	158.2	176.9
1986	60.1				264.0	258.3	179.8
1987	23.8				90.1	45.9	33.3
1988	5.2				28.3	39.1	27.4
1989	3.4				46.9	24.1	9.4

Table 12. Bluefin tuna catch (in metric tons) by gear and for east and west Atlantic and Mediterranean Sea - as of November 2, 1990

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
TOTAL	24701	27984	33823	29318	35213	31002	22706	25207	15738	17385	16019	17493	14492	14532	23534
W. ATL.	1032	1620	5799	13838	18679	14171	8090	5940	3176	3012	5466	6591	3948	3871	5393
-PS	277	903	3768	5770	5158	3331	1006	2082	687	1118	4288	3769	2011	1656	960
CANADA	0	0	0	323	579	461	0	0	0	0	1161	935	260	635	103
NORWAY	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0
USA	277	903	3768	5447	4571	2870	1006	2082	687	1118	3127	2834	1751	1021	857
-RR	29	101	380	1162	601	1062	3726	343	619	1008	587	1049	1084	519	2913
CANADA	5	41	40	90	99	94	111	56	180	170	151	88	188	239	409
USA	24	60	340	1072	502	968	3615	287	439	838	436	961	896	280	2504
-LL	340	373	1351	6558	12410	9469	3085	3126	1665	593	268	1390	339	1127	946
ARGENTIN	0	0	106	271	204	100	100	60	21	0	0	2	0	2	0
BRASIL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CANADA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CHI.TAIW	0	0	0	0	0	0	0	0	12	7	2	13	7	2	20
CUBA	0	0	0	0	0	139	465	2352	1351	468	200	0	0	0	0
JAPAN	339	373	1219	6191	12044	9147	2471	694	272	116	66	1375	321	1097	905
KOREA	0	0	0	0	0	0	0	0	0	0	0	0	11	23	20
NORWAY	0	0	0	0	63	4	10	0	0	0	0	0	0	0	0
PANAMA	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
URUGUAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
USA	1	0	26	96	99	79	39	20	9	2	0	++	0	1	1
-OTH	386	243	300	348	510	309	273	389	205	293	323	383	514	569	574
ARGENTIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CANADA	32	79	137	229	318	81	87	174	101	193	130	59	29	144	256
MEXICO	0	0	0	0	0	0	0	0	0	0	0	0	23	29	39
POLAND	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
ST.LUCIA	0	0	0	0	0	0	0	0	0	0	**	**	**	**	**
USA	354	164	163	119	192	228	186	215	104	100	193	324	462	396	276
E. ATL.	18854	20750	23230	9020	10239	10834	9290	10523	4629	5683	5764	4675	4732	4685	6067
-BB	1198	1453	1537	1178	1079	1820	3347	1805	1474	1826	3017	3055	3032	3142	2348
CAP VERT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FRANCE	553	907	965	543	400	621	1624	860	390	534	732	680	740	540	522
JAPAN	0	0	0	0	3	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	191
ESPANA	645	546	572	635	676	1199	1723	945	1084	1292	2285	2375	2292	2602	1635

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
TOTAL	26121	28167	25457	20388	18347	19786	19487	23597	24008	26480	26525	22117	19747	24978	21195
W. ATL.	5032	5883	6694	5763	6255	5801	5771	1431	2541	2292	2678	2322	2595	3011	2840
-PS	2320	1582	1502	1230	1381	758	910	232	384	401	377	360	367	383	385
CANADA	291	332	298	241	0	0	105	0	0	0	0	0	0	0	0
NORWAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
USA	2029	1250	1204	989	1381	758	805	232	384	401	377	360	367	383	385
-RR	328	590	630	475	499	535	523	308	476	401	466	328	539	439	557
CANADA	206	342	302	208	214	259	279	0	71	1	1	2	1	7	0
USA	122	248	328	267	285	276	244	308	405	400	465	326	538	432	557
-LL	1522	3066	3752	3217	3691	3972	3879	349	828	835	1238	1278	1330	1588	899
ARGENTIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BRASIL	0	0	++	14	10	2	3	1	1	++	1	0	2	++	2
CANADA	0	0	0	0	0	0	0	0	0	0	0	32	33	104	53
CHI.TAIW	1	0	1	1	49	15	7	11	2	3	3	3	0	0	3
CUBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
JAPAN	1513	2902	3658	3144	3621	3936	3771	292	711	696	1092	584	960	1109	468
KOREA	8	7	1	0	1	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
PANAMA	0	157	92	58	10	9	14	12	0	0	0	0	0	0	0
URUGUAY	0	0	0	0	0	0	1	3	0	9	10	6	4	2	++
USA	0	0	0	0	0	10	83	30	114	127	132	653	331	373	373
-OTH	862	645	810	841	684	536	459	542	853	655	597	356	359	601	999
ARGENTIN	0	0	0	0	0	0	0	0	0	0	6	0	2	++	0
CANADA	144	172	372	221	31	65	41	291	362	263	141	39	49	282	580
MEXICO	24	37	14	28	22	10	20	14	0	0	0	0	0	0	0
POLAND	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
ST.LUCIA	**	**	**	**	**	0	0	0	0	0	0	0	++	3	3
USA	694	433	424	592	631	461	398	237	491	392	450	317	308	316	416
E. ATL.	9976	5212	6977	5800	4767	4064	3331	6669	8010	7386	4756	4292	4199	6745	5308
-BB	2991	1803	2881	3904	2128	1874	1553	957	3032	2948	2366	2253	2128	2682	2683
CAP VERT	0	0	0	0	0	0	0	0	10	1	0	0	0	0	0
FRANCE	692	267	592	723	275	260	153	150	400	566	380	272	533	479	306
JAPAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PORTUGAL	303	24	14	56	10	17	16	30	53	15	3	28	58	29	1
ESPANA	1996	1512	2275	3125	1843	1597	1384	777	2569	2366	1983	1953	1537	2174	2376

Table 12. Continued..

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
-PS	6222	10962	9781	1575	3458	3378	2737	4022	1149	1435	669	598	961	932	1455
MAROC	2286	2994	1628	1419	2059	906	1778	2048	453	678	406	30	531	512	590
NORWAY	3936	7968	8153	156	1390	2472	959	1974	696	757	263	568	430	420	865
PORTUGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S.AFRICA	0	0	0	0	9	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
USA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-TRAP	10430	7576	9014	4472	5059	5172	3123	4540	1790	2220	1786	663	372	505	20
MAROC	3714	1377	3648	2318	2256	1882	1601	1331	635	59	286	63	122	1	7
PORTUGAL	1016	1499	666	354	303	90	122	209	55	261	0	0	0	0	0
ESPANA	5700	4700	4700	1800	2500	3200	1400	3000	1100	1900	1500	600	250	504	13
-LL	481	223	2484	1618	582	434	81	141	208	201	274	254	261	91	2243
CHI.TAIW	0	0	0	0	0	0	0	0	138	114	46	12	2	1	12
JAPAN	481	204	2484	1618	582	404	50	100	13	2	21	157	240	44	2195
KOREA	0	0	0	0	0	0	0	0	0	0	0	0	19	43	36
NORWAY	0	19	0	0	0	30	31	41	57	85	207	85	0	0	0
PANAMA	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
ESPANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-OTH	523	536	414	177	61	30	2	15	8	1	18	105	106	15	1
DENMARK	47	192	202	4	61	30	2	15	8	1	++	1	++	2	1
FRANCE	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0
GER.F.R.	434	331	212	++	++	++	++	0	++	++	14	1	6	2	0
GREECE	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
NETHERLA	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
POLAND	0	0	0	0	0	0	0	0	0	0	0	100	100	0	0
PORTUGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESPANA	0	0	0	173	0	0	0	0	0	0	0	0	0	0	0
SWEDEN	42	13	++	++	0	++	++	++	++	0	4	3	0	0	0
MED	4815	5614	4794	6460	6295	5997	5326	8744	7933	8690	4789	6227	5812	5976	12074
-PS	225	472	419	1533	1261	435	1876	2919	3341	3629	2393	3904	4084	4324	8119
FRANCE	0	0	0	0	0	0	1000	1500	2500	1500	1100	2200	1100	1400	1800
ITALY	116	349	332	1256	990	301	630	1088	691	1828	1203	1336	2783	2700	6000
MAROC	0	0	0	0	0	0	0	0	0	0	0	42	1	0	2
ESPANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TUNISIE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TURKEY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
YUGOSLAV	109	123	87	277	271	134	246	331	150	301	90	326	200	224	317

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
-PS	3612	860	1426	257	266	437	266	655	262	414	86	288	0	0	0
MAROC	2624	331	662	36	206	155	105	600	187	127	86	122	0	0	0
NORWAY	988	529	764	221	60	282	161	50	1	243	0	31	0	0	0
PORTUGAL	0	0	0	0	0	0	0	0	74	3	0	123	0	0	0
S.AFRICA	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	41	0	12	0	0	0
USA	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
-TRAP	448	490	561	450	600	706	859	2309	1956	2271	1630	891	1062	2424	1478
MAROC	0	0	222	0	0	6	72	393	94	0	0	0	123	35	304
PORTUGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESPANA	448	490	339	450	600	700	787	1916	1862	2271	1630	891	939	2389	1174
-LL	2923	2048	1806	733	748	1002	575	2705	2626	1538	535	741	904	1169	847
CHI.TAIW	5	3	2	0	3	5	6	16	2	0	0	0	0	0	0
JAPAN	2900	1973	1594	577	630	880	515	2573	2609	1514	420	710	900	1169	832
KOREA	15	3	2	0	1	0	0	0	3	0	77	0	0	0	0
NORWAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PANAMA	0	69	208	156	14	117	48	12	0	17	22	11	4	**	0
ESPANA	3	0	0	0	100	0	6	104	12	7	16	20	0	0	15
-OTH	2	11	303	456	1025	45	78	43	134	215	139	119	105	470	300
DENMARK	++	3	1	3	1	0	4	++	++	0	2	1	0	0	0
FRANCE	0	0	0	0	0	0	0	0	0	36	110	76	0	245	154
GER.F.R.	0	0	0	1	1	0	2	0	0	0	0	0	0	0	0
GREECE	0	0	0	0	0	0	++	5	0	0	0	0	0	0	0
MAROC	0	0	0	0	0	0	0	0	84	44	0	0	0	202	144
NETHERLA	0	0	0	0	0	0	0	++	++	++	++	++	++	++	++
NORWAY	0	0	0	0	0	0	++	0	0	0	0	0	0	0	0
POLAND	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PORTUGAL	0	0	0	0	25	7	1	11	47	16	26	42	105	19	2
ESPANA	0	0	300	450	998	38	70	27	2	119	1	0	0	4	0
SWEDEN	2	8	2	2	++	++	1	++	1	++	0	0	0	++	++
MED	11113	17072	11786	8825	7325	9921	10385	15497	13457	16802	19091	15503	12953	15222	13047
-PS	8065	13970	9552	7278	5990	8394	8432	12023	10374	9786	13292	10591	8437	10532	8269
FRANCE	1600	3800	3182	1566	1527	1701	2300	4818	3600	3570	5400	3460	4300	5750	4404
ITALY	6270	9607	5431	4663	3705	6120	5704	6442	5552	5382	4522	4789	2579	2229	2345
MAROC	40	1	7	0	2	++	2	++	0	0	0	0	0	0	0
ESPANA	0	0	0	0	0	0	50	277	0	79	56	22	0	0	0
TUNISIE	0	0	0	0	0	0	0	0	0	0	0	0	0	120	50
TURKEY	0	0	0	0	0	0	0	0	0	0	2230	1524	910	910	910
YUGOSLAV	155	562	932	1049	756	573	376	486	1222	755	1084	796	648	1523	560

Table 12. Continued..

	1960	1961	1962	1963	1964	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
-TRAP	2890	3043	2861	2059	3081	3872	2250	3337	3082	3768	1489	1372	1023	566	880	817	718	820	331	326	611	565	451	401	1028	677	545	949	708	901
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
ITALY	1229	1423	1280	1227	1652	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
LIBYA	1100	1000	800	100	400	600	700	800	1000	2000	0	0	0	0	0	0	0	0	0	0	339	255	130	0	0	0	0	0	0	0
MAROC	0	0	0	0	0	172	11	27	5	0	0	37	36	1	7	0	0	0	0	0	0	0	0	0	0	0	0	337	96	286
ESPANA	561	620	377	472	653	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
TUNISIE	0	0	404	260	376	601	293	307	184	77	248	238	64	52	123	101	65	120	120	131	120	98	100	80	80	80	84	83	83	83
-LL	0	0	0	800	300	400	500	300	600	400	69	129	236	520	2387	1363	1218	592	153	199	219	300	1499	939	1146	1064	539	461	434	361
ITALY	0	0	0	0	0	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
JAPAN	0	0	0	0	0	0	0	0	0	0	0	0	112	246	2195	1260	968	520	61	99	119	100	961	677	1036	873	421	280	236	200
PANAMA	0	0	0	0	0	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
ESPANA	0	0	0	800	300	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
-OTH	1700	2099	1514	2068	1653	1290	700	2188	910	893	838	822	469	566	688	868	1166	822	1063	810	697	1088	1524	1743	4842	4058	3828	3106	3548	3516
ALGERIE	0	0	0	0	0	0	0	0	0	0	100	100	1	++	33	66	49	40	20	150	190	220	250	252	254	260	566	420	677	820
FRANCE	400	599	214	668	953	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
GREECE	900	1100	1000	1200	600	700	500	600	500	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	131	131	131	131	131
ITALY	0	0	0	0	0	0	0	0	0	0	100	100	100	100	100	100	112	134	110	120	0	104	61	0	1390	2320	2493	1608	1563	1563
LIBYA	0	0	0	0	0	0	0	0	0	0	500	600	300	400	500	634	799	336	677	424	59	16	180	300	300	300	300	300	300	84
MALTA	100	100	100	100	100	100	100	100	100	++	++	++	++	++	21	37	25	47	26	23	24	32	40	31	21	21	41	36	25	25
MAROC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	12	18	0	44	9
ESPANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	88	72	15	33	101	108	542	1974	984	249	581	778	854
TURKEY	300	300	200	100	0	100	100	1488	310	393	138	22	68	66	34	17	181	177	127	27	391	565	825	557	869	0	0	0	0	0

++ CATCH: < 0.5 MT
** CATCH: UNKNOWN

Table 13. Catch in number for west Atlantic bluefin tuna

YEAR :	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
AGE :																				
1 :	64869	62998	45402	5102	55958	43557	5412	1273	5133	2745	3160	6087	3528	4173	868	568	563	1513	4849	786
2 :	105064	153364	98577	74304	19846	148026	19643	22395	10848	10537	16160	9606	3710	2438	7495	5510	5896	13268	8995	12864
3 :	127518	38359	33762	30485	21291	8329	72511	9481	19831	16179	10855	16550	1649	3253	1855	12311	7176	9105	11843	1675
4 :	20998	46021	3555	7115	6487	11850	2754	32093	6409	14993	8880	4962	519	909	1989	2715	3383	5508	3815	3624
5 :	4062	704	4031	2010	3137	899	3035	5171	10424	3416	3033	6194	336	816	2110	4216	1162	4334	4182	1840
6 :	979	1595	117	1594	712	569	372	3560	4213	3407	2869	3602	730	912	1709	4173	1669	2421	4138	2018
7 :	182	2000	514	825	918	311	187	1080	655	2715	5306	2833	484	1388	584	1014	994	1421	2408	2644
8 :	115	1481	601	1625	879	565	1166	483	509	633	3790	3332	482	1310	719	655	518	1341	1592	1859
9 :	542	1146	263	586	1076	1680	514	1089	314	521	1022	2677	823	1012	1014	660	334	1053	1553	1415
10+:	3777	6021	5548	4490	12580	9568	14110	13615	12030	12352	12323	10867	3171	5761	4715	5650	5370	3908	4710	5417
1+ :	328106	313689	192370	128136	122884	225354	119704	90240	70366	67498	67398	66710	15432	21972	23058	37472	27065	43872	48085	34142
2+ :	263237	250691	146968	123034	66926	181797	114292	88967	65233	64753	64238	60623	11904	17799	22190	36904	26502	42359	43236	33356
3+ :	158173	97327	48391	48730	47080	33771	94649	66572	54385	54216	48078	51017	8194	15361	14695	31394	20606	29091	34241	20492
4+ :	30655	58968	14629	18245	25789	25442	22138	57091	34554	38037	37223	34467	6545	12108	12840	19083	13430	19986	22398	18817

Table 14. Percentage composition of the catch (numbers) of western Atlantic bluefin tuna as used by the 1990 SCRS

YEAR :	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
AGE:																				
1 :	.1979	.2008	.2360	.0398	.4554	.1933	.0452	.0141	.0729	.0407	.0469	.0912	.2286	.1899	.0376	.0152	.0208	.0345	.1008	.0230
2 :	.3206	.4889	.5124	.5799	.1615	.6569	.1641	.2482	.1542	.1561	.2398	.1440	.2404	.1110	.3250	.1470	.2178	.3024	.1871	.3768
3 :	.3891	.1223	.1755	.2379	.1733	.0370	.6058	.1051	.2818	.2397	.1611	.2481	.1069	.1481	.0804	.3285	.2651	.2075	.2463	.0491
4 :	.0641	.1467	.0185	.0555	.0528	.0526	.0230	.3556	.0911	.2221	.1318	.0744	.0336	.0414	.0863	.0725	.1250	.1255	.0793	.1061
5 :	.0124	.0022	.0210	.0157	.0255	.0040	.0254	.0573	.1481	.0506	.0450	.0928	.0218	.0371	.0915	.1125	.0429	.0988	.0870	.0539
6 :	.0030	.0051	.0006	.0124	.0058	.0025	.0031	.0395	.0599	.0505	.0426	.0540	.0473	.0415	.0741	.1114	.0617	.0552	.0861	.0591
7 :	.0006	.0064	.0027	.0064	.0075	.0014	.0016	.0120	.0093	.0402	.0787	.0425	.0314	.0632	.0253	.0271	.0367	.0324	.0501	.0774
8 :	.0002	.0047	.0031	.0127	.0072	.0025	.0097	.0054	.0072	.0094	.0562	.0499	.0312	.0596	.0312	.0175	.0191	.0306	.0331	.0544
9 :	.0013	.0037	.0014	.0046	.0088	.0075	.0043	.0121	.0045	.0077	.0152	.0401	.0533	.0461	.0440	.0176	.0123	.0240	.0323	.0414
10+:	.0107	.0192	.0288	.0350	.1024	.0425	.1179	.1509	.1710	.1830	.1828	.1629	.2055	.2622	.2045	.1508	.1984	.0891	.0980	.1587
2+:	.8021	.7992	.7640	.9602	.5446	.8067	.9548	.9859	.9271	.9593	.9531	.9088	.7714	.8101	.9624	.9848	.9792	.9655	.8992	.9770
3+:	.4814	.3103	.2516	.3803	.3831	.1499	.7907	.7377	.7729	.8032	.7133	.7648	.5310	.6991	.6373	.8378	.7614	.6631	.7121	.6002
4+:	.0923	.1880	.0760	.1424	.2099	.1129	.1849	.6327	.4911	.5635	.5523	.5167	.4241	.5511	.5569	.5093	.4962	.4556	.4658	.5511
5+:	.0283	.0413	.0576	.0869	.1571	.0603	.1619	.2770	.4000	.3414	.4205	.4423	.3905	.5097	.4706	.4368	.3712	.3300	.3865	.4450
6+:	.0159	.0390	.0366	.0712	.1315	.0563	.1366	.2197	.2518	.2908	.3755	.3494	.3687	.4726	.3791	.3243	.3283	.2312	.2995	.3911

Table 15. Abundance indices considered for calibration of west Atlantic bluefin tuna stock size estimation.

GEAR	Larval BFT	Tended line	LL	LL			LL				R R
COUNTRY	U.S.A.	CANADA*	JAPAN	JAPAN	--------------- U.S. OBS ---------------					--- U.S.A. ----	
AREA	Gulf of Mexico	NW Atl.	NW Atl.	NW Atl.			U.S. EEZ				U.S. Coast
AGE**	8+	10+	3-5	6-7	3	4	5	6	7	8+	1-3
WEIGHT***	0.01946	0.19039	0.03378	0.12754						0.4663	0.16221
1975	--	--	--	--	--	--	--	--	--	--	--
1976	--	--	1.00000	1.00000	--	--	--	--	--	--	--
1977	2.266	--	2.66627	5.06285	--	--	--	--	--	--	--
1978	5.511	--	1.22972	5.40911	--	--	--	--	--	--	--
1979	--	--	0.25491	6.21409	--	--	--	--	--	--	--
1980	--	--	0.80326	5.68401	--	--	--	--	--	--	1.00000
1981	1.270	0.135	0.61729	4.25890	--	--	--	--	--	--	0.82877
1982	0.932	0.090	0.35583	1.59831	--	--	--	--	--	--	1.01717
1983	0.991	0.058	0.15095	1.22356	--	--	--	--	--	1.00000	0.92694
1984	0.286	0.029	0.46443	3.19730	1.000	1.000	1.000	1.000	1.000	0.66905	--
1985	--	0.016	0.54976	4.59009	4.446	1.129	0.781	1.958	1.878	0.54591	0.90496
1986	0.393	0.020	0.25108	2.37093	1.449	0.723	0.429	0.576	1.165	0.70652	0.92050
1987	0.342	0.016	0.45939	4.30793	2.050	1.687	1.350	1.618	1.589	--	0.91701
1988	0.868	0.023	0.51530	5.56218	1.498	0.903	0.943	1.662	1.576	0.53211	0.89057
1989	0.944	0.013	0.52792	4.25868	1.046	0.595	0.870	1.782	1.768	0.45475	0.97009
Stock measure	Biomass	Numbers	Numbers	Numbers	Numbers	Numbers	Numbers	Numbers	Numbers	Numbers	Numbers
Time of year for stock size	Middle	Middle	Start	Start	Start	Start	Start	Start	Start	Middle	Middle
Ref.SCRS/	90/77	90/94	90/75	90/75	90/80	90/80	90/80	90/80	90/80	90/79	90/81

* The Canadian tended line large fish index is considered to represent fish in the 13+ age categories. Due to our pooling of the catch-at-age table to 10+ the index was adjusted by the ratio of the catch at age 13+ to catch at age 10+.

** Age refers to the age groups to which the index was applied.

*** Weight refers to the relative weights applied to each index during calibration.

Table 16. SVPA analysis of west Atlantic bluefin tuna

```
:::...Separable VPA   using
      POPE/SHEPARD (1982) log catch ratio method
                VERSION 2.1      ...    04/NOV/88
                last revision           26/OCT/89
                RUN DATE:                1 /11/90   17:21
```

INPUT DATA USED FOR ANALYSIS:-

FIRST YEAR	83	LAST YEAR	89	TOTAL YEARS	7
FIRST AGE	1	LAST AGE	13	TOTAL AGES	13

CATCH DATA USED IN THE SEPARABLE ANALYSIS

YEAR	83	84	85	86	87	88	89
AGE							
1	4173.	868.	568.	563.	1513.	4849.	786.
2	2438.	7495.	5510.	5896.	13268.	8995.	12864.
3	3253.	1855.	12311.	7176.	9105.	11843.	1675.
4	909.	1989.	2715.	3383.	5508.	3815.	3624.
5	816.	2110.	4216.	1162.	4334.	4182.	1840.
6	912.	1709.	4173.	1669.	2421.	4138.	2018.
7	1388.	584.	1014.	994.	1421.	2408.	2644.
8	1310.	719.	655.	518.	1341.	1592.	1859.
9	1012.	1014.	660.	334.	1053.	1553.	1415.
10	1177.	1136.	965.	559.	625.	1064.	1432.
11	1179.	1166.	1278.	1087.	793.	989.	1167.
12	843.	919.	1569.	1541.	943.	890.	1007.
13	654.	478.	869.	1124.	691.	808.	762.

NATURAL MORTALITY = .140
TERMINAL F= .200
TERMINAL S= 2.000

REFERENCE AGE (FOR UNIT SELECTION) IS 5

APPROX.COEFF. VARIATION OF CATCH DATA = 34.9%
APPROX. TWICE S.E. (2 ln (1 + cv/100) = .60

YEAR	83	84	85	86	87	88	89
F(I)	.083	.082	.123	.101	.174	.232	.200

Partial recruitment

AGE	1	2	3	4	5	6	7
S(J)	.102	.673	.702	.441	.500	.630	.440

AGE	8	9	10	11	12	13+
S(J)	.414	.443	.545	.791	1.000	1.000

Re-estimated: truncated at 9 and standardized to age 3

AGE	1	2	3	4	5	6	7
S(J)	.151	.970	1.000	.636	.712	.894	.636

AGE	8	9	10+
S(J)	.591	.636	.636

Table 17. Fishing mortality rates estimated by VPA for west Atlantic bluefin tuna by the 1990 SCRS

	F AT AGE DURING YEAR																			
Age	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
1	0.2337	0.3008	0.2452	0.0456	0.1330	0.4033	0.0454	0.0164	0.1084	0.0400	0.0591	0.1316	0.0736	0.0524	0.0152	0.0079	0.0087	0.0845	0.0518	0.0584
2	0.8121	1.2308	0.9853	0.7344	0.2335	0.5634	0.2985	0.2490	0.1762	0.3143	0.3224	0.2386	0.1038	0.0627	0.1176	0.1184	0.0993	0.2710	0.9105	0.1769
3	0.9799	0.7476	0.9563	0.9104	0.4440	0.1359	0.5558	0.2148	0.3392	0.4000	0.5733	0.5919	0.0548	0.1170	0.0583	0.2685	0.2084	0.2049	0.3844	0.3858
4	0.2958	1.1694	0.1271	0.4950	0.4548	0.4430	0.0570	0.4761	0.2062	0.4320	0.3719	0.5229	0.0298	0.0364	0.0913	0.1064	0.1026	0.2289	0.1162	0.1808
5	0.1178	0.0134	0.2562	0.0923	0.3935	0.0967	0.1800	0.1353	0.2593	0.1514	0.1349	0.4481	0.0553	0.0561	0.1041	0.2648	0.0569	0.1733	0.2543	0.0708
6	0.0236	0.0582	0.0026	0.1427	0.0402	0.1065	0.0496	0.3087	0.1460	0.1182	0.1718	0.2195	0.0801	0.1953	0.1496	0.2865	0.1487	0.1510	0.2327	0.1753
7	0.0119	0.0576	0.0225	0.0212	0.1072	0.0208	0.0432	0.1858	0.0799	0.1239	0.2542	0.2393	0.0387	0.2010	0.1732	0.1167	0.0956	0.1709	0.2062	0.2141
8	0.0025	0.1186	0.0207	0.0862	0.0266	0.0834	0.0951	0.1407	0.1173	0.0969	0.2377	0.2345	0.0545	0.1312	0.1424	0.2792	0.0754	0.1690	0.2743	0.2273
9	0.0174	0.0285	0.0261	0.0238	0.0710	0.0611	0.0954	0.1133	0.1198	0.1584	0.2093	0.2459	0.0782	0.1449	0.1334	0.1765	0.2092	0.2025	0.2809	0.3890
10+	0.0174	0.0285	0.0261	0.0238	0.0710	0.0611	0.0954	0.1133	0.1198	0.1584	0.2093	0.2459	0.0782	0.1449	0.1334	0.1765	0.2092	0.2025	0.2809	0.3890

Table 18. Population numbers (stock size) of west Atlantic bluefin tuna as estimated from VPA by the 1990 SCRS

	STOCK AT AGE AT BEGINNING OF YEAR																				
Age	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
1	332661	259007	223101	122644	480724	139971	130689	83974	53479	74957	59007	52810	53229	87597	61660	77390	69294	19978	102821	14826	0
2	200585	228932	166683	151776	101871	365871	81296	108576	71817	41717	62609	48356	40248	42991	72268	52796	66751	59717	15961	84873	12157
3	216324	77409	58124	54099	63307	70123	181064	52439	73588	52349	26486	39431	33114	31539	35104	55855	40773	52544	39593	5583	61824
4	87568	70588	31865	19419	18925	35303	53215	90288	36777	45572	30507	12979	18966	27253	24392	28791	37124	28777	37218	23436	3300
5	39107	56633	19057	24395	10291	10440	19708	43699	48759	26016	25720	18284	6689	16004	22846	19354	22504	29126	19899	28807	17005
6	45037	30219	48579	12823	19339	6036	8240	14311	33181	32707	19441	19538	10155	5502	13154	17897	12911	18483	21293	13415	23331
7	16490	38242	24786	42124	9665	16149	4717	6817	9137	24927	25264	14232	13638	8149	3934	9846	11683	9673	13817	14667	9787
8	50310	14166	31384	21069	35853	7548	13750	3928	4922	7333	19146	17034	9740	11407	5794	2877	7617	9231	7088	9774	10293
9	33710	43630	10938	26725	16804	30350	6037	10869	2966	3805	5786	13123	11713	8019	8697	4369	1892	6141	6777	4684	6769
10+	234911	229505	230776	204723	196484	172712	166063	136007	114010	90211	69763	53278	45144	45710	40409	37360	30407	22779	20533	17927	13322

Table 19. Minimum estimates of percent composition of the catch less than 6.4 kg for both stocks of Atlantic bluefin tuna and of fish less than 120 cm for the west Atlantic stock by numbers and weight.

Year	East Atlantic	Mediterranean	East Atlantic & Mediterranean	West Atlantic	
	<6.4 kg as % by numbers			<6.4 kg % nos.	<120 cm % weight
1974	--	--	--	45.7	15.5
1975	75.1	46.2	64.9	19.6	35.1
1976	45.9	17.7	24.0	4.5	26.3
1977	51.3	51.6	51.5	1.7	12.1
1978	50.6	38.9	42.9	7.6	11.4
1979	48.7	25.6	35.0	4.0	9.2
1980	57.0	20.7	33.2	4.6	8.9
1981	63.1	11.8	26.1	7.2	9.6
1982	67.3	28.9	37.1	23.2	6.8
1983	75.3	59.0	65.0	18.2	4.4
1984	16.7	22.8	21.0	4.2	6.4
1985	20.8	58.7	53.3	1.7	12.0
1986	74.6	58.9	63.5	2.9	9.0
1987	28.4	26.8	27.2	5.3	13.7
1988	73.4	58.3	63.6	10.0	11.8
1989	50.9	26.4	35.7	2.3	6.6

Table 20. Von Bertalanffy equations for eastern Atlantic bluefin tuna.

AGE	Farrugio FL (cm)	Cort FL (cm)	Equations Used
1	54.0	53.4	
2	76.8	77.0	
3	97.9	98.4	Farrugio (1980):
4	117.4	118.0	
5	135.4	135.8	$FL_t = 351.1\ (1 - e^{-0.080(t+1.087)})$
6	151.9	152.1	
7	167.3	166.9	
8	181.4	180.4	
9	194.4	192.7	Cort (1990):
10	206.5	203.9	
11	217.6	214.1	$FL_t = 318.9\ (1 - e^{-0.093(t+0.970)})$
12	227.9	223.4	
13	237.3	231.9	
14	246.1	239.6	
15	254.2	246.6	
16	261.6	253.1	
17	268.5	258.9	
18	274.8	264.2	
19	280.7	269.1	
20	286.1	273.5	
21	291.1	277.5	
22	295.7	281.2	
23	300.0	284.5	
24	303.9	287.6	
25	307.5	290.4	

Table 21. Catch (in number) at age for east Atlantic and Mediterranean bluefin tuna

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	131840	10520	116589	142935	186866	696992	96862	217522	151674	75626	110996	149285	694110	701587	172146	216123	617532	251645	808930	453193
2	76505	88641	148620	66884	130114	289278	188236	289105	193498	33479	159990	334475	224081	168119	638408	356305	265385	433168	168442	405271
3	26947	53183	77256	83721	57037	34849	281023	45353	152039	98925	121531	109998	189939	120199	48742	312983	165805	106367	219658	114479
4	16487	14692	11383	6268	63067	19907	39694	63918	19172	48816	30033	12896	23436	24727	36167	31784	73990	29316	25984	24253
5	9940	12405	8288	3314	7322	6053	20424	2329	5160	7172	9239	14332	5306	12359	19508	13148	8106	9550	8410	9515
6	8227	3653	7086	3314	4811	4375	5059	5255	1546	2392	4590	5604	3230	3339	10112	8811	5486	7442	8802	6978
7	4550	4478	4240	6746	2891	3210	3175	3983	2868	2254	3063	3829	5085	9759	6130	3918	2642	7929	9527	10715
8	3559	9694	2295	7907	4387	3339	2030	2461	1797	3872	2261	4557	8839	5820	6524	3415	1910	3831	5010	6067
9	5660	5638	3291	8516	10575	5374	3794	2499	1224	3619	2353	3403	5069	4463	10173	3686	2882	3261	4284	4017
10	6330	1619	1053	1665	5012	5129	2588	3115	3414	3538	3399	3028	4868	13774	11379	5632	3271	4941	7068	4670
11	6706	1419	1108	1493	3657	5578	3521	3652	2012	2506	3914	3893	6415	5581	8522	6873	4309	3995	5774	3943
12	4171	1225	1335	1607	4532	7531	4004	3277	2292	1514	3163	3197	6799	4331	7755	6000	5285	3693	5096	3122
13	2263	1846	2169	2023	6263	9875	6844	4287	3147	2424	3363	2595	5885	5725	8146	5254	4816	3330	4799	3311
14	2097	2785	2570	2267	5704	7956	5093	4419	2586	2941	3164	1267	8455	4283	3695	3966	3843	2566	3561	2043
15+	3498	9380	7271	7551	14264	18087	17080	17444	13312	9802	7522	3667	6140	5595	6583	5630	4201	3651	5581	3265
1	131840	10520	116589	142935	186866	696992	96862	217522	151674	75626	110996	149285	694110	701587	172146	216123	617532	251645	808930	453193
2-4	119939	156516	237259	156873	250218	344034	508953	398376	364709	181220	311554	457369	437456	313045	723317	701072	505180	568851	414084	544003
5-9	31936	35868	25200	29797	29986	22351	34482	16527	12595	19309	21506	31725	27529	35740	52447	32978	21026	32013	36033	37292
10+	25065	18274	15506	16606	39432	54156	39130	36194	26763	22725	24525	17647	38562	39289	46080	33355	25725	22176	31879	20354
Tot	308780	221178	394554	346211	506502	1117533	679427	668619	555741	298880	468581	656026	1197657	1089661	993990	983528	1169463	874685	1290926	1054842

Table 22. Abundance indices used for east Atlantic bluefin tuna

Gear	LL	TRAP	BB	LL	PSFB	PSFB	PSM	PSM
Country	JAPAN	SPAIN	SPAIN	JAPAN	ITALY	ITALY	FRANCE	FRANCE
Area	EATL	EATL Gibraltar	EATL B.Biscay	MED	MED Tyrrhenian	MED Tyrrhenian	MED G.Lions	MED G.Lions
Ages	5+	6+	2	7+	3-7	8+	2	3
N/W	N	N	N	N	N	N	N	N
70			18.0					
71		11.0	3.7					
72		3.5	13.3					
73		18.2	5.6					
74	1.34	-	29.2	2.74				
75	1.43	15.5	42.2	2.00				
76	1.86	13.7	37.6	2.94				
77	2.63	10.1	43.9	6.36				
78	1.40	16.2	24.8	0.53				
79	2.02	16.8	7.8	1.82				
80	1.26	33.7	17.0	1.38	2.31	21.70		
81	0.92	33.0	25.5	0.90	8.22	14.30		
82	1.96	71.3	23.6	7.13	5.82	11.25	122.7	96.2
83	1.27	41.3	33.2	3.97	6.36	18.17	87.7	54.7
84	1.08	43.4	05.0	2.79	25.24	13.94	256.6	16.0
85	0.68	37.8	51.1	2.71	7.08	6.91	150.9	173.5
86	0.97	11.5	36.5	1.52	3.10	6.54	96.7	75.0
87	1.51	14.2	82.0	2.63	8.30	5.81	228.5	80.4
88	1.00	41.1	35.3	1.92	4.45	4.33	63.8	111.1
89	1.00	25.7	49.8	1.00	-	-	296.9	63.5
Fish Season	begin year	begi year	middle year	begin year	middle year	middle year	middle year	middle year

Table 23. Partial recruitment calculation for east Atlantic and Mediterranean bluefin.

Age	1989 svpa	1990 svpa	1990 svpa	1990 L-S	1990 final
1	0.83	0.73	0.75	-	0.60
2	0.94	1.00	1.00	0.66	0.66
3	0.73	1.01	0.96	1.00	1.00
4	0.33	0.32	0.29	0.40	0.40
5	0.15	0.11	0.10	0.17	0.17
6	0.12	0.11	0.09	0.14	0.14
7	0.14	0.13	0.10	0.28	0.28
8	0.14	0.12	0.10	0.22	0.22
9	0.19	0.17	0.13	0.17	0.17
10	0.36	0.34	0.25	0.24	0.24
11	0.46	0.45	0.30	0.24	0.24
12	0.76	0.58	0.35	0.24	0.24
13	1.00	0.81	0.42	0.28	0.28
14	1.00	1.00	0.40	0.28	0.28
15+	1.00	1.00	0.40	0.28	0.28
Parameters used:					
First year	1982	1985	1985	1970	1970
Final year	1988	1989	1989	1989	1989
First age	1	1	1	1	1
Final age	19	14	14	14	14
Natural mortality	0.18	0.14	0.14	0.14	0.14
Reference age	1	2	2		
F at reference age	0.50	0.40	0.40		
PR in terminal year	1.00	1.00	0.40		

Table 24. Fishing mortality rates at age for east Atlantic and Mediterranean bluefin tuna.

AGE	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.28	0.02	0.24	0.26	0.16	0.80	0.11	0.29	0.31	0.12	0.12	0.20	0.88	0.39	0.18	0.28	0.49	0.38	0.44	0.35
2	0.26	0.29	0.35	0.20	0.38	0.38	0.48	0.49	0.42	0.10	0.38	0.57	0.49	0.50	0.70	0.64	0.62	0.72	0.45	0.38
3	0.21	0.27	0.41	0.32	0.25	0.15	0.71	0.19	0.48	0.36	0.55	0.46	0.70	0.49	0.24	0.84	0.65	0.50	0.97	0.58
4	0.13	0.16	0.08	0.05	0.40	0.12	0.25	0.32	0.11	0.26	0.17	0.09	0.15	0.17	0.25	0.23	0.45	0.21	0.20	0.23
5	0.09	0.13	0.12	0.03	0.07	0.06	0.16	0.02	0.04	0.05	0.07	0.10	0.05	0.11	0.18	0.12	0.08	0.09	0.08	0.10
6	0.09	0.04	0.09	0.06	0.05	0.05	0.06	0.05	0.01	0.02	0.04	0.05	0.03	0.04	0.11	0.11	0.07	0.09	0.10	0.08
7	0.05	0.06	0.06	0.11	0.07	0.04	0.04	0.05	0.04	0.03	0.03	0.04	0.05	0.11	0.08	0.05	0.04	0.12	0.15	0.16
8	0.04	0.13	0.04	0.13	0.10	0.09	0.03	0.04	0.03	0.06	0.03	0.05	0.11	0.08	0.09	0.05	0.03	0.07	0.10	0.13
9	0.07	0.08	0.06	0.18	0.25	0.15	0.14	0.04	0.02	0.07	0.04	0.05	0.07	0.07	0.17	0.06	0.06	0.07	0.10	0.10
10	0.11	0.02	0.02	0.03	0.15	0.17	0.10	0.15	0.07	0.08	0.08	0.07	0.10	0.26	0.23	0.13	0.07	0.12	0.18	0.14
11	0.17	0.03	0.02	0.03	0.09	0.23	0.16	0.18	0.13	0.07	0.12	0.12	0.18	0.14	0.24	0.20	0.13	0.11	0.19	0.14
12	0.12	0.04	0.03	0.03	0.12	0.26	0.23	0.20	0.15	0.13	0.10	0.12	0.29	0.17	0.28	0.24	0.22	0.15	0.18	0.14
13	0.09	0.07	0.09	0.06	0.16	0.37	0.36	0.39	0.29	0.22	0.43	0.11	0.33	0.40	0.50	0.29	0.29	0.20	0.27	0.16
14	0.07	0.15	0.12	0.11	0.23	0.30	0.31	0.39	0.41	0.44	0.46	0.26	0.56	0.40	0.46	0.45	0.34	0.23	0.31	0.16
15+	0.07	0.15	0.12	0.11	0.23	0.30	0.31	0.39	0.41	0.44	0.46	0.26	0.56	0.40	0.46	0.45	0.34	0.23	0.31	0.16

AVERAGE F BY AGE GROUPS

1	0.28	0.02	0.24	0.26	0.16	0.80	0.11	0.29	0.31	0.12	0.12	0.20	0.88	0.39	0.18	0.28	0.49	0.38	0.44	0.35
2-4	0.20	0.24	0.28	0.19	0.34	0.22	0.48	0.33	0.34	0.24	0.37	0.38	0.45	0.38	0.40	0.57	0.57	0.48	0.54	0.40
5-9	0.07	0.09	0.07	0.10	0.11	0.08	0.09	0.04	0.03	0.04	0.04	0.06	0.06	0.08	0.13	0.08	0.05	0.09	0.11	0.11
10+	0.10	0.08	0.06	0.06	0.16	0.27	0.25	0.29	0.24	0.23	0.28	0.16	0.34	0.29	0.36	0.30	0.23	0.17	0.24	0.15

AVERAGE F BY AGE GROUPS (weighted by N)

1	0.28	0.02	0.24	0.26	0.16	0.80	0.11	0.29	0.31	0.12	0.12	0.20	0.88	0.39	0.18	0.28	0.49	0.38	0.44	0.35
2-4	0.22	0.26	0.32	0.22	0.34	0.30	0.55	0.39	0.39	0.23	0.39	0.49	0.51	0.44	0.59	0.67	0.60	0.61	0.60	0.40
5-9	0.07	0.09	0.08	0.09	0.09	0.06	0.09	0.04	0.03	0.04	0.04	0.06	0.06	0.08	0.13	0.09	0.06	0.09	0.10	0.11
10+	0.11	0.07	0.06	0.06	0.17	0.28	0.25	0.30	0.22	0.18	0.19	0.12	0.26	0.25	0.31	0.24	0.18	0.15	0.22	0.15

AVERAGE F BY AGE GROUPS (weighted by the catch)

1	0.28	0.02	0.24	0.26	0.16	0.80	0.11	0.29	0.31	0.12	0.12	0.20	0.88	0.39	0.18	0.28	0.49	0.38	0.44	0.35
2-4	0.23	0.27	0.36	0.26	0.35	0.34	0.59	0.43	0.43	0.29	0.43	0.53	0.56	0.47	0.65	0.71	0.60	0.66	0.71	0.42
5-9	0.08	0.10	0.09	0.12	0.13	0.08	0.13	0.05	0.03	0.05	0.05	0.07	0.07	0.09	0.14	0.10	0.06	0.09	0.11	0.12
10+	0.12	0.11	0.09	0.08	0.18	0.29	0.28	0.33	0.31	0.30	0.30	0.15	0.36	0.29	0.34	0.28	0.24	0.17	0.23	0.15

Table 25. Stock numbers at age (in 1,000's) at the beginning of the year for east Atlantic and Mediterranean bluefin tuna

AGE	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1	580	629	577	660	1341	1354	1025	933	613	703	1065	877	1273	2320	1116	943	1700	847	2440	1654	0
2	358	381	537	393	440	992	528	800	608	392	540	822	624	459	1362	810	618	902	502	1367	1016
3	150	240	249	328	279	261	593	283	426	348	309	320	403	333	242	589	372	290	380	279	811
4	144	105	159	144	207	189	195	253	204	229	210	156	176	173	178	165	220	169	153	126	136
5	125	110	77	128	120	121	146	132	160	159	153	155	123	131	127	121	114	123	119	109	87
6	100	99	84	60	108	97	100	108	113	135	132	125	121	102	103	93	93	92	98	96	86
7	103	80	83	67	49	89	80	82	89	97	115	110	103	102	86	80	72	75	73	77	77
8	92	85	65	68	52	40	75	67	68	75	82	97	92	85	80	69	66	60	58	54	57
9	90	77	65	54	52	41	31	63	56	57	61	69	80	72	68	63	57	55	49	46	42
10	67	73	61	54	39	35	30	24	53	47	46	51	57	65	58	50	52	47	45	39	36
11	46	52	62	52	45	30	26	24	18	42	38	37	42	45	44	40	38	42	36	33	29
12	40	34	44	53	44	36	21	19	18	14	35	29	29	30	34	30	29	29	33	26	25
13	27	31	28	37	44	34	24	14	14	13	10	27	23	19	22	22	20	20	22	24	19
14	34	22	25	23	30	33	21	15	8	9	9	6	21	14	11	12	14	13	14	15	18
15+	56	73	71	75	76	74	69	57	42	30	22	17	15	18	19	17	16	19	22	23	28
TOT	2013	2091	2188	2195	2927	3427	2962	2875	2489	2349	2828	2899	3182	3969	3551	3103	3481	2783	4044	3966	2465

SUMMARY BY AGE GROUPS

1	580	629	577	660	1341	1354	1025	933	613	703	1065	877	1273	2320	1116	943	1700	847	2440	1654	0
2-4	652	726	945	865	926	1443	1315	1337	1238	969	1060	1298	1203	966	1782	1565	1211	1361	1035	1772	1962
5-9	510	451	375	377	380	388	432	452	486	522	543	556	520	493	464	425	401	405	397	382	348
10+	271	285	292	293	279	241	190	153	152	155	160	167	186	191	188	171	169	170	172	159	155

Table 26. Blue marlin catch (MT) by gear and for North and South Atlantic - as of November 2, 1990

	1960	1961	1962	1963	1964	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
TOTAL	2815	4083	7308	9037	8010	6155	3859	2240	2434	3091	2864	3201	2375	3181	3017	3181	2312	2168	1495	1381	1611	1896	2734	1780	2212	2668	1913	1845	2336	2664
N. ATL.	684	653	3452	5141	4809	3682	2040	1173	1344	1601	1845	2115	1315	1616	1916	2075	1364	1253	971	878	1060	1247	1613	1139	1188	1293	1030	654	744	920
-LL	581	531	3331	5010	4645	3517	1884	970	1170	1388	1635	1932	1122	1406	1497	1683	978	876	553	480	639	780	1154	763	806	1062	726	384	402	696
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	1	0	0
CHI.TAI	0	0	9	27	8	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
CUBA	0	0	0	123	128	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
JAPAN	581	379	3223	4759	4434	3330	1677	485	474	658	758	1223	335	229	267	551	260	118	54	68	193	332	637	192	351	409	174	78	206	275
KOREA	0	0	0	0	1	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
PANAMA	0	0	0	0	0	0	0	0	0	0	**	**	10	208	62	44	47	87	42	6	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	0	3	4	1	0	0	23
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	20	61	92	140	214
USSR	0	0	0	0	0	1	1	3	3	3	2	3	7	10	1	3	0	1	1	**	0	0	0	0	0	0	7	23	0	0
VENEZUE	0	152	99	101	74	36	35	62	96	43	30	178	188	124	83	82	78	79	93	132	79	102	81	167	107	214	214	55	14	3
-RR	103	122	121	131	164	165	156	203	174	213	210	183	193	210	236	242	266	296	296	297	297	299	297	192	197	159	202	173	178	126
PORTUGA	0	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	11	7	2	0
USA	103	116	115	128	161	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
VENEZUE	0	6	6	3	3	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
-OTH	0	0	0	0	0	0	0	0	0	0	**	**	**	**	183	150	120	81	122	101	124	168	162	184	185	72	102	97	84	98
BARBADO	0	0	0	0	0	0	0	0	0	0	**	**	**	**	183	150	120	81	72	51	73	117	99	126	126	10	14	13	11	11
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	0	15
GRENADA	0	0	0	0	0	0	0	0	0	0	**	**	**	**	**	**	**	**	**	**	1	1	12	6	8	11	36	33	21	21
NLD.ANT	0	0	0	0	0	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
PORTUGA	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	1	1	1	++	1
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	2	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	++	1	++	++	0
S. ATL.	2131	3430	3856	3896	3201	2473	1819	1067	1090	1490	1019	1086	1060	1565	1101	1106	948	915	524	503	551	436	840	496	924	1275	783	1091	1492	1644
-LL	2131	3430	3856	3896	3201	2473	1819	1067	1090	1489	1018	1086	1060	1565	1101	1106	937	863	522	488	544	410	812	493	813	1164	673	987	1331	1483
BRASIL	**	41	24	12	12	12	12	6	15	17	38	21	26	8	16	12	34	171	41	18	20	5	16	16	31	25	30	33	48	53
CHI.TAI	0	0	11	21	5	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
CUBA	0	0	0	22	26	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
JAPAN	2131	3389	3821	3841	3156	2421	1693	588	472	302	247	172	85	117	17	57	4	17	15	66	115	136	495	248	482	691	335	362	617	825
KOREA	0	0	0	0	1	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
PANAMA	0	0	0	0	0	0	0	0	0	0	**	**	12	244	72	51	107	103	32	7	0	0	0	0	0	0	0	0	0	0
S.AFRIC	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	0	0
USSR	0	0	0	0	1	3	5	13	12	13	12	14	36	52	8	15	1	9	4	**	0	1	0	0	0	7	16	22	32	5
-OTH	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	11	52	2	15	7	26	28	3	111	111	110	104	161	161
BENIN	0	0	0	0	0	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
BRASIL	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	11	52	2	15	7	20	20	3	2	1	3	++	11	11
C.IVOIR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	100	100	100	138	150
ATL. UNCL	0	0	0	0	0	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
-PS	0	0	0	0	0	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
FIS	0	0	0	0	0	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
ESPANA	0	0	0	0	0	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

++ CATCH: < 0.5 MT
** CATCH: UNKNOWN

Table 27. White marlin catch (MT), by gear and for North and South Atlantic - as of November 2, 1990

	1960	1961	1962	1963	1964	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
TOTAL	313	830	2064	2614	3735	4906	3512	1426	2047	2254	2097	2258	2341	1784	1754	1576	1817	979	939	1014	958	1132	1092	1676	1076	1438	1587	1450	1057	1568
N. ATL.	85	108	381	914	1694	2127	1798	588	692	1212	1048	1547	1208	995	1218	1088	1052	501	428	481	508	780	653	1381	701	842	927	582	260	210
-LL	25	41	302	848	1620	2048	1711	497	594	1114	932	1440	1099	886	1103	977	938	390	317	370	396	669	543	1236	549	693	893	484	161	188
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	1	0	0
CHI.TAIW	0	0	1	4	3	2	32	47	58	132	97	178	244	120	248	84	142	44	79	62	105	174	130	203	52	100	319	153	++	4
CUBA	0	0	0	35	45	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
JAPAN	25	30	271	754	1493	1913	1417	174	273	451	419	915	339	328	381	404	540	80	27	42	99	118	84	27	52	45	56	60	68	80
KOREA	0	0	0	0	1	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
PANAMA	0	0	0	0	0	0	0	0	0	0	**	**	10	48	14	10	17	20	8	1	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	0	9	14	0	0	0	13
USA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	39	11	103	89	41	36
USSR	0	0	0	0	0	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
VENEZUEL	0	11	30	55	78	63	93	104	107	268	15	82	258	170	114	113	107	108	127	181	110	140	112	230	148	148	148	148	38	10
-RR	60	67	79	66	74	79	87	91	98	98	116	107	109	109	115	111	114	111	111	111	112	111	110	145	150	148	34	97	75	21
USA	60	60	74	64	70	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
VENEZUEL	0	7	5	2	4	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
-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	2	1	**	1	24	1
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	0	1
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	0	0	0	0	0	24	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	2	1	**	1	++	0
S. ATL.	228	722	1683	1700	2041	2779	1714	838	1355	1042	1049	711	1133	789	536	488	765	478	511	533	450	352	439	295	375	596	660	868	797	1358
-LL	228	722	1683	1700	2041	2779	1714	838	1355	1042	1049	711	1133	789	536	488	740	475	509	529	447	352	439	295	375	592	634	862	708	1269
ARGENTIN	0	0	0	0	0	0	0	3	14	0	**	20	100	57	++	2	2	2	**	0	0	0	0	0	0	0	0	0	0	0
BRASIL	**	60	34	17	17	17	17	9	21	24	54	15	94	10	36	31	41	126	163	128	58	36	82	66	60	40	117	84	81	157
CHI.TAIW	0	0	5	10	3	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
CUBA	0	0	0	9	17	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
JAPAN	228	662	1644	1664	2002	2718	1585	494	815	392	284	65	101	27	9	14	3	26	14	15	7	25	27	17	24	81	73	74	76	90
KOREA	0	0	0	0	2	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
PANAMA	0	0	0	0	0	0	0	0	0	0	**	**	16	75	22	16	59	31	1	2	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	0	0	0	0	0	1	5	0	54	0	0	0	1	1
USSR	0	0	0	0	0	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
-UNCL	0	0	0	0	0	0	0	0	0	++	++	0	0	0	0	0	25	3	2	4	3	++	++	++	++	4	26	6	89	89
ARGENTIN	0	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	4	0	0	0
BRASIL	0	0	0	0	0	0	0	0	0	++	++	0	0	0	0	0	25	3	2	4	3	++	++	++	++	++	++	0	1	1
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	0	0	22	6	88	88

++ CATCH: < 0.5 MT
** CATCH: UNKNOWN

Table 28. Atlantic sailfish* catch (MT) by gear and for east and west Atlantic - as of October 28, 1990

	1960	1961	1962	1963	1964	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
TOTAL	326	690	903	998	1483	2919	2420	1900	2596	2112	2778	2832	2461	1638	1351	1208	1531	1924	2645	3287	2472	2073	1912	3622	3125	2816	2545	3017	2609	2318
E. ATL.	0	0	0	0	0	3	5	90	89	95	98	126	161	160	124	165	193	816	1723	2350	1519	1047	784	2788	2020	1898	1538	2060	1541	1714
-LL	0	0	0	0	0	3	5	14	13	14	11	14	39	14	9	7	1	13	5	**	0	37	171	200	128	51	67	56	33	112
CAP VERT	0	0	0	0	0	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
CHI.TAIW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	9	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	158	200	115	19	55	50	22	53
KOREA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	1	1	7	8
ESPANA	0	0	0	0	0	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
USSR	0	0	0	0	0	3	5	14	13	14	11	14	39	14	9	7	1	13	5	**	0	37	0	0	0	0	2	5	4	4
-RR	0	0	0	0	0	0	0	2	5	7	13	38	48	70	33	61	76	93	79	77	62	88	69	49	41	35	43	40	52	50
SENEGAL	0	0	0	0	0	0	0	2	5	7	13	38	48	70	33	61	76	93	79	77	62	88	69	49	41	35	43	40	52	50
-TROL	0	0	0	0	0	0	0	74	71	74	74	74	74	74	74	75	91	72	65	27	266	437	448	376	80	224	438	500	385	529
SENEGAL	0	0	0	0	0	0	0	74	71	74	74	74	74	74	74	75	91	72	65	27	266	437	448	376	80	224	438	500	385	529
-UNCL	0	0	0	0	0	0	0	0	0	0	0	0	0	2	8	22	25	638	1574	2246	1191	485	96	2163	1771	1588	990	1464	1071	1023
BENIN	0	0	0	0	0	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
C.IVOIRE	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	40	40	40	76	60
GHANA	0	0	0	0	0	0	0	0	0	0	0	0	0	2	8	22	11	638	1574	2246	1191	449	16	2161	1658	1497	925	1392	950	950
KOREA	0	0	0	0	0	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
SENEGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	2	20	1	0	0	5	5
W. ATL.	111	329	301	236	259	330	312	347	354	352	709	663	467	396	452	440	554	699	691	644	628	568	767	650	931	796	908	914	989	539
-LL	**	196	154	77	82	139	107	136	136	116	449	396	196	123	159	144	178	191	203	159	148	116	305	192	409	318	386	493	743	297
BRASIL	**	159	91	46	46	46	46	23	57	27	21	70	105	37	82	88	124	137	139	68	93	46	68	49	87	36	189	127	301	89
CHI.TAIW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	42	39	49	19	300	126
CUBA	0	0	0	0	0	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
KOREA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37	39	21	24	5	7
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	3	78	40	16
VENEZUEL	0	37	63	31	36	93	61	113	79	89	428	326	91	86	77	56	54	54	64	91	55	70	56	115	74	74	74	74	19	4
-RR	111	133	147	159	177	191	205	211	218	236	232	239	243	245	255	258	266	310	310	310	311	310	309	312	352	228	233	237	38	34
BRASIL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37	26	35	36	27	27
USA	111	126	142	157	173	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
VENEZUEL	0	7	5	2	4	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
-UNCL	0	0	0	0	0	0	0	0	**	**	28	28	28	28	38	38	110	198	178	175	169	142	153	146	170	250	289	184	208	208
ARUBA	0	0	0	0	0	0	0	0	0	0	++	++	++	++	10	10	20	20	30	30	30	30	30	30	30	30	30	30	30	30
BRASIL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	62	119	90	84	87	55	53	8	4	0	20	0	10	10
DOMIN.R.	0	0	0	0	0	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
GRENADA	0	0	0	0	0	0	0	0	**	**	**	**	**	**	**	**	**	31	37	40	31	36	27	37	66	164	211	104	114	114
NLD.ANT.	0	0	0	0	0	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
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

Table 28. Continued.

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
TOTAL	326	690	903	998	1483	2919	2420	1900	2596	2112	2778	2832	2461	1638	1351
ATL.UNCL.	215	361	602	762	1224	2586	2103	1463	2153	1665	1971	2043	1833	1082	775
-LL	215	361	602	762	1224	2586	2103	1463	2153	1665	1971	2043	1833	1082	775
CHI.TAIW	0	0	2	4	2	2	34	183	594	593	498	779	802	598	248
CUBA	0	0	0	23	49	102	75	371	314	71	100	51	30	100	229
JAPAN	215	361	600	735	1170	2471	1845	678	970	458	594	446	221	144	137
KOREA	0	0	0	0	3	11	149	231	275	543	779	767	745	165	139
PANAMA	0	0	0	0	0	0	0	0	0	0	**	**	35	75	22

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
TOTAL	1208	1531	1924	2645	3287	2472	2073	1912	3622	3125	2816	2545	3017	2609	2318
ATL.UNCL.	603	784	409	231	293	325	458	361	184	174	122	99	43	79	65
-LL	603	784	409	231	293	325	458	361	184	174	122	99	43	79	65
CHI.TAIW	66	270	64	52	37	49	86	140	108	0	0	0	0	0	0
CUBA	262	185	156	120	191	198	213	0	0	0	0	0	0	0	0
JAPAN	150	137	47	20	39	55	94	173	69	97	122	99	43	79	60
KOREA	109	151	111	32	24	23	65	48	7	77	0	0	0	0	5
PANAMA	16	41	31	7	2	0	0	0	0	0	0	0	0	0	0

++ CATCH: < 0.5 MT
* INCLUDES SPEARFISH (T. Peluegeri and T. Belone)
** CATCH: UNKNOWN

Table 29. Swordfish annual catches (in MT) by regions and gears

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
TOTAL	4387	5591	6399	11900	13669	12954	12960	13792	14672	16897	17657	11746	12598	13247	13365
N. ATLANTIC	3828	4381	5342	10189	11258	8652	9338	9084	9137	9138	9425	5198	4727	6001	6301
-LL	1042	2060	3202	9192	10833	7759	8492	8656	8950	8938	9127	5140	4430	5446	5078
CANADA	0	0	311	6682	6888	4155	3731	4534	4342	4149	4800	0	0	0	2
CHI TAIW	0	0	0	2	1	1	37	76	115	218	234	226	129	243	204
CUBA	300	300	400	125	134	171	175	336	224	97	134	160	75	248	572
JAPAN	20	54	106	311	700	1025	658	280	262	130	298	914	784	518	1178
KOREA	0	0	0	0	1	2	27	46	24	22	40	159	155	374	152
MAROC	0	6	12	6	18	14	12	11	13	16	14	21	15	10	12
NORWAY	0	0	0	0	0	++	300	300	200	600	400	200	**	**	**
PANAMA	0	0	0	0	0	0	0	0	0	0	**	**	7	171	24
PORTUGAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESPANA	722	1700	2300	1000	1800	1433	2999	2690	3551	3502	3160	3384	3210	3833	2893
USA	0	0	65	1053	1279	945	534	340	180	93	0	0	0	0	0
USSR	0	0	0	0	0	5	8	22	21	11	24	24	28	26	17
VENEZUEL	0	0	8	13	12	8	11	21	18	100	23	52	27	23	24
NEI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-OTH & UNCL	2786	2321	2140	997	425	893	846	428	187	200	298	58	297	555	1223
CANADA	2328	1913	1781	800	211	519	702	260	51	108	0	0	0	0	0
FRANCE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IRELAND	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	0	0
LIBERIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MARTINIQ	**	**	**	**	**	**	0	0	0	0	0	0	0	0	0
MEXICO	++	++	++	++	++	++	++	++	++	++	0	0	2	4	3
MAROC	++	0	0	0	100	86	49	23	30	4	3	12	28	8	3
POLAND	0	0	0	0	0	0	0	0	0	0	0	++	0	100	0
PORTUGAL	0	0	0	0	9	6	15	11	12	11	8	11	21	37	92
ROUMANIE	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
ST LUCIA	0	0	0	0	0	0	0	0	0	0	++	++	++	++	++
USA	458	408	359	197	105	282	80	134	94	77	287	35	246	406	1125
USSR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
TOTAL	15344	13478	13910	19805	19831	23968	20657	24536	25704	33425	36940	38644	41127	48797	50576
N. ATLANTIC	8776	6587	6352	11797	11859	13527	11126	12832	14423	12516	14255	18278	19959	19137	17592
-LL	7015	5125	5401	11085	11099	12800	10507	12600	13897	12350	14120	18080	19753	18792	15923
CANADA	21	15	113	2314	2970	1794	542	542	960	465	550	973	876	686	1097
CHI TAIW	209	362	189	126	260	103	140	200	209	126	117	121	40	18	13
CUBA	280	283	398	281	128	278	227	254	410	206	162	636	910	832	834
JAPAN	2462	1149	793	946	542	1167	1315	1755	537	665	921	807	413	621	1637
KOREA	172	335	541	634	303	284	136	198	53	32	160	68	60	30	320
MAROC	15	12	6	11	208	136	124	91	125	79	137	178	207	195	219
NORWAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PANAMA	25	91	22	76	26	0	0	0	0	0	0	0	0	0	0
PORTUGAL	0	0	0	0	0	0	0	0	0	7	15	448	959	600	289
ESPANA	3747	2816	3309	3611	2582	3810	4013	4554	7100	6315	7431	9712	11134	9600	5696
USA	0	0	0	3020	3888	5015	3986	4912	4468	4416	4563	5035	5068	6026	5649
USSR	32	19	15	20	10	21	0	69	0	16	13	18	0	0	0
VENEZUEL	52	43	15	46	182	192	24	25	35	23	51	84	86	108	57
NEI	0	0	0	0	0	0	0	0	0	0	0	0	0	76	112
-OTH & UNCL	1761	1462	951	712	760	727	619	232	526	166	135	198	206	345	1669
CANADA	0	0	0	0	0	91	19	12	128	34	35	86	78	18	150
FRANCE	0	0	0	0	0	5	4	0	0	1	4	4	0	0	0
IRELAND	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0
ITALY	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0
LIBERIA	0	0	0	0	0	5	38	34	53	++	24	16	30	19	19
MARTINIQ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MEXICO	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
MAROC	0	0	1	0	0	0	0	0	4	2	0	0	0	1	4
POLAND	0	0	0	6	0	1	0	0	0	0	0	0	0	++	++
PORTUGAL	58	32	38	17	29	15	13	11	9	7	7	20	10	5	8
ROUMANIE	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
ESPANA	0	0	0	11	0	0	1	0	0	0	10	7	1	199	950
ST LUCIA	++	++	++	++	++	0	0	0	0	0	0	0	0	0	0
USA	1700	1429	912	664	731	610	544	175	332	122	55	65	83	103	538
USSR	0	0	0	3	0	0	0	0	0	0	0	0	4	0	0

Table 29. Continued.

	1960	1961	1962	1963	1964	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
S. ATLANTIC	459	1016	769	1417	2029	2578	1930	1539	2335	4290	5130	1945	2381	2799	2451	2650	2674	2704	2548	2862	5058	3819	6295	5330	9143	9475	5825	5183	11401	15273
-LL	359	816	769	1417	2029	2578	1930	1539	2235	4090	5130	1943	2381	2799	2451	2650	2674	2689	2531	2833	4914	3782	6192	5235	8901	8752	4882	4599	10851	14720
ARGENTIN	281	111	196	400	508	400	200	79	259	500	400	63	100	48	10	10	111	132	4	0	++	0	0	0	0	0	0	0	0	0
BRASIL	**	440	251	125	125	125	125	62	100	181	162	113	108	137	348	318	399	389	293	386	1476	618	978	754	463	501	727	921	810	705
CHI TAIW	0	0	1	4	2	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
CUBA	0	0	0	63	101	164	122	559	410	170	148	74	66	221	509	248	317	302	319	272	316	147	432	818	1161	1301	95	173	159	83
JAPAN	78	265	321	825	1288	1845	1300	474	859	2143	2877	662	1023	480	191	805	105	514	503	782	2029	2170	3287	1908	4395	4613	2913	1877	3426	3792
KOREA	0	0	0	0	1	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
PANAMA	0	0	0	0	0	0	0	0	0	0	**	**	12	274	90	40	219	28	83	26	0	0	0	0	0	0	0	0	0	0
S AFRICA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	3	3	5	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	66	0	4393	7725
URUGUAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	94	583	1099	1953	1140	543	699	432	314
USSR	0	0	0	0	4	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
NEI	0	0	0	0	0	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
-OTH & UNCL	100	200	**	**	**	**	**	**	100	200	0	2	0	0	0	0	++	15	17	29	144	37	103	95	242	723	943	584	550	553
ANGOLA	100	200	++	++	0	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
ARGENTIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	++	0	0	0	0	0	20	0	0	361	31	351	198	198
BENIN	0	0	0	0	0	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
BRASIL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	++	12	5	1	3	1	1	0	1	0	1	0	0	0
BULGARIA	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
C IVOIRE	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	10	10	10	10	10
GHANA	**	**	**	**	**	**	**	**	100	200	0	0	0	0	0	0	0	0	0	0	110	5	55	5	15	25	13	123	235	235
JAPAN	0	0	0	0	0	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
NIGERIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**	**	83	69	0	0	0	0	0
S AFRICA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	31	9	3	7	23	3	2	2	4	++
TOGO	0	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	32	1	++	++
USSR	0	0	0	0	0	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
MED	100	194	288	294	382	1724	1692	3169	3200	3469	3102	4603	5490	4447	4613	3918	4217	4854	5460	5110	5383	5712	5409	5951	11766	13210	14541	15985	18259	17711
-LL	0	94	188	94	282	1423	1192	869	1196	1350	1114	1426	1529	1288	893	212	3402	3879	4324	3986	4075	4292	4004	4462	4792	4492	5468	4951	5867	5234
CYPRUS	0	0	0	0	0	0	0	0	0	0	0	0	++	++	++	5	59	95	82	98	72	78	103	28	63	71	154	84	121	139
GREECE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	91	690	689	965	925	1530	1163	1251	1251
ITALY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3067	2973	3348	3085	3252	3002	2306	2375	2463	2226	2341	2528	2669	2669
JAPAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	3	1	1	5	6	19	14	7	3	4	1
MAROC	0	94	188	94	282	223	192	169	196	250	214	326	229	183	193	118	186	144	172	0	++	++	0	43	39	37	99	39	62	97
ESPANA	0	0	0	0	0	1200	1000	700	1000	1100	900	1100	1300	1105	700	89	89	667	720	800	750	1120	900	1321	1243	1219	1337	1134	1760	1077
-OTH & UNCL	100	100	100	200	100	301	500	2300	2004	2119	1988	3177	3961	3159	3720	3706	815	975	1136	1124	1308	1420	1405	1489	6974	8718	9073	11034	12392	12477
ALGERIE	0	0	0	0	0	0	0	0	0	0	**	++	++	100	196	500	368	370	320	521	650	760	870	877	884	890	847	1820	2621	2621
ITALY	**	**	**	**	**	**	**	1900	1400	2000	1800	2900	3700	2800	3330	3002	279	372	675	424	447	412	318	327	5894	7473	7849	8477	8947	8947
LIBYA	0	0	0	0	0	200	200	300	500	++	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MALTA	**	**	**	**	**	++	++	++	++	++	100	200	200	200	171	191	156	199	121	135	198	171	158	53	84	96	87	117	185	185
MAROC	0	0	0	0	0	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
ESPANA	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	8	0	0	2	87
TUNISIE	0	0	0	0	0	0	0	0	0	0	++	++	++	++	5	3	5	0	0	0	0	7	19	15	15	61	64	63	80	80
TURKEY	100	100	100	200	100	100	300	99	103	119	88	76	60	59	15	10	7	34	20	44	13	70	40	216	95	190	226	557	557	557

** CATCH: UNKNOWN.

++ CATCH: < 0.5 MT

Table 30. Catch at age (in number) for Atlantic swordfish, 1978-1989

North Atlantic

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
0	580	1178	3306	2953	3697	4149	5187	4995	13401	19646	21366	7573
1	6402	10406	25881	14760	20357	29247	28526	32636	45821	73249	85168	72278
2	19279	27379	46023	34832	31038	54190	51459	57999	91183	116581	131543	112481
3	36184	33384	49655	40424	43192	55267	54705	65603	85681	107162	102241	93068
4	35416	32012	39174	34777	39982	48456	43471	51681	65921	72945	64364	60170
5	26021	22812	25817	20987	26889	30545	25255	27096	34974	37875	31581	28239
6	13661	14327	14852	11283	13260	15415	12365	12857	16198	18216	13235	13286
7	8664	8992	9327	7282	7745	8368	6325	7216	8046	7922	7630	7234
8	4269	4694	4697	4143	4971	4023	3166	3551	4203	3931	3610	3401
9	3290	3494	3228	2428	2932	2599	1985	2258	2862	2206	2039	2194
10	2051	2057	1927	1557	1678	1381	1106	1166	1597	1702	1102	1106
11	1074	1470	1151	928	1209	873	738	672	1006	1071	778	750
12	820	825	707	622	619	522	407	434	644	604	460	483
13	712	851	496	511	478	367	309	287	419	368	346	369
14	507	651	399	376	315	352	284	231	322	328	232	167
15+	5228	5985	5113	4758	6193	3808	2845	2833	4177	3972	2572	3255
TOT	164159	170515	231754	182622	204557	259560	238132	271514	376455	467777	468267	406053

Northwest Atlantic

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
0	187	788	2260	1263	3098	2263	3206	3055	6344	6132	12519	4507
1	3552	6579	19304	7727	15738	17664	19508	20387	30512	46567	42588	49736
2	11836	19811	34201	21037	21621	26710	35083	33250	60434	67159	82106	79484
3	25585	24278	34832	23631	27616	23716	30631	38377	56798	57828	58520	62611
4	23084	22961	24717	17529	19480	18974	19943	27612	43135	36144	33742	35439
5	15644	16101	16659	10841	12106	12211	11372	15032	21217	18020	15649	17095
6	7810	10177	9378	6530	6396	7414	6021	7295	10323	8673	7348	8437
7	4913	6861	5584	4348	3845	4308	3284	4095	5065	4337	3961	4547
8	2369	3638	3000	2436	2675	2498	1705	2144	2770	2259	1906	2435
9	1826	2654	1866	1586	1657	1649	1017	1362	2088	1272	1167	1420
10	1000	1626	1163	1049	906	923	650	749	1172	931	734	869
11	497	1282	781	594	706	619	435	465	722	587	535	585
12	548	704	500	423	379	358	225	291	508	313	314	391
13	407	740	313	353	315	246	176	183	316	219	178	248
14	228	560	269	257	205	272	153	149	245	216	150	134
15+	3097	5042	3419	3685	4091	2799	1972	2091	3308	2794	1872	2470
TOT	102584	123800	158245	103291	120833	122625	135383	156537	244955	253450	263290	270408

Northeast Atlantic

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
0	393	391	1046	1690	600	1886	1981	1940	7058	13514	8847	3066
1	2849	3827	6577	7033	4618	11583	9018	12249	15309	26682	42580	22542
2	7444	7568	11821	13795	9418	27479	16376	24749	30749	49421	49437	32997
3	10600	9106	14823	16792	15577	31551	24074	27226	28883	49335	43721	30458
4	12332	9051	14458	17249	20502	29481	23528	24069	22786	36801	30622	24731
5	10376	6711	9158	10146	14784	18334	13883	12065	13758	19855	15932	11144
6	5851	4150	5475	4752	6864	8001	6343	5562	5875	9543	5888	4849
7	3751	2131	3743	2934	3900	4059	3041	3121	2981	3586	3669	2687
8	1900	1056	1697	1707	2296	1524	1461	1406	1434	1672	1704	966
9	1464	840	1362	843	1275	950	968	895	774	934	871	774
10	1051	431	764	508	772	458	456	417	425	771	368	237
11	577	188	370	333	503	254	303	207	284	484	242	165
12	272	121	208	199	240	165	182	144	136	291	146	92
13	305	111	182	157	163	120	132	104	103	149	168	121
14	280	91	130	119	111	80	130	82	77	112	83	33
15+	2130	943	1693	1073	2102	1009	873	743	869	1178	700	786
TOT	61575	46715	73508	79331	83723	136934	102749	114977	131500	214326	204978	13564

Table 30. Continued.

Total Atlantic

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
0	648	1262	3472	3075	3994	4201	6163	5811	13677	19980	24438	10568
1	6887	11022	26896	16066	23625	30793	33914	40633	51480	78616	97928	95828
2	20764	30707	49752	37988	42336	62163	68090	80123	104915	132784	154152	153516
3	37647	40756	58097	44794	62079	68195	80302	91422	104093	123121	153415	158332
4	37621	37535	51669	40671	56681	60195	67403	86954	83487	87756	101412	121527
5	29903	28196	35457	27520	42111	44080	43923	52007	51044	51970	57071	67803
6	18547	18083	26062	16846	23971	26395	24292	25617	26289	29691	29063	31884
7	11462	11579	16482	11100	13315	11553	13654	12178	13824	13469	15870	15389
8	5314	6286	7305	6471	7743	6114	6488	6812	6787	5988	8930	6593
9	4632	5134	4569	4113	4358	3280	3955	3907	4563	3620	4984	3504
10	2922	3292	2754	2858	2805	2087	2553	2142	3021	2272	1747	1277
11	1580	2390	1499	1725	1745	1008	1572	1108	1688	1693	1199	1071
12	1041	964	865	874	902	584	844	634	930	857	1151	539
13	1017	980	753	713	675	517	552	515	558	708	1432	751
14	752	746	564	540	499	474	440	444	481	367	296	199
15+	7984	6962	6185	8287	7667	4608	5048	5535	5548	5559	3976	3959
TOT	188720	205893	292383	223642	294505	326247	359190	415841	472385	558452	657064	672741

Mediterranean

AGE	1985	1986	1987	1988	1989
0	35642	29081	69511	97215	75695
1	107301	87186	108824	181543	172926
2	96601	133124	106322	116476	143001
3	56811	57576	67652	72703	70163
4	31054	38610	47965	42347	37880
5	14595	16551	18951	14038	11342
6	2977	3165	3768	4158	4912
7	1179	2694	1855	1529	1043
8	510	1469	1245	1638	981
9	450	163	750	513	194
10	168	29	145	140	73
11	0	3	4	5	217
12	0	2	121	67	74
13	0	2	240	133	2
14	0	1	120	65	3
15+	10	5	120	65	12
TOT	347298	369660	427592	532637	518519

Table 31. CPUE series used for tuning VPA

A. Total North Atlantic

	US AGE 1 1-4A	US AGE 2 1-4A	US AGE 3 1-4A	US AGE 4 1-4A	US AGE 5+ 1-4A	SPAIN AGE 1 4A&B	SPAIN AGE 2 4A&B	SPAIN AGE 3 4A&B	SPAIN AGE 4 4A&B	SPAIN AGE 5+ 4A&B	JAPAN AGE 5+ NORTH
78											3.4348
79											1.4662
80											1.9933
81	1.0000	1.0000	1.0000	1.0000	1.0000						1.3096
82	1.3789	0.8186	0.6931	0.8795	0.8120						1.6493
83	1.5084	0.8688	0.4261	0.5184	0.4597	1.0000	1.0000	1.0000	1.0000	1.0000	0.9624
84	1.2561	0.9272	0.4966	0.5299	0.2246	1.0482	0.9271	1.0812	1.0313	0.9772	1.3129
85	1.6990	0.8817	0.5454	0.6133	0.3766	1.0345	1.2312	1.0950	1.0243	0.8790	1.0435
86	2.1377	1.3000	0.4747	0.5594	0.2799	1.5526	1.1407	0.9090	0.7522	0.7442	1.0931
87	2.2693	1.1498	0.4762	0.4488	0.2305	2.1523	1.5476	0.9993	0.7140	0.6220	0.8533
88	1.9267	1.2912	0.4631	0.4433	0.2024	2.3916	1.3551	0.8898	0.6412	0.5618	1.1628
89	2.4991	1.1720	0.4360	0.4163	0.2147	2.0886	1.6130	0.8058	0.5730	0.4758	1.0000

B. Northwest Atlantic

	US AGES 1-5 1-4A	US AGE 1 1-4A	US AGE 2 1-4A	US AGE 3 1-4A	US AGE 4 1-4A	US AGE 5 1-4A	SPAIN AGE 1 4A	SPAIN AGE 2 4A	SPAIN AGE 3 4A	SPAIN AGE 4 4A	SPAIN AGE 5+ 4A	JAPAN AGE 5+ 1-4A
78												4.5265
79												2.2640
80												2.2236
81	SAME AS											2.2063
82	TOTAL	1.0000	1.0000	1.0000	1.0000	1.0000						4.6826
83	ATLANTIC	1.1204	1.0768	0.6226	0.5974	0.5743						1.5242
84	FOR	1.0867	1.1490	0.7259	0.6123	0.4421						1.9796
85	1981-89	1.2702	1.0920	0.7957	0.7084	0.4708	1.0000	1.0000	1.0000	1.0000	1.0000	1.9073
86	SERIES	1.6051	1.6130	0.6931	0.6466	0.3512	2.5695	0.8368	0.6361	0.5672	0.6213	2.2677
87		1.7070	1.4234	0.6941	0.5188	0.2890	3.3865	1.2114	0.6041	0.4309	0.4090	1.1561
88		1.4491	1.6034	0.6759	0.5128	0.2535	5.6330	1.6231	0.7061	0.4400	0.3450	1.2621
89		1.8819	1.4561	0.6369	0.4816	0.2692	4.9613	1.7127	0.7301	0.4388	0.3758	1.0000

Table 31. Continued.

C. Northeast Atlantic

	SPAIN AGE 1 4B	SPAIN AGE 2 4B	SPAIN AGE 3 4B	SPAIN AGE 4 4B	SPAIN AGE 5+ 4B	JAPAN AGE 5+ 4B
78						3.5597
79						1.5961
80						2.6229
81						1.2429
82						1.3760
83	1.0000	1.0000	1.0000	1.0000	1.0000	0.9563
84	1.0986	0.8544	0.9681	0.9745	0.9737	1.3178
85	1.1844	1.2026	0.9758	0.9185	0.7903	0.8962
86	1.7985	1.2085	0.8559	0.7035	0.6872	0.8377
87	2.4629	1.6162	1.0470	0.7454	0.6254	0.8965
88	2.4226	1.2649	0.8542	0.6523	0.5550	1.3224
89	2.1474	1.5827	0.7385	0.5411	0.4225	1.0000

D. TOTAL ATLANTIC (SOUTH+NORTH)

AGE	US 1-5+ 1-4A	SPAIN AGE 1 ALL	SPAIN AGE 2 ALL	SPAIN AGE 3 ALL	SPAIN AGE 4 ALL	SPAIN AGE 5+ ALL	JAPAN AGE 5+ ALL
78							2.7708
79							1.3274
80							1.5423
81	SAME						1.3410
82	AS						1.1684
83	LISTED	1.0000	1.0000	1.0000	1.0000	1.0000	0.9917
84	IN	1.0479	0.9270	1.0813	1.0313	0.9771	1.2643
85	TABLE A	1.0342	1.2311	1.0950	1.0244	0.8789	0.9160
86		1.5522	1.1407	0.9091	0.7523	0.7442	1.0709
87		2.1514	1.5475	0.9993	0.7140	0.6220	0.9679
88		2.4048	1.3564	0.8885	0.6402	0.5627	1.0328
89		2.0762	1.6114	0.8069	0.5738	0.4751	1.0000

Table 32. North Atlantic swordfish stock structure hypotheses and affirmative/negative comments regarding support of the various hypotheses by available data.

Stock structure	CPUE by age	Larval Dist.	Catch Dist. (JLL Data)	Mark/Recapture (Interchange)	Size Dist.	Recruitment Trends
N. Atl. single stock	--	Yes	Yes	[1]	Yes	--
Separate stocks:						
a) Areas 1,2,3,4A vs. 4B (Boundary at 30°W)	No	No	No	[1]	No[2]	No[3]
b) Areas 1,2,3,4A vs. 4B (Boundary at 60°W)	--	No	No	Yes	No[2]	Yes[4]
N + S single stock	--	Yes	--	No[5]	--	--

COMMENTS:

[1]There have been no transatlantic recoveries reported which indicate direct E-W or W-E movement. However, movement has been demonstrated from tropical eastern areas to the temperate central areas and from central areas to the tropical west. Moreover, a common spawning stock in the tropical zone could be feeding E-W production units with slight communication between both sides at the high latitudes. The differences in the probability of obtaining recoveries in different east/west areas are not explained.

[2]If recruitment and exploitation are the same for both stocks, similar age composition would mask existence of separate stocks. However, exploitation patterns appear to be somewhat different in the east and west.

[3]In VPAs, run separately for eastern and western stocks, recruitment trends were generally parallel.

[4]Substantial inconsistency occurs between eastern and western stock recruitment trends for the West 1, 2, 3 hypothesis.

[5]No recovery from the North Atlantic has been reported in the south. Moreover, a common spawning population in the tropical area could be feeding the North and South Atlantic. The different probabilities for obtaining recoveries in different areas of the Atlantic have not been taken into account.

JLL = Japanese longline.

Table 33A. VPA estimates for swordfish stock size (in number - as of January 1)
- North Atlantic (ages pooled for 9+)

AGE	78	79	80	81	82	83	84	85	86	87	88	89	90
1	370317	398181	405079	408054	478275	512309	532695	568312	605265	642799	723302	765789	0
2	260468	297408	316607	308300	320762	373204	393052	410391	435846	454218	460258	515432	561804
3	194703	195863	218809	217763	221019	234633	256743	275440	283755	274828	267147	258739	320854
4	140563	126847	130306	134504	141911	142095	142424	161005	166547	155434	129093	127188	128460
5	88825	83263	75092	71532	78881	80291	72903	77602	85469	77364	62138	48293	50424
6	48078	49369	47685	38340	39729	40480	38388	37054	39253	38691	29552	22721	14445
7	29350	27098	27560	25717	21264	20639	19340	20340	18815	17650	15416	12371	6796
8	14680	16254	14124	14203	14518	10471	9411	10163	10188	8211	7373	5816	3700
9+	47050	53093	39154	38327	39205	25774	22812	22555	26728	21412	15377	14235	5998
1	370317	398181	405079	408054	478275	512309	532695	568312	605265	642799	723302	765789	0
2-4	595735	620119	665723	660567	683692	749932	792220	846836	886147	884480	856498	901360	1011117
5+	227983	229077	203614	188119	193596	177655	162856	167715	180452	163326	129856	103437	81364

Table 33B. VPA estimates for swordfish fishing mortality - North Atlantic (ages pooled for 9+)

AGE	78	79	80	81	82	83	84	85	86	87	88	89
1	0.0193	0.0292	0.0730	0.0407	0.0481	0.0650	0.0608	0.0654	0.0871	0.1340	0.1388	0.1098
2	0.0851	0.1069	0.1743	0.1328	0.1127	0.1740	0.1556	0.1690	0.2611	0.3308	0.3760	0.2740
3	0.2285	0.2075	0.2866	0.2282	0.2418	0.2992	0.2666	0.3031	0.4019	0.5556	0.5421	0.5002
4	0.3237	0.3243	0.3997	0.3337	0.3695	0.4674	0.4072	0.4333	0.5668	0.7169	0.7832	0.7252
5	0.3874	0.3574	0.4722	0.3881	0.4671	0.5379	0.4768	0.4816	0.5926	0.7624	0.8061	1.0069
6	0.3733	0.3830	0.4175	0.3895	0.4549	0.5386	0.4352	0.4777	0.5993	0.7202	0.6708	1.0069
7	0.3910	0.4516	0.4629	0.3718	0.5083	0.5853	0.4435	0.4914	0.6292	0.6729	0.7747	1.0069
8	0.3839	0.3807	0.4528	0.3854	0.4698	0.5449	0.4594	0.4820	0.5991	0.7378	0.7625	1.0069
9+	0.3839	0.3807	0.4528	0.3854	0.4698	0.5449	0.4594	0.4820	0.5991	0.7378	0.7625	1.0069
Fishing mortality rate pooled over age categories												
1	0.0193	0.0292	0.0730	0.0407	0.0481	0.0650	0.0608	0.0654	0.0871	0.1340	0.1388	0.1098
2-4	0.1835	0.1797	0.2516	0.2022	0.2028	0.2629	0.2325	0.2578	0.3571	0.4573	0.4793	0.3898
5+	0.3839	0.3807	0.4528	0.3854	0.4698	0.5449	0.4594	0.4820	0.5991	0.7378	0.7625	1.0069

Table 34A. VPA estimates for swordfish stock size (in number - as of January 1) - North Atlantic (ages pooled for 5+)

AGE	78	79	80	81	82	83	84	85	86	87	88	89	90
1	390526	391973	414083	419385	489925	524987	550944	602089	601581	643757	718083	851049	0
2	281769	313955	311525	315671	330039	382742	403431	425331	463498	451201	461043	511160	631596
3	203516	213300	232354	213604	227052	242227	264549	283934	295981	297444	264682	259380	317361
4	155288	134056	144573	145579	138509	147030	148633	167389	173491	165419	147523	125180	128982
5+	264482	252269	228098	209166	209892	189896	171256	173748	180399	164130	134838	116892	90598
1	390526	391973	414083	419385	489925	524987	550944	602089	601581	643757	718083	851049	0
2-4	640572	661311	688452	674854	695601	771999	816613	876654	932970	914065	873249	895721	1077939
5+	264482	252269	228098	209166	209892	189896	171256	173748	180399	164130	134838	116892	90598

Table 34B. VPA estimates for swordfish fishing mortality - North Atlantic (ages pooled for 5+)

AGE	78	79	80	81	82	83	84	85	86	87	88	89
1	0.0182	0.0297	0.0714	0.0396	0.0469	0.0634	0.0588	0.0616	0.0876	0.1338	0.1399	0.0982
2	0.0784	0.1010	0.1774	0.1295	0.1093	0.1693	0.1513	0.1626	0.2436	0.3334	0.3752	0.2766
3	0.2175	0.1889	0.2675	0.2332	0.2345	0.2884	0.2577	0.2926	0.3818	0.5012	0.5488	0.4986
4	0.2883	0.3040	0.3527	0.3041	0.3805	0.4477	0.3866	0.4130	0.5370	0.6564	0.6468	0.7421
5+	0.3217	0.3393	0.3936	0.3394	0.4247	0.4997	0.4315	0.4609	0.5994	0.7326	0.7219	0.8283
Fishing mortality pooled over age categories												
1	0.0182	0.0297	0.0714	0.0396	0.0469	0.0634	0.0588	0.0616	0.0876	0.1338	0.1399	0.0982
2-4	0.1696	0.1675	0.2423	0.1975	0.1989	0.2544	0.2248	0.2479	0.3360	0.4390	0.4678	0.3928
5+	0.3217	0.3393	0.3936	0.3394	0.4247	0.4997	0.4315	0.4609	0.5994	0.7326	0.7219	0.8283

Table 35A. VPA estimates for swordfish stock size (in number - as of January 1). - Northwest Atlantic

AGE	78	79	80	81	82	83	84	85	86	87	88	89	90
1	222830	228985	219733	222585	272561	318226	321417	353674	352421	404378	443210	522969	0
2	175824	179230	181538	162494	175262	208953	244601	245552	271168	261021	289106	324470	383325
3	130544	133274	128884	117855	114084	124009	147009	168662	171086	167676	153372	162989	194225
4	107288	83861	87266	74239	75233	68585	80190	92810	103586	89148	85452	73177	77393
5+	165712	168289	141500	126584	119822	112315	101188	106321	107888	91910	80485	75423	55610
1	222830	228985	219733	222585	272561	318226	321417	353674	352421	404378	443210	522969	0
2-4	413655	396365	397687	354587	364578	401546	471800	507023	545840	517845	527930	560636	654943
5+	165712	168289	141500	126584	119822	112315	101188	106321	107888	91910	80485	75423	55610

Table 35B. VPA estimates for swordfish fishing mortality - Northwest Atlantic

AGE	78	79	80	81	82	83	84	85	86	87	88	89
1	0.0177	0.0322	0.1018	0.0390	0.0658	0.0631	0.0692	0.0656	0.1002	0.1356	0.1119	0.1106
2	0.0771	0.1298	0.2320	0.1537	0.1459	0.1516	0.1717	0.1613	0.2807	0.3317	0.3731	0.3132
3	0.2425	0.2234	0.3516	0.2489	0.3089	0.2360	0.2599	0.2875	0.4519	0.4741	0.5400	0.5448
4	0.2696	0.3571	0.3719	0.3000	0.3342	0.3616	0.3188	0.3947	0.6067	0.5852	0.5650	0.7503
5+	0.2931	0.3882	0.4042	0.3261	0.3633	0.3930	0.3465	0.4290	0.6595	0.6361	0.6141	0.8156
Fishing mortality rate pooled over age categories												
1	0.0177	0.0322	0.1018	0.0390	0.0658	0.0631	0.0692	0.0656	0.1002	0.1356	0.1119	0.1106
2-4	0.1753	0.2057	0.2994	0.2142	0.2320	0.2106	0.2225	0.2420	0.3884	0.4168	0.4488	0.4256
5+	0.2931	0.3882	0.4042	0.3261	0.3633	0.3930	0.3465	0.4290	0.6595	0.6361	0.6141	0.8156

Table 36A. VPA estimates for swordfish stock size (in number - as of January 1). - Northeast Atlantic

AGE	78	79	80	81	82	83	84	85	86	87	88	89	90
1	170047	165997	190844	196111	218111	208609	233171	254776	262341	255248	293402	319029	0
2	107218	136650	132451	150312	154213	174404	160342	182764	197538	200973	184926	201865	240863
3	74821	81067	105051	97782	110626	117761	118046	116513	127338	134041	120132	107003	135564
4	48846	51710	58164	72656	64941	76541	68078	74993	70920	78288	65556	59191	60263
5+	96792	83063	87107	83699	92059	80577	71003	67925	73258	73676	57198	46635	45017
1	170047	165997	190844	196111	218111	208609	233171	254776	262341	255248	293402	319029	0
2-3	230884	269427	295666	320750	329780	368707	346466	374270	395796	413302	370613	368059	436690
5+	96792	83063	87107	83699	92059	80577	71003	67925	73258	73676	57198	46635	45017

Table 36B. VPA estimates for swordfish fishing mortality - Northwest Atlantic

AGE	78	79	80	81	82	83	84	85	86	87	88	89
1	0.0187	0.0258	0.0387	0.0403	0.0236	0.0632	0.0436	0.0545	0.0665	0.1223	0.1739	0.0811
2	0.0796	0.0630	0.1035	0.1066	0.0697	0.1903	0.1193	0.1614	0.1878	0.3146	0.3471	0.1982
3	0.1695	0.1320	0.1687	0.2093	0.1683	0.3480	0.2537	0.2965	0.2864	0.5152	0.5078	0.3741
4	0.3244	0.2137	0.3186	0.3020	0.4245	0.5467	0.4753	0.4332	0.4338	0.7186	0.7121	0.6095
5+	0.3808	0.2509	0.3739	0.3544	0.4982	0.6417	0.5579	0.5085	0.5091	0.8434	0.8358	0.7154
	Fishing mortality rate pooled over age categories											
1	0.0187	0.0258	0.0387	0.0403	0.0236	0.0632	0.0436	0.0545	0.0665	0.1223	0.1739	0.0811
2-4	0.1562	0.1110	0.1659	0.1791	0.1643	0.3055	0.2266	0.2524	0.2596	0.4446	0.4549	0.3048
5+	0.3808	0.2509	0.3739	0.3544	0.4982	0.6417	0.5579	0.5085	0.5091	0.8434	0.8358	0.7154

Table 37A. VPA estimates for swordfish stock size (in number - as of January 1) - Total Atlantic

AGE	78	79	80	81	82	83	84	85	86	87	88	89	90
1	531474	564135	609535	634820	762934	761446	794084	857376	928782	943387	986182	1246336	0
2	413388	428914	451922	474769	505241	603308	595624	619530	665288	713968	701477	719126	933977
3	292025	319715	323465	325156	354445	375474	437906	426286	435035	450218	465054	435708	450709
4	209429	205168	225037	212541	225862	234316	246037	286259	266797	262621	258044	243195	214896
5+	387732	378484	367998	347057	348712	324566	313155	304658	306439	291689	271178	230272	161072
1	531474	564135	609535	634820	762934	761446	794084	857376	928782	943387	986182	1246336	0
2-4	914842	953797	1000423	1012466	1085548	1213099	1279567	1332074	1367119	1426807	1424576	1398030	1599582
5+	387732	378484	367998	347057	348712	324566	313155	304658	306439	291689	271178	230272	161072

Table 37B. VPA estimates for swordfish fishing mortality - Total Atlantic

AGE	78	79	80	81	82	83	84	85	86	87	88	89
1	0.0144	0.0218	0.0499	0.0283	0.0347	0.0456	0.0482	0.0537	0.0630	0.0963	0.1158	0.0885
2	0.0570	0.0822	0.1292	0.0923	0.0968	0.1204	0.1345	0.1535	0.1905	0.2287	0.2762	0.2672
3	0.1530	0.1512	0.2200	0.1644	0.2139	0.2227	0.2251	0.2686	0.3047	0.3566	0.4483	0.5068
4	0.2200	0.2245	0.2905	0.2361	0.3221	0.3311	0.3574	0.4048	0.4199	0.4556	0.5614	0.7859
5+	0.2760	0.2817	0.3645	0.2962	0.4042	0.4155	0.4484	0.5079	0.5268	0.5716	0.7044	0.9860
	Fishing mortality rate pooled over age categories											
1	0.0144	0.0218	0.0499	0.0283	0.0347	0.0456	0.0482	0.0537	0.0630	0.0963	0.1158	0.0885
2-4	0.1227	0.1344	0.1927	0.1441	0.1781	0.1895	0.2050	0.2397	0.2677	0.3069	0.3778	0.4143
5+	0.2760	0.2817	0.3645	0.2962	0.4042	0.4155	0.4484	0.5079	0.5268	0.5716	0.7044	0.9860

Table 38. Atlantic and world southern bluefin catches (MT) by gear, area and country

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
ATLANTIC TOTAL	4680	6203	2823	2569	1138	514	1636	1476	413	1166	562	549*
CATCH BY GEAR												
LL	4680	6203	2810	2563	1138	514	1636	1476	413	1162	562	548*
BB	0	0	13	6	0	0	0	0	0	0	0	1
SPORT	0	0	0	0++		0	0	0	0	0	0	0
CATCH BY COUNTRY												
CHINA-TAIWAN	29	11	22	57	3	9	0	8	24	42	14	0
JAPAN	4651	6192	2788	2506	1135	505	1636	1468	389	1120	548	548*
S. AFRICA	0	0	13	6	0	0	0	0	0	0	0	1
WORLD CATCHES (ALL OCEANS)												
LL	23125	27789	33412	28081	20854	24758	23421	20405	15791	14036	11425	9774*
SURF	12190	10783	11325	17042	21806	17827	13504	12683	12613	10880	10684	5568
TOTAL	35315	38572	44737	45123	42660	42585	36925	33088	28404	24916	22109	15342*

* Preliminary
++ catch < 0.5 MT
Source for "world" catches: Report of the Ninth Meeting of Australian, Japanese and New Zealand Scientists on Southern Bluefin Tuna (Hobart, Australia - September, 1990).

Table 39. Small tunas catch (1,000 MT), by gear, for Atlantic and Mediterranean - as of November 2, 1990

	1960	1961	1962	1963	1964	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
TOTAL																														
ATL+MED	74.0	84.3	52.4	65.4	49.7	71.4	66.2	91.4	74.6	115.5	88.7	97.3	87.3	66.8	90.8	78.8	74.6	90.8	83.3	87.8	113.2	111.7	130.7	128.3	100.4	95.0	86.5	104.3	123.1	121.7
MED	37.0	50.6	12.9	29.3	18.4	30.9	26.1	46.4	30.6	60.6	25.4	33.3	20.7	11.1	13.4	10.3	12.7	14.5	15.4	19.8	25.4	34.1	39.4	42.7	22.6	25.8	21.8	25.9	31.2	29.5
ATL	37.0	33.7	39.5	36.0	31.2	40.5	40.2	45.0	44.0	55.0	63.2	64.0	66.6	55.7	77.4	68.4	61.9	76.3	68.0	68.0	87.8	77.5	91.3	85.6	77.7	69.1	64.7	78.5	91.8	92.1

ATLANTIC BONITO (*S. sarda*)

	1960	1961	1962	1963	1964	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
ATL+MED	40.7	50.7	14.8	28.2	16.8	31.4	29.1	49.1	31.9	61.7	28.7	44.0	25.0	12.3	21.4	15.6	16.0	20.7	17.3	20.0	31.4	39.1	44.1	42.5	21.8	25.1	21.5	29.3	39.0	36.6
MED	34.4	45.8	7.5	22.8	13.5	27.0	22.1	41.2	26.3	55.6	20.7	28.2	16.2	6.3	7.7	6.0	6.5	8.7	9.4	13.5	18.9	29.0	31.2	35.5	15.0	18.5	16.0	21.7	23.3	22.8
-PS	++	0.1	++	++	++	++	0.1	0.1	++	++	++	++	++	++	++	++	++	++	++	++	0.1	++	0.1	1.0	0.7	13.5	11.9	17.4	17.4	17.4
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.6	0.6	0.4	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.8	11.4	17.3	17.3	17.3
OTHERS	++	0.1	++	++	++	++	0.1	0.1	++	++	++	++	++	++	++	++	++	++	++	++	0.1	++	0.1	++	++	++	++	0.1	++	0.1
-SURF	0.1	++	0.6	0.5	0.3	0.4	0.6	0.8	0.4	0.4	0.7	0.9	0.3	0.6	0.4	0.5	1.0	1.1	0.8	0.9	0.5	1.0	1.0	0.3	0.4	0.5	0.3	0.1	1.1	0.6
MAROC	0.0	0.0	0.0	0.0	0.0	++	++	0.1	++	++	++	0.1	0.1	0.3	0.1	0.1	0.6	0.5	0.1	0.2	0.1	0.3	++	0.1	0.1	0.1	++	0.0	0.1	++
ESPANA	0.1	++	0.6	0.5	0.3	0.4	0.6	0.7	0.4	0.3	0.7	0.9	0.3	0.3	0.3	0.3	0.4	0.6	0.7	0.7	0.5	0.7	1.0	0.3	0.3	0.4	0.3	0.1	1.0	0.6
-LL+TRWL	34.2	45.7	6.9	22.3	13.2	26.5	21.3	40.3	25.9	55.2	20.0	27.3	15.9	5.7	7.3	5.6	5.4	7.6	8.5	12.6	18.3	28.0	30.1	34.2	13.9	4.5	3.8	4.3	4.9	4.7
ALGERIE	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.2	0.1	0.1	0.0	++	0.2	0.3	0.2	0.1	0.1	0.2	0.2	0.5	0.6	0.7	0.9	0.9	0.9	0.9	0.5	0.2	0.6	1.5
BULGARIA	0.0	0.0	0.0	0.0	0.0	1.7	1.5	2.3	1.8	2.1	0.0	0.1	0.0	0.0	0.0	0.0	++	++	++	++	++	0.2	++	++	++	++	0.0	++	0.0	++
GREECE	1.4	1.9	2.0	2.2	0.9	3.2	2.3	1.8	1.7	2.0	0.9	0.6	0.6	0.5	0.5	0.7	0.5	0.6	0.6	0.7	0.8	1.3	1.4	1.4	1.7	1.6	1.3	1.3	1.3	1.3
ITALY	0.6	2.0	1.1	1.0	1.0	0.9	1.0	1.4	0.8	1.0	0.9	1.1	1.0	0.7	0.8	1.0	1.0	1.5	1.4	1.4	1.2	1.1	1.1	1.8	2.8	1.4	1.4	2.1	2.2	1.4
TUNISIE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.2	0.2	0.5	0.4	0.6	0.8	0.8	0.9	0.7	0.4	0.7	0.6	0.6	0.5	0.5	0.5	0.6	0.4
TURKEY	32.2	41.8	3.8	19.1	11.2	20.6	16.1	34.5	21.3	50.1	18.1	25.2	13.9	3.9	5.3	3.4	3.2	4.5	5.5	9.1	14.9	24.3	26.0	29.5	7.8	0.0	0.0	0.0	0.0	0.0
OTHERS	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	++	++	++	++	++	++	++	++	++	++	0.1	0.1	0.1	0.1	0.1	0.1
ATLANTIC	6.4	4.9	7.3	5.3	3.3	4.4	7.0	7.9	5.7	6.1	8.0	15.8	8.8	6.1	13.7	9.6	9.5	12.0	7.9	6.5	12.6	10.0	12.9	7.0	6.8	6.6	5.5	7.6	15.7	13.8
-PS	++	0.0	0.2	0.6	0.0	0.1	0.5	0.3	0.5	2.4	4.2	3.2	2.9	1.2	2.3	0.2	0.3	2.0	2.6	1.3	2.7	0.9	++	0.3	0.1	0.5	0.5	0.2	0.3	0.1
ARGENTIN	0.0	0.0	0.2	0.6	0.0	0.1	0.5	0.3	0.5	2.4	4.2	3.2	2.9	1.2	2.3	0.2	0.3	2.0	1.7	1.3	2.6	0.8	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	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	0.0	0.0	0.0	++	0.0	++	0.0	0.0	++	++	0.1	0.1	++	0.3	0.1	0.5	0.5	0.2	0.3	0.1
-TROL	++	++	++	++	++	0.0	++	++	++	++	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	++	0.1	0.6	0.9	0.5	0.2	0.0	0.1	0.2	0.2	0.2
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.9	0.4	0.1	0.0	0.1	0.2	0.2	0.2
OTHERS	++	++	++	++	++	0.0	++	++	++	++	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	++	0.1	++	0.0	0.2	0.1	0.0	++	0.1	++	++
-TRAP	0.6	0.3	0.6	1.0	1.0	0.7	1.6	1.3	0.5	1.0	0.7	0.9	0.5	0.3	0.2	++	0.1	0.1	0.1	0.3	0.3	0.5	0.3	0.2	0.3	0.3	0.1	0.1	0.3	0.2
ANGOLA	0.5	0.3	0.4	0.5	0.7	0.3	1.2	0.8	0.4	0.6	0.7	0.8	0.4	0.3	0.2	++	++	0.1	0.1	0.1	0.2	0.1	0.2	++	0.1	0.1	0.1	0.0	0.1	0.1
OTHERS	0.1	++	0.1	0.5	0.3	0.3	0.4	0.4	0.1	0.4	0.1	0.1	0.1	++	++	++	++	++	++	0.1	0.1	0.4	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.1
-SURF	5.6	4.2	6.2	3.6	2.0	3.3	4.5	5.6	4.3	1.9	2.4	11.1	4.6	3.9	8.7	6.5	7.3	4.8	3.8	2.0	8.7	6.8	8.8	4.5	3.3	4.1	3.7	5.1	2.6	2.6
ANGOLA	0.1	++	0.1	++	++	0.1	0.2	0.1	++	0.1	0.2	0.1	0.2	0.2	0.2	++	0.8	0.8	0.5	0.1	0.2	0.1	0.1	0.1	0.1	0.1	++	0.1	++	0.1
BRASIL	0.1	0.8	3.0	1.6	0.8	1.4	1.5	3.4	2.5	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	0.2	0.2	0.3	0.3	0.2	0.2
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	0.0	0.0	++	++	0.0	++	++	0.0	0.1	++	0.1	++	++	++	0.0	0.9	0.0	0.0
MARTINIQ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.4	0.5	0.4	0.5	0.5	0.4	0.5	0.5	0.5	0.6	0.5	0.6	0.5	0.4	0.5	0.4	0.4
MAROC	1.8	0.7	0.7	0.7	0.4	0.3	0.7	0.3	0.5	0.4	0.2	0.2	0.1	0.1	0.2	0.3	0.3	0.1	0.2	0.2	0.3	0.5	0.5	0.4	0.2	0.0	0.0	0.4	0.6	0.6

Table 39. Continued.

	1960	1961	1962	1963	1964	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
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	0.0	0.0	++	++	0.2	0.6	0.5	0.2	0.1	0.1	++	0.2	++	0.4	0.3	0.5	0.0	0.0
ESPANA	3.6	2.7	2.4	1.3	0.8	1.5	2.1	1.8	0.8	1.0	1.6	10.0	3.5	2.0	7.0	4.8	4.3	2.0	1.9	0.6	0.1	0.2	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0
USSR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.4	4.6	6.3	2.4	1.3	2.1	1.1	1.1	0.0	0.0
VENEZUEL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.4	0.3	0.5	0.5	0.7	0.5	0.6	0.8	0.8	0.4	0.4	0.9	0.8	0.9	0.6	0.7	0.8	1.4	1.0	1.2	1.2
OTHERS	++	++	++	++	++	++	++	++	++	++	0.0	0.0	0.0	0.4	0.4	0.4	0.3	++	++	++	++	0.1	++	0.1	0.1	0.2	0.1	0.2	0.2	0.3
-LL+TRWL	0.2	0.3	0.3	0.2	0.3	0.3	0.4	0.7	0.4	0.7	0.7	0.6	0.8	0.7	2.4	2.8	1.9	5.0	1.3	2.9	0.8	1.2	2.8	1.4	2.9	1.7	1.1	2.0	12.3	10.6
ARGENTIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	0.3	2.1	1.4	0.7	1.6	2.8	2.8
MEXICO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.2	0.4	0.4	0.2	0.1	0.1	0.2	0.3	0.4	0.4	0.6	0.7	0.2	0.2	0.4	0.4	0.3
USA	++	0.0	++	++	0.0	0.0	++	0.0	0.0	++	0.1	0.1	++	0.3	0.1	0.1	++	0.3	0.2	0.5	++	0.2	0.2	0.0	++	++	++	++	++	++
USSR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.3	0.1	0.2	++	1.4	1.5	1.3	4.2	0.8	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.9	7.4
OTHERS	0.2	0.3	0.3	0.2	0.3	0.3	0.4	0.7	0.3	0.3	0.2	0.2	0.3	0.2	0.5	0.7	0.3	0.5	0.2	0.1	0.5	0.6	0.4	0.6	0.1	0.1	0.1	++	0.3	0.1

ATL. BLACK SKIPJACK (*E. alletteratus*)

	1960	1961	1962	1963	1964	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
ATL+MED	3.0	2.5	5.1	4.0	1.7	4.1	3.3	4.0	3.2	3.6	8.4	5.4	2.9	2.4	5.1	8.7	9.9	7.3	16.6	13.1	17.7	16.1	15.8	25.4	17.0	12.1	9.6	20.4	20.4	24.3
MEDI	++	++	++	++	++	++	++	++	0.2	1.0	0.7	0.5	0.7	0.8	0.9	1.0	1.5	1.5	1.5	1.3	1.0	0.2	0.9	0.1	0.2	0.4	0.3	0.4	0.4	0.4
-SURF	++	++	++	++	++	++	++	++	0.2	0.9	0.6	0.4	0.6	0.7	0.7	0.8	1.1	1.1	1.2	1.0	0.8	0.1	0.7	++	++	++	++	++	++	++
ESPANA	++	0.0	++	++	++	++	++	++	0.1	0.9	0.6	0.4	0.6	0.7	0.7	0.7	1.1	1.1	1.2	1.0	0.8	++	0.7	0.0	++	++	++	0.0	++	0.0
OTHERS	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	0.1	++	++	0.0	++	0.0	0.1	++	++	++	++	++	++	++	++
-LL+TRWL	0.0	0.0	0.0	0.0	0.0	++	++	++	++	++	0.1	0.1	0.1	0.1	0.2	0.2	0.4	0.4	0.3	0.3	0.2	0.1	0.2	0.1	0.2	0.4	0.3	0.4	0.4	0.4
OTHERS	0.0	0.0	0.0	0.0	0.0	++	++	++	++	++	0.1	0.1	0.1	0.1	0.2	0.2	0.4	0.4	0.3	0.3	0.2	0.1	0.2	0.1	0.2	0.4	0.3	0.4	0.4	0.4
ATLANTIC	3.0	2.5	5.1	4.0	1.7	4.1	3.3	4.0	3.0	2.6	7.7	4.8	2.2	1.5	4.2	7.7	8.4	5.8	15.1	11.8	16.7	15.9	14.8	25.3	16.8	11.7	9.3	20.0	20.0	23.9
-BB	++	++	++	++	++	++	0.1	0.7	0.3	0.6	1.9	1.1	0.6	0.2	0.5	0.5	0.2	0.7	0.4	0.6	1.3	1.0	1.4	1.2	1.6	2.1	1.8	1.7	0.9	0.7
ANGOLA	++	++	++	++	++	++	0.1	0.7	0.3	0.6	1.2	0.7	0.3	0.2	0.4	0.4	++	0.6	0.3	0.5	0.8	0.7	1.1	1.2	1.3	1.3	1.1	1.3	0.5	0.4
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	0.0	++	0.1	0.1	0.1	0.1	0.1	0.1	++	++	++	0.0	0.3	0.7	0.5	0.3	0.3	0.2
ESPANA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.4	0.3	++	0.0	0.0	0.0	0.0	0.0	0.0	++	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	0.0
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	0.0	0.0	0.1	0.0	++	++	0.5	0.3	0.3	++	0.1	0.1	0.1	0.1	0.1	0.1
-PS	0.0	0.0	0.0	0.0	0.0	0.0	++	0.0	0.0	0.0	0.0	0.4	0.0	++	0.1	0.1	0.1	++	5.5	++	0.8	1.9	3.0	2.7	1.2	2.5	1.1	2.7	2.9	2.8
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	0.0	0.0	0.0	0.0	0.0	0.0	1.1	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2
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	0.0	0.0	0.0	++	++	0.0	0.0	0.0	0.0	0.4	0.6	0.0	0.3	0.2	0.1	++	0.0	0.0
SENEGAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.3	0.7	1.0	0.5	1.0	0.6	2.6	2.1	2.1
USSR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	0.0	5.5	0.0	0.0	0.0	0.4	1.6	0.4	0.9	0.3	0.1	0.8	0.5
OTHERS	0.0	0.0	0.0	0.0	0.0	0.0	++	0.0	0.0	0.0	0.0	0.4	0.0	++	0.1	0.1	0.0	++	0.1	++	0.3	0.1	++	++	++	0.5	0.1	++	++	++
-TROL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.3	1.5	2.5	0.9	1.2	0.8	1.0	1.5	1.5
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.5	2.5	0.9	1.2	0.8	1.0	1.5	1.5
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	0.0	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
-TRAP	2.9	2.4	4.8	3.7	1.4	2.9	2.8	3.1	2.4	1.4	1.8	1.1	0.5	0.6	0.7	0.1	++	0.2	0.1	0.2	0.4	0.4	0.6	0.5	0.4	0.2	++	0.1	0.6	0.7
ANGOLA	2.9	2.4	4.8	3.7	1.4	2.7	2.7	3.1	2.4	1.4	1.7	1.1	0.5	0.6	0.7	0.1	++	0.2	++	0.2	0.4	0.4	0.6	0.4	0.3	0.1	++	0.1	0.6	0.7
OTHERS	++	++	++	++	++	0.2	++	++	++	0.1	++	++	++	++	++	0.0	0.0	0.0	++	0.0	++	++	0.0	0.1	++	0.1	++	++	++	++

Table 39. Continued.

	1960	1961	1962	1963	1964	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
-SURF	++	++	0.2	0.2	0.3	1.2	0.4	0.2	0.3	0.6	3.9	2.3	0.9	0.5	1.1	6.1	7.7	4.4	9.1	10.9	13.8	8.1	3.8	13.0	11.1	4.8	5.5	9.2	13.1	13.1
ANGOLA	++	++	0.2	0.2	0.3	0.8	0.4	0.2	0.1	0.1	3.2	0.6	0.5	0.1	0.2	++	0.0	0.5	0.5	++	0.1	++	++	++	++	++	++	++	++	0.1
BRASIL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.4	0.4	0.1	0.1	0.1
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	0.0	0.0	0.0	4.5	6.0	1.1	6.0	5.4	4.1	2.9	1.5	5.0	5.4	0.0	++	5.2	11.3	11.3
MAROC	0.0	0.0	0.0	0.0	0.0	++	0.1	0.0	0.2	0.4	0.3	0.6	0.1	++	++	0.1	++	++	++	0.3	++	++	++	0.0	++	0.0	0.0	0.1	++	++
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	0.0	0.0	0.4	1.1	0.7	1.5	1.4	1.7	1.9	0.6	1.1	2.4	3.8	3.0	3.6	2.1	0.0	0.0
ESPANA	0.0	0.0	++	++	++	0.4	0.0	0.0	0.0	++	0.1	0.7	++	++	0.0	++	++	++	++	++	0.5	++	++	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.7	0.7	2.2	6.3	3.6	0.6	4.9	0.3	0.1	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	0.1	0.1	0.2	0.3	0.2	0.3	0.4	0.4	0.5	0.4	0.4	1.3	0.7	0.8	0.3	0.6	0.6	1.0	1.1	1.5	1.2	1.2
OTHERS	++	0.0	0.0	++	0.0	0.0	0.0	++	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.2	0.3	0.3	0.2	0.4	0.4
-LL+TRWL	0.0	0.0	0.0	0.0	0.0	0.0	++	0.0	0.0	0.0	0.2	++	0.3	0.1	1.9	0.9	0.4	0.5	0.1	0.1	0.4	3.1	4.6	5.4	1.6	0.9	0.1	5.3	1.1	5.0
C.IVOIRE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.9	0.4	0.4	++	0.1	0.2	2.9	3.1	4.4	1.0	0.6	++	5.3	0.0	4.9
GER.D.R.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.5	0.1	++	++	++	0.0	++
ISRAEL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.6	0.3	0.3	0.1	0.0	0.0	0.0	0.0
USSR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0
OTHERS	0.0	0.0	0.0	0.0	0.0	0.0	++	0.0	0.0	0.0	0.2	++	0.3	0.1	0.3	0.1	++	0.1	++	++	++	++	0.4	0.2	0.3	0.1	0.1	++	0.2	0.1

FRIGATE TUNA (*A. thazard*)**

	1960	1961	1962	1963	1964	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
ATL+MED	8.8	10.1	8.2	8.0	6.8	9.5	7.2	11.5	8.6	16.2	11.7	10.3	13.4	10.2	13.9	10.4	10.6	20.3	8.7	13.6	20.5	14.6	23.4	20.0	25.0	22.1	15.8	18.1	19.1	17.1
MEDI	1.5	3.6	4.0	4.4	2.8	2.6	2.7	4.6	3.1	2.8	3.5	4.1	3.3	3.5	4.3	2.5	4.1	3.7	3.9	4.7	3.5	3.4	5.4	5.6	6.0	4.9	3.2	1.6	4.1	4.3
-PS	++	++	++	0.1	0.1	0.1	++	0.1	0.1	0.1	++	++	++	++	++	++	++	++	++	++	++	++	++	1.6	1.6	1.4	1.3	++	++	++
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	1.6	1.4	1.3	0.0	0.0	0.0
OTHERS	++	++	++	0.1	0.1	0.1	++	0.1	0.1	0.1	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++
-TRAP	0.9	0.0	++	0.5	0.4	0.7	0.7	0.7	1.0	0.6	0.2	0.4	0.4	0.4	0.8	0.1	0.4	0.5	0.3	0.1	++	0.1	0.2	0.5	0.7	0.6	0.3	0.6	1.3	2.2
MAROC	0.0	0.0	0.0	0.0	0.0	0.5	0.4	0.4	0.6	0.1	0.1	0.2	0.1	0.1	0.3	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
ESPANA	0.9	0.0	++	0.5	0.4	0.2	0.3	0.3	0.3	0.5	0.1	0.2	0.3	0.2	0.5	0.1	0.2	0.4	0.3	0.1	++	0.1	0.2	0.5	0.7	0.6	0.3	0.6	1.3	2.1
-SURF	0.0	2.6	3.1	2.9	1.8	1.2	1.1	2.6	0.8	1.1	1.9	1.9	1.1	1.8	1.9	1.3	1.5	0.9	1.4	1.7	2.1	1.6	1.7	0.1	0.1	0.1	0.3	0.0	2.1	1.5
MAROC	0.0	0.1	0.3	0.7	0.7	++	++	++	++	++	++	++	0.1	0.3	0.1	0.0	0.1	0.1	0.1	0.1	++	++	0.0	0.1	++	++	0.3	0.0	0.8	1.1
ESPANA	0.0	2.5	2.9	2.1	1.2	1.2	1.1	2.6	0.8	1.1	1.8	1.9	1.1	1.5	1.9	1.3	1.4	0.8	1.3	1.6	2.1	1.6	1.7	0.0	++	++	++	0.0	1.3	0.4
-LL+TRWL	0.6	1.0	0.8	0.9	0.5	0.7	0.9	1.2	1.2	1.1	1.4	1.8	1.7	1.4	1.5	1.1	2.1	2.3	2.1	2.9	1.4	1.7	3.5	3.4	3.7	2.8	1.4	0.9	0.6	0.5
GREECE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	2.2	1.9	2.1	1.4	0.0	0.0	0.0	0.0
ITALY	0.6	1.0	0.7	0.8	0.5	0.7	0.9	1.2	1.2	1.1	1.1	1.6	1.7	1.2	1.3	0.9	0.9	1.1	1.2	1.3	1.4	1.2	1.3	1.5	1.6	1.3	1.3	0.9	0.6	0.5
TUNISIE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	++	0.2	0.2	0.1	1.2	1.1	0.9	1.5	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	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++
ATLANTIC	7.3	6.5	4.2	3.6	4.0	6.9	4.5	7.0	5.5	13.4	8.2	6.2	10.2	6.6	9.6	7.9	6.5	16.6	4.8	8.9	17.0	11.1	17.9	14.4	19.0	17.2	12.6	16.5	14.9	12.8
-BB	0.0	++	0.0	0.1	0.0	0.9	0.4	0.6	1.6	3.2	3.1	0.3	0.2	1.7	0.7	0.1	++	0.1	0.1	0.3	0.2	0.3	0.5	0.4	0.4	0.3	0.2	0.4	0.2	0.1
JAPAN	0.0	0.0	0.0	0.0	0.0	0.9	0.4	0.6	1.6	3.2	3.1	0.0	++	1.2	0.5	++	++	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHERS	0.0	++	0.0	0.1	0.0	++	++	0.0	++	++	++	0.3	0.2	0.4	0.2	0.1	++	++	0.1	0.3	0.2	0.3	0.5	0.4	0.4	0.3	0.2	0.4	0.2	0.1

Table 39. Continued.

	1960	1961	1962	1963	1964	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
-PS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.3	0.2	0.7	0.7	1.3	0.2	++	++	++	0.0	1.2	0.8	6.0	5.4	4.6	4.7	8.7	5.3	3.6	6.1	4.9	2.3
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	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.7	1.1	0.1	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	0.4	1.3	0.2	0.7	0.6	1.2	0.2	++	++	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	1.1	0.5	++	++	0.4	0.2	0.0	0.0
SENEGAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0
ESPANA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.8	5.8	4.7	2.5	2.5	5.5	3.6	3.1	4.4	3.8	1.6
USSR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	0.0	0.6	0.0	0.0	0.0	0.4	0.3	3.1	1.6	0.1	0.2	0.4	0.3
OTHERS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	++	0.0	0.0	0.0	0.2	++	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.1	++	0.4	0.7	0.4
-TRAP	1.7	2.8	1.9	0.9	1.3	2.8	2.1	1.6	0.8	1.1	0.9	0.6	0.9	1.0	0.8	0.3	0.3	0.3	0.3	0.4	0.1	0.2	0.3	0.2	0.1	0.1	0.1	0.2	0.1	0.4
ANGOLA	1.6	2.0	1.2	0.9	0.8	1.6	1.4	1.1	0.5	0.7	0.3	0.4	0.4	0.5	0.7	0.2	++	0.1	0.1	0.1	++	0.1	0.1	0.1	0.1	++	0.0	0.0	++	++
MAROC	0.0	0.0	0.0	0.0	0.0	0.8	0.3	0.2	0.1	++	0.4	++	0.3	0.1	0.1	0.0	0.0	++	0.0	0.0	0.1	++	0.0	++	0.0	0.0	0.0	0.0	++	0.1
ESPANA	0.2	0.8	0.7	++	0.5	0.4	0.5	0.2	0.2	0.3	0.1	0.1	0.3	0.4	0.1	0.2	0.3	0.2	0.2	0.3	++	0.1	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.3
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	0.0	0.0	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	5.6	3.7	2.3	2.6	2.7	3.2	1.9	4.3	1.8	8.9	3.5	4.7	7.7	3.8	8.0	7.4	6.1	16.2	3.1	7.4	10.6	5.2	12.5	9.0	9.8	11.5	8.7	9.8	9.7	9.9
ANGOLA	0.1	0.1	0.3	0.3	0.1	0.1	0.1	0.1	0.2	++	0.2	0.5	1.7	0.2	0.6	0.3	0.0	0.1	0.1	++	++	++	++	++	++	0.0	++	++	0.0	++
BRASIL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.4	0.4	1.7	1.7
GHANA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.9	8.2	2.0	1.8	5.1	1.6	6.3	6.0	4.3	13.9	1.0	4.3	7.6	2.0	6.1	5.6	4.5	4.5	3.3	4.7	0.0	0.0
MAROC	0.0	0.1	0.3	1.0	0.8	0.5	0.1	0.5	0.1	0.1	0.5	0.1	++	1.0	0.1	++	0.3	0.7	0.8	0.7	0.7	1.3	0.1	0.7	0.2	0.4	0.0	0.5	0.2	0.5
ESPANA	4.2	2.6	0.7	0.4	0.4	0.8	0.4	0.4	0.3	0.2	0.1	1.8	0.2	0.2	0.1	0.1	0.2	0.4	0.4	0.1	0.4	0.5	0.4	0.0	0.2	++	++	0.0	++	0.0
USSR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.5	0.7	0.4	5.2	1.3	2.8	4.4	3.3	2.7	5.5	5.5
VENEZUEL	1.3	0.8	1.0	1.0	1.4	1.8	1.4	1.1	0.4	0.4	0.7	0.5	0.6	0.7	0.9	1.0	1.3	0.9	0.6	1.8	1.2	0.9	0.5	1.2	1.5	1.7	1.6	1.4	2.2	2.2
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	0.0	0.0	0.0	0.0	0.0	0.0	++	++	0.1	0.2	0.1	0.1	0.1	0.1	++	++	++
SPOTTED SPANISH MACKEREL (*S. maculatus*)***																														
ATLANTIC	11.2	11.2	11.7	11.1	10.0	11.9	13.5	12.8	12.8	12.5	15.9	13.9	16.8	20.0	21.0	18.1	14.6	15.4	15.0	14.6	18.1	15.0	16.4	14.0	13.8	14.8	16.7	15.3	16.7	17.1
-LL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.5	0.4	0.1	0.0	0.1	0.2	0.1	0.3	0.1	0.1	0.1	0.5	0.2	0.2
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	0.0	0.0	0.6	0.5	0.4	0.1	0.0	0.1	0.2	0.1	0.3	0.1	0.1	0.1	0.5	0.2	0.2
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	++	0.0	0.0	0.0	0.0
-TROL	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.4	0.5	1.3	0.4	0.1	0.2	++	0.1	0.4	0.1	0.1
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	0.0	0.0	0.0	0.0	0.0	0.5	0.4	0.5	0.4	0.4	0.1	0.1	++	0.1	0.4	0.1	0.1
USA	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	0.8	0.0	++	0.1	0.0	0.0	0.0	0.0	0.0
-SURF	9.1	8.2	8.5	7.4	7.8	8.3	9.1	7.8	7.0	7.2	4.5	3.9	5.5	7.9	9.7	5.3	2.5	3.4	3.8	4.1	10.0	6.3	3.2	6.6	6.8	7.9	9.2	6.6	9.7	8.1
BRASIL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	1.2	2.8	4.4	6.3	2.7	0.3	1.0	1.5	1.2	1.4	1.5	1.1	1.2	1.7	1.5	++	++	1.2	1.2
CUBA	1.5	1.4	1.0	0.7	1.2	1.6	1.3	1.1	0.8	0.8	0.9	0.5	0.5	0.7	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.4	0.3	0.5	0.7	0.5	0.5
DOMIN.R.	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.2	0.3	0.4	0.5	0.5	0.4	0.2	1.1	1.3	1.3	1.3	1.4	1.4
USA	3.4	3.3	4.2	3.4	2.7	3.5	4.2	3.5	5.2	4.8	0.0	0.0	0.0	0.0	0.0	++	0.0	0.0	0.0	0.0	5.4	1.9	0.0	2.8	1.8	2.8	5.9	3.1	4.9	3.3
VENEZUEL	4.1	3.5	3.3	3.3	3.9	3.2	3.5	3.0	0.8	1.3	1.5	2.0	2.0	2.5	2.5	2.4	2.0	2.2	2.0	2.5	2.8	2.4	1.7	2.1	1.9	2.0	1.5	1.5	1.7	1.7
-UNCL	2.0	2.9	3.0	3.6	2.2	3.5	4.3	4.9	5.7	5.2	11.4	10.0	11.3	12.1	11.3	12.2	11.6	11.6	10.6	10.1	7.5	7.3	12.8	7.1	6.7	6.9	7.3	7.8	6.7	8.7
COLOMBIA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.6	0.1	0.2	0.3	0.4	0.2	0.3	0.2	0.2	0.2	0.4	++	++	0.1	0.1	0.1	0.1	0.2	0.1
MEXICO	2.0	2.9	3.0	3.6	2.2	3.5	4.3	4.9	5.7	5.2	4.8	3.5	5.3	6.7	5.2	4.8	3.4	4.4	5.1	5.8	5.9	5.9	7.8	5.9	5.8	5.8	6.2	6.5	5.2	7.2
TRINIDAD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.2	1.0	0.8	0.8	1.7	1.5	1.5	1.9	1.2	1.3	0.9	1.2	1.1	0.9	1.0	1.0	1.1	1.1	1.1
USA	++	++	++	++	++	++	++	++	++	++	5.5	4.7	4.9	4.4	5.0	5.3	6.4	5.5	3.3	2.9	++	++	3.7	++	++	++	++	0.1	0.2	0.3
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	0.0	0.0	0.0	++	++	0.0	++	++	++	++	++	++	++	0.0	0.0	0.0

Table 39. Continued.

	1960	1961	1962	1963	1964	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
KING MACKEREL (*S. cavalla*)																														
ATLANTIC	2.7	2.7	2.9	3.3	2.8	3.2	3.0	3.9	5.3	5.4	6.5	6.4	7.4	9.7	13.6	9.0	8.3	8.7	6.8	11.5	7.4	8.5	10.7	8.5	6.4	6.4	9.1	8.6	11.4	9.2
ARGENTIN	0.0	++	++	++	++	0.0	0.0	++	++	0.0	0.0	++	0.0	0.0	0.0	0.0	0.5	1.0	0.4	0.0	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	0.0	0.0	0.0	0.0	1.5	0.9	2.5	3.3	5.2	2.2	0.5	0.8	0.8	0.8	0.8	0.8	0.6	0.7	0.9	0.8	++	++	0.6	0.6
MEXICO	1.0	1.0	1.0	1.0	0.9	1.0	0.9	1.0	0.7	1.1	0.9	1.3	1.5	2.2	1.5	1.4	1.5	1.3	1.5	2.2	1.9	2.7	4.4	2.9	2.2	2.3	2.6	3.1	3.1	2.3
USA	1.7	1.7	1.9	2.3	1.6	2.1	2.1	2.8	2.8	2.8	3.0	2.6	2.2	2.7	4.7	3.1	4.1	3.8	2.5	6.3	3.2	3.4	3.7	3.0	2.4	2.4	5.4	4.6	6.4	4.9
VENEZUEL	0.0	0.0	0.0	0.0	0.3	0.1	0.0	0.1	1.8	1.5	1.0	1.6	1.1	1.5	2.2	2.4	1.7	1.6	1.3	2.0	1.4	1.6	1.9	1.9	0.9	0.8	0.9	0.9	1.3	1.3
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	0.0	++	0.0	0.2	0.2	0.1	++	++	++	++	++	0.0	0.0	0.0	0.0	0.0
WEST AFRTRICAN SPANISH MACKEREL (*S. tritor*)																														
ATLANTIC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	2.7	0.2	1.3	2.1	1.6	4.7	1.1	1.9	2.6	6.7	4.2	4.9	2.6	5.0	5.1	4.2	4.4	3.2	1.7	3.2	3.6
GER.D.R.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.5	++	++	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	1.8	2.5	0.0	0.7	1.5	1.0	3.5	0.6	0.6	0.7	0.8	1.6	4.4	2.0	3.0	2.2	3.0	3.0	1.5	0.0	1.5	1.5
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	0.0	0.0	0.1	0.3	1.3	1.2	1.1	1.1	0.4	0.5	0.3	1.1	0.9	1.1	1.4	1.7	1.6	1.6
USSR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.6	0.6	0.6	0.8	0.2	0.1	0.6	4.8	1.4	0.0	0.0	0.6	1.2	0.2	0.2	0.2	++	0.1	0.2
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	0.0	0.3	0.0	0.0	++	0.1	++	0.1	0.1	0.2	++	++	0.1	0.1	++	++	0.3
BLACKFIN TUNA (*T. atlanticus*)																														
ATLANTIC	0.6	0.4	0.7	0.8	0.8	0.7	0.7	0.9	0.7	0.8	2.0	1.9	1.9	0.9	1.1	0.8	1.0	1.2	1.3	1.2	1.2	2.0	1.9	1.7	1.9	1.4	1.9	2.2	2.3	2.7
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.6	0.6	0.5	0.2	0.5	0.6	0.3	0.3
DOMIN.R.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	++	0.6
GUADELOU	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	1.1	1.1	0.2	0.2	0.2	0.2	0.5	0.5	0.5	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4
MARTINIQ	0.6	0.4	0.7	0.7	0.7	0.6	0.6	0.8	0.5	0.6	0.6	0.5	0.3	0.1	0.4	0.3	0.6	0.3	0.4	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.4	0.4
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	0.0	0.0	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	0.6
OTHERS	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.4	0.4	0.3	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.3	0.2	0.5	0.4	0.5	0.5	0.6	0.5
WAHOO (*A. solandri*)																														
ATLANTIC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.4	0.4	0.4	0.3	0.4	0.3	0.4	0.4	0.5	0.5	0.5	2.8	2.1	2.1	2.0	0.8	0.8	1.0	1.2	1.5
CAP VERT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	2.3	1.5	1.6	1.4	0.1	0.2	0.3	0.3	0.6
OTHERS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.4	0.4	0.4	0.3	0.4	0.3	0.4	0.4	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.7	0.9	0.9
CERO (*S. regalis*)																														
ATLANTIC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.5	0.8	0.8	0.8	0.6	0.6	0.6	0.6	0.7	0.6	0.6	0.6	0.7	0.7	0.7	0.6	0.5	0.5	0.2	0.2
MARTINIQ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	0.5	0.4	0.2	0.3	0.2	0.5	0.6	0.5	0.5	0.5	0.6	0.6	0.6	0.5	0.4	0.5	0.2	0.2
OTHERS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.3	0.3	0.3	0.4	0.4	0.4	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	++	0.1	0.1
SCOMBEROMORUS UNCLASSIFIED (*S. spp.*)																														
ATLANTIC	1.5	1.6	1.6	1.5	1.8	1.8	1.9	2.1	2.1	3.4	0.5	0.4	0.3	0.5	0.5	0.8	0.5	0.5	0.4	0.4	0.3	0.5	0.5	0.4	1.0	0.3	0.3	0.4	0.7	0.4
BRASIL	0.7	1.0	1.0	1.0	1.1	1.1	1.3	1.5	1.6	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
COLOMBIA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.1	0.2	0.3	0.4	0.1	0.1	0.1	0.1	0.1	0.2	0.1	++	0.5	++	++	0.1	0.2	0.2
OTHERS	0.8	0.6	0.6	0.5	0.7	0.7	0.6	0.6	0.5	0.4	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.4	0.4	0.5	0.3	0.3	0.3	0.5	0.2

Table 39. Continued.

	1960	1961	1962	1963	1964	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
PLAIN BONITO (*O. unicolor*)																														
ATL+MED	1.0	2.2	3.0	3.1	2.3	0.2	0.3	0.7	0.2	1.3	0.8	0.7	0.3	0.1	0.2	0.1	0.2	0.5	1.0	0.5	0.7	1.4	0.6	++	++	0.1	0.1	0.6	1.5	1.1
MEDITERR	0.0	0.0	0.0	0.0	0.0	++	++	++	++	++	++	++	++	++	++	0.0	0.0	0.1	0.2	++	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	0.1	0.2	++	0.0	0.0	0.0	0.0	0.0	++	++	0.0	++	++
ATLANTIC	1.0	2.2	3.0	3.1	2.3	0.2	0.3	0.7	0.2	1.3	0.8	0.7	0.3	0.1	0.1	0.1	0.2	0.3	0.8	0.5	0.7	1.4	0.6	++	++	0.1	0.1	0.6	1.5	1.1
MAURITAN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.1	++	++	++	0.1	0.1	0.1	0.1
MAROC	1.0	2.2	3.0	3.1	2.3	0.2	0.3	0.7	0.2	1.3	0.8	0.6	0.2	++	++	++	0.1	0.2	0.7	0.4	0.6	1.0	0.5	0.0	0.0	0.1	++	0.5	1.4	1.1
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	0.0	0.0	0.0	0.0	0.0	++	++	++	++	++	++	++	++	++	++	++
MIXED OR UNKNOWN TUNA-LIKE SPECIES																														
ATLANTIC	4.5	3.0	4.5	5.4	6.6	8.6	7.2	6.3	7.7	7.9	13.2	11.9	16.1	8.0	8.3	13.2	10.6	12.5	8.4	7.7	9.9	8.4	9.5	7.8	6.5	7.0	7.1	6.3	7.4	7.8
MEDITERR	1.1	1.2	1.4	2.1	2.1	1.3	1.2	0.5	1.1	1.2	0.6	0.5	0.5	0.4	0.4	0.8	0.5	0.5	0.4	0.3	2.0	1.5	1.8	1.4	1.4	2.1	2.2	2.2	3.4	2.0
ISRAEL	0.5	0.7	1.0	0.9	1.1	0.2	0.3	0.0	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LEBANON	0.6	0.5	0.4	0.5	0.5	0.5	0.3	0.2	0.3	0.8	0.2	0.2	0.2	0.2	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
ESPANA	0.0	0.0	0.0	0.7	0.5	0.6	0.6	0.3	0.5	0.2	0.3	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	0.0	0.0	0.0	0.0	0.0	0.0
TUNISIE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.3	0.1	0.1	0.2	0.4	0.3	0.3	0.1	1.8	1.3	1.5	1.2	1.3	1.8	1.9	1.9	3.0	1.7
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	0.1	++	++	++	++	++	++	++	++	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.2
ATLANTIC	3.4	1.8	3.1	3.3	4.5	7.3	6.0	5.8	6.6	6.7	12.7	11.4	15.5	7.5	7.9	12.4	10.1	12.1	8.0	7.5	7.9	6.9	7.8	6.4	5.1	4.9	4.9	4.0	4.0	5.8
BRASIL	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	0.1	0.1	0.1	0.2	0.5	0.3	0.5	0.9	0.4	1.1	0.9	++	++	0.2	++	++	++
CHI.TAIW	0.0	0.0	0.0	0.0	0.0	++	++	0.2	0.4	1.1	0.8	0.7	0.9	1.0	0.9	0.4	1.0	++	0.5	1.3	0.8	0.8	1.1	0.8	++	++	0.1	0.3	0.1	1.1
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	++	0.1	++	++	++	++	++	++	0.3	++	0.3	1.0	0.7	0.9	0.8	1.2
CUBA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	++	0.0	0.0	0.4	0.6	1.1	0.3	1.0	0.4	0.1	0.1	0.1	++	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E.GUINEA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.4	0.4	0.5	0.4	0.4	0.4
GHANA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.9	0.0	0.0	0.9	0.5	0.7	1.0	0.4	0.1	0.2	0.2	0.6	0.1	0.4	0.0	0.0	0.0	0.0	0.0
GUADELOU	0.8	0.9	0.9	1.0	1.0	1.0	0.8	1.0	1.0	1.1	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	0.0	0.0	0.0	0.0	0.0	0.0
ISRAEL	0.0	0.0	0.0	0.0	0.0	0.5	0.1	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
JAPAN	0.6	0.6	1.1	1.5	2.7	5.2	4.8	3.3	1.5	1.1	1.6	1.5	1.0	0.5	0.6	0.4	1.0	0.8	1.0	1.6	1.3	0.8	0.7	0.1	0.3	0.5	0.4	0.3	1.4	1.4
KOREA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	1.0	7.0	5.7	3.1	2.4	3.5	5.8	2.9	4.2	2.5	1.7	2.1	2.0	1.9	1.2	1.0	1.0	0.7	0.4	0.0	0.5
LIBERIA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.5	0.2	0.4	0.4	0.4	0.3	0.2	0.2	0.3	0.2	0.2
PANAMA	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	1.0	0.0	0.8	1.4	2.6	0.8	0.2	0.7	1.1	0.6	0.7	0.0	0.4	0.4	0.4	0.0	0.0
PORTUGAL	1.5	0.3	0.8	0.7	0.8	0.4	0.1	0.1	0.3	0.5	0.3	0.5	0.2	++	++	0.2	0.3	0.3	0.5	0.2	0.2	0.2	0.1	0.0	0.0	++	0.4	0.0	++	0.0
SI.LEONE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	++	0.0	0.5	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
ESPANA	0.0	0.0	0.2	0.1	0.0	0.0	0.0	1.0	0.8	0.7	0.1	0.0	6.6	0.0	0.0	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	0.0	0.1
TOGO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.5	0.5	0.6	0.6	0.8	0.7	0.5	0.5	++	0.4	0.3	0.4	0.3	0.1	0.3	0.1	0.2	0.4	0.3
USA	0.0	0.0	0.0	++	0.1	0.1	++	++	++	++	0.0	0.1	0.0	0.0	++	++	++	0.1	++	++	0.5	0.1	0.2	0.4	0.9	0.2	0.3	0.3	0.1	0.1
USSR	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.0	++	0.2	0.3	0.3	0.2	0.2	0.3	0.4	++	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
VENEZUEL	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.2	0.2	0.8	0.0	0.0	++	0.7	0.0	0.1	++	0.0	0.0	0.0	0.9	0.9	0.4	0.4	++	0.0	0.0
OTHERS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.4	0.5	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.2	0.4	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.4	0.4	0.4

++ CATCH < 50 MT

* INCLUDES FRIGATE TUNA FOR COTE D'IVOIRE

** INCLUDES BULLET TUNA (A. rochei) & INCLUDE ATLANTIC BLACK SKIPJACK FOR ATLANTIC PS ESPANA BEGINING 1978

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

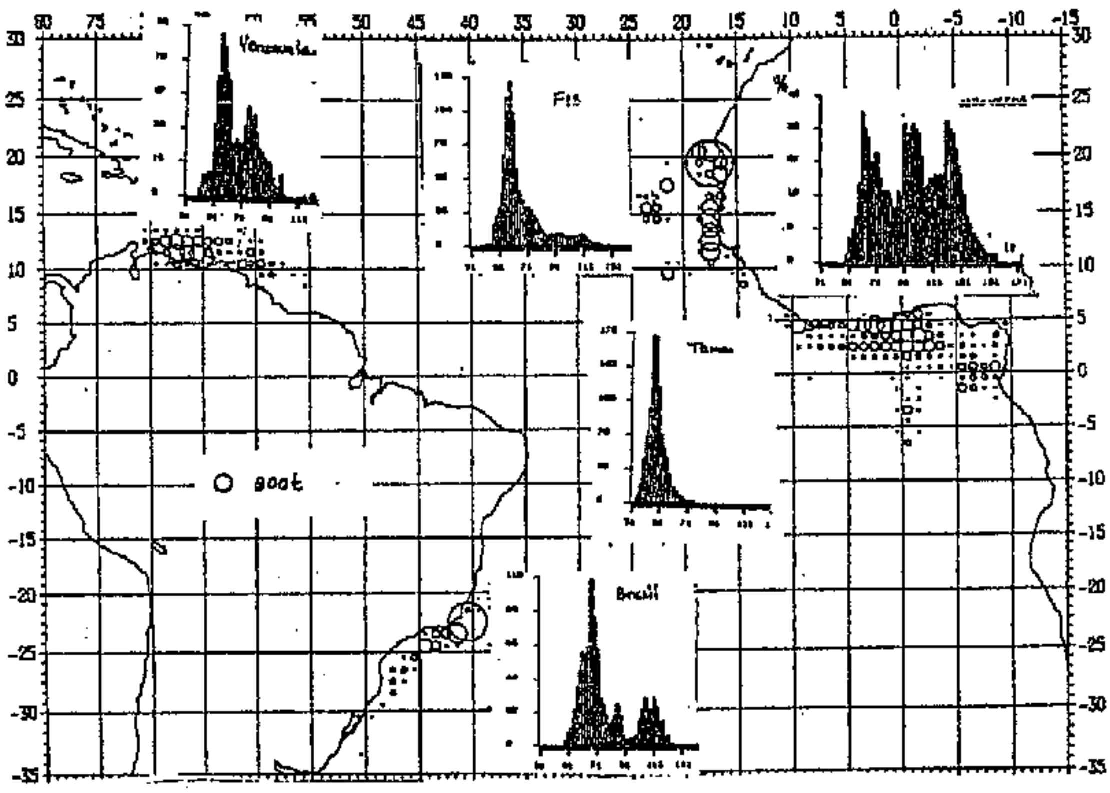


Fig. 1. Yellowfin catch distribution of the principal Atlantic baitboat and handline fisheries and average size distribution of yellowfin for the period 1983-1986 (SCRS/89/51).

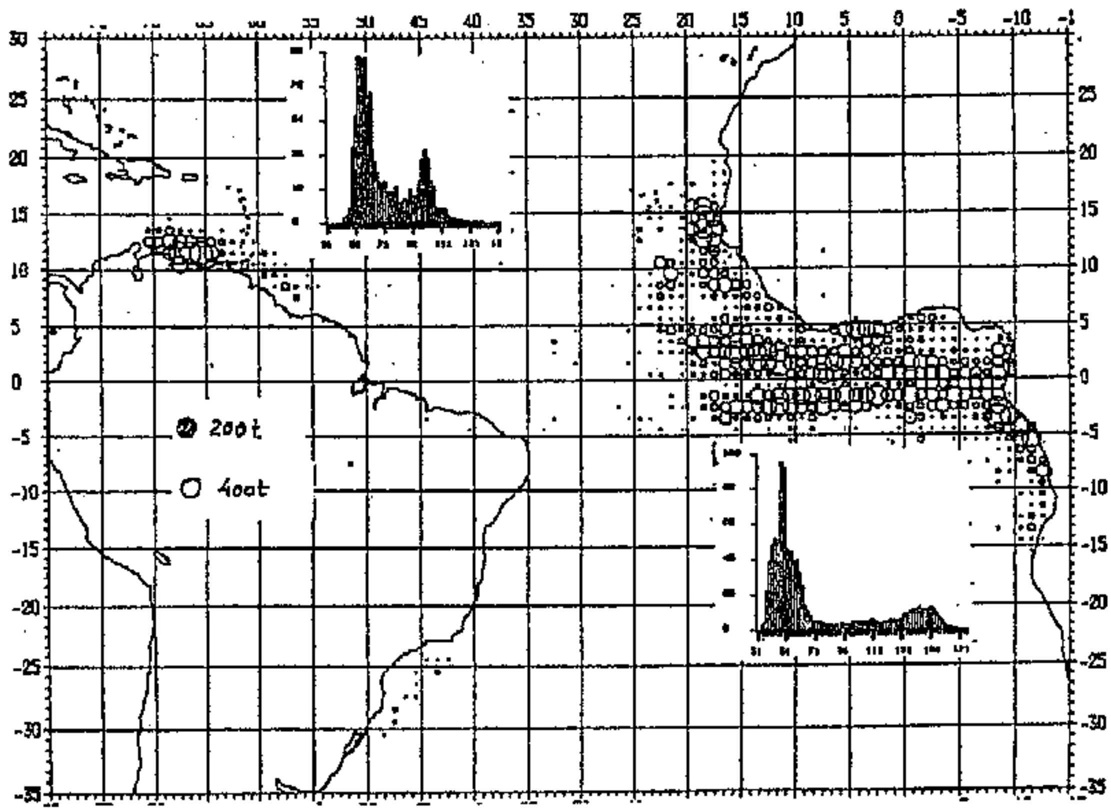


Fig. 2. Yellowfin catch distribution of all Atlantic purse seiners (average of the 1983-1986 period) and average yellowfin size distribution in each area (SCRS/89/51).

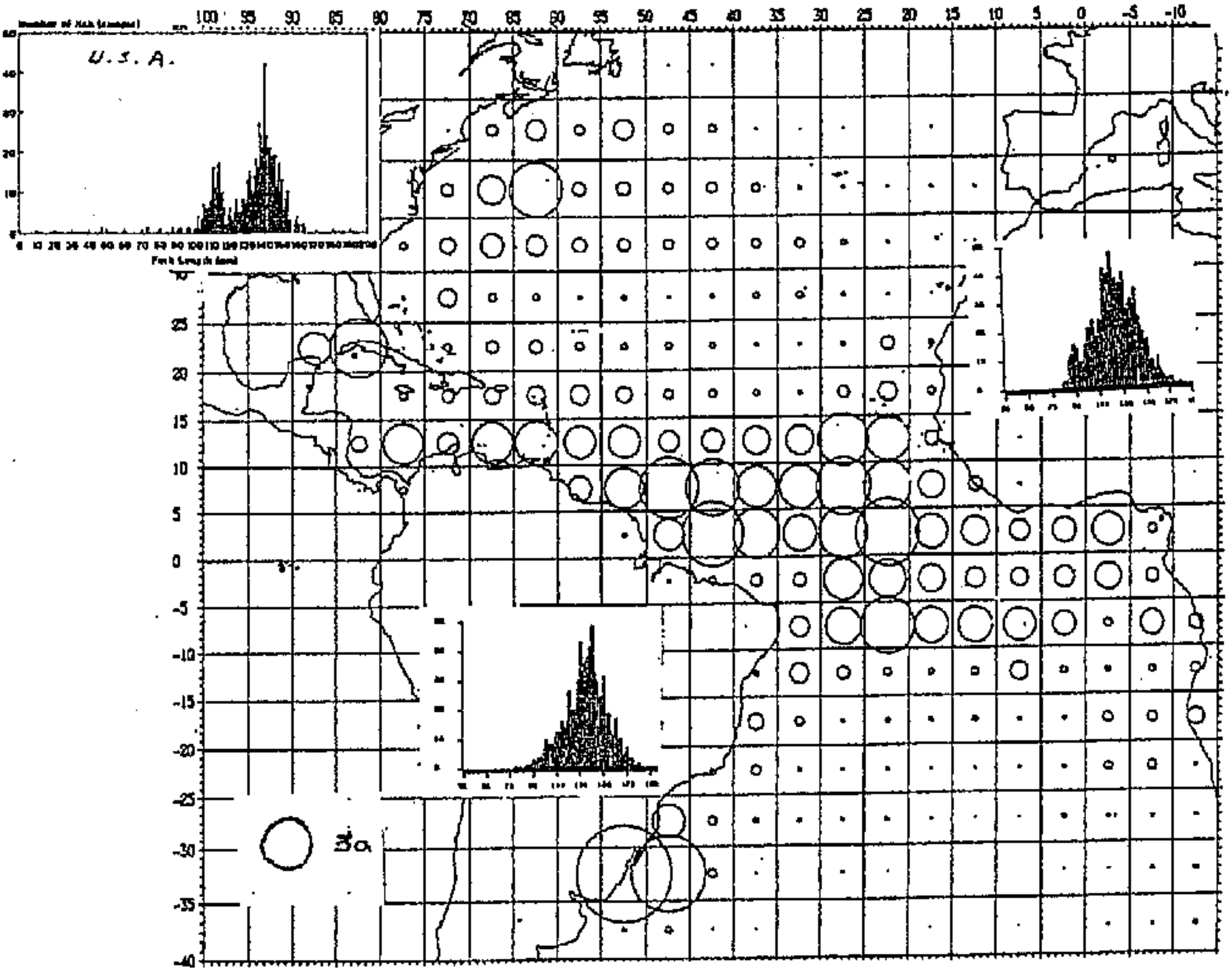


Fig. 3. Yellowfin catch distribution by Atlantic longline fisheries and average size distribution of yellowfin for the period 1983-86. The size distribution of the U.S. longline fleet corresponds to 1987.

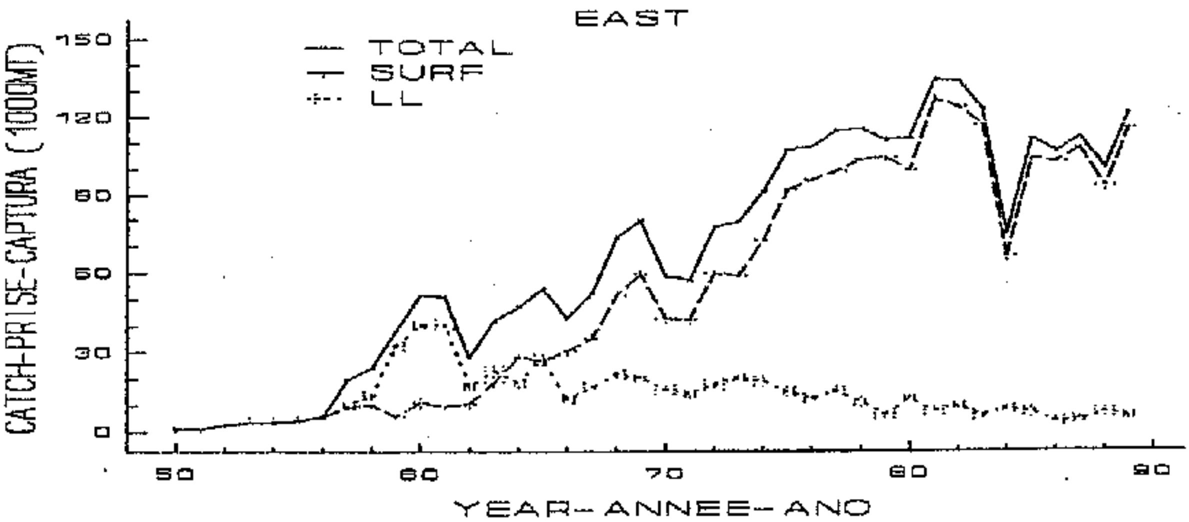


Fig. 4. Changes in yellowfin catches in the surface (SURF), longline (LL) and total (TOTAL) for east Atlantic fisheries.

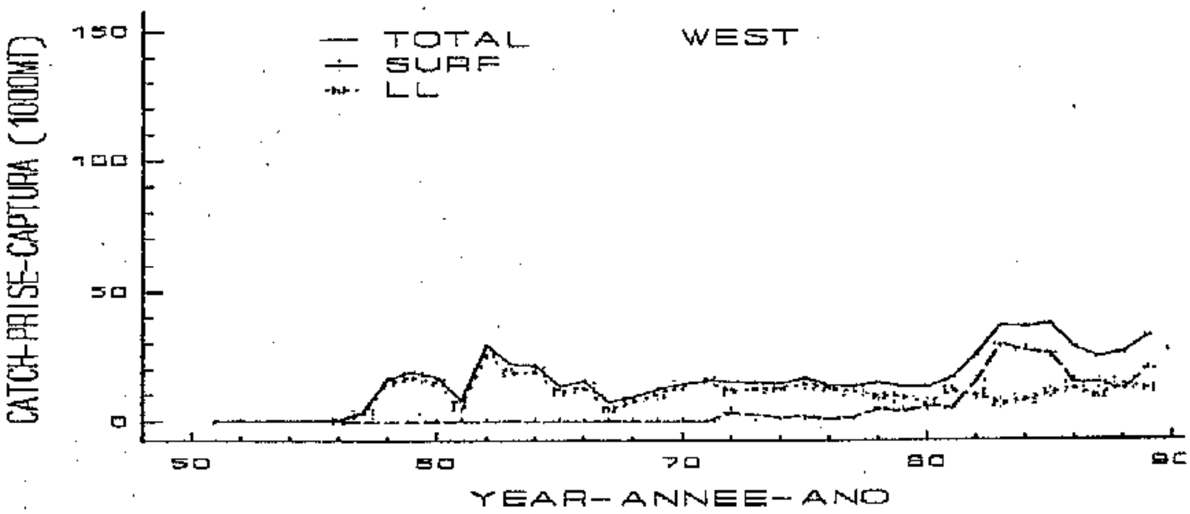


Fig. 5. Changes in yellowfin catches in the surface (SURF), longline (LL) and total (TOTAL) fisheries in the west Atlantic.

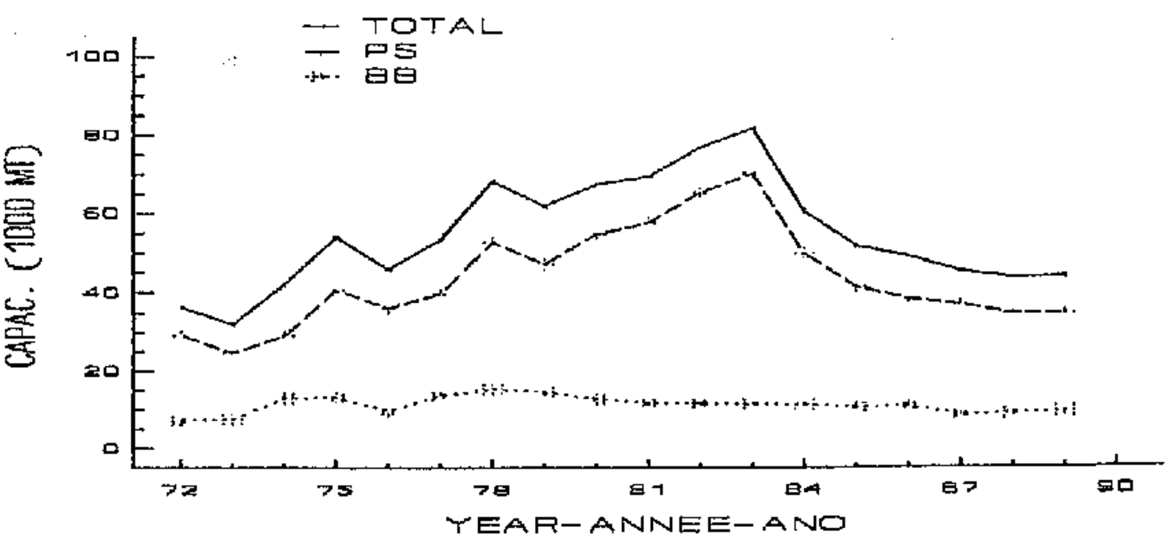


Fig. 6. Changes in carrying capacity of the surface fleets (purse seine and baitboat) in the east Atlantic.

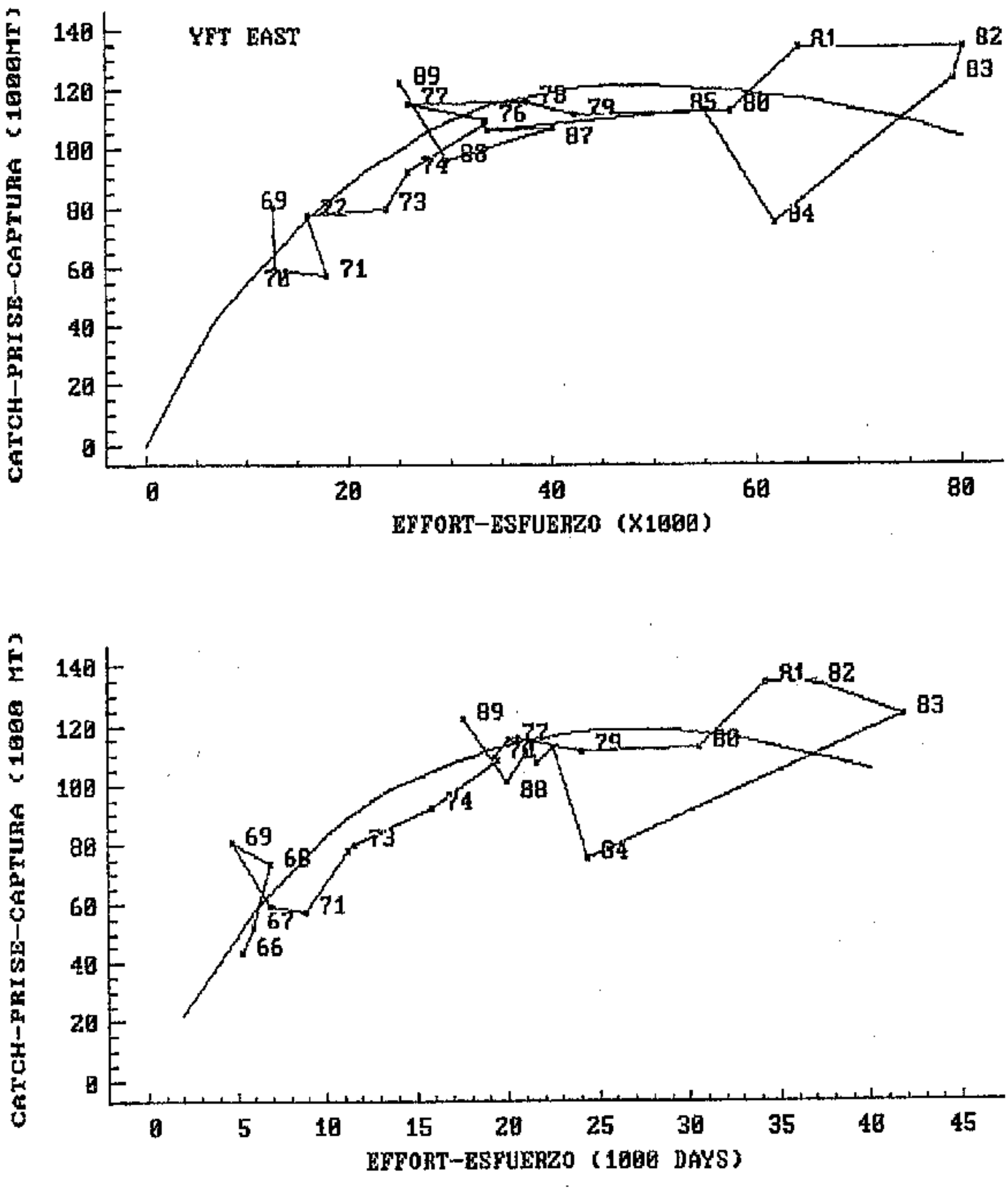


Fig. 7. Generalized production models for east Atlantic yellowfin.
Upper panel: m=1, k=3, effort in searching days and standardized to large FIS purse seiners and average CPUE of the CPUE by 1°x 1° squares and month.
Lower panel: m=1, k=4, effort in total days fishing standardized to large FIS purse seiners and CPUE=ΣC/Σf.

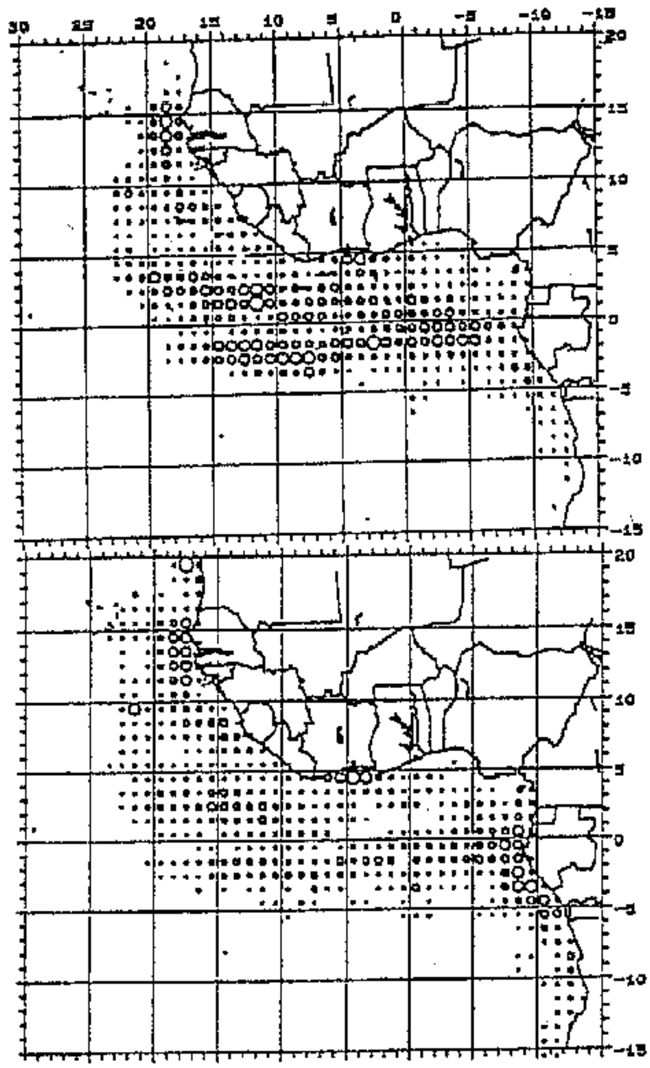


Fig. 8. Average fishing areas of the FIS purse seine and baitboat fisheries for yellowfin larger than 30 kg (a) and smaller than 30 kg (b) in recent years (1980-1988) in the eastern Atlantic Ocean (SCRS/90/61).

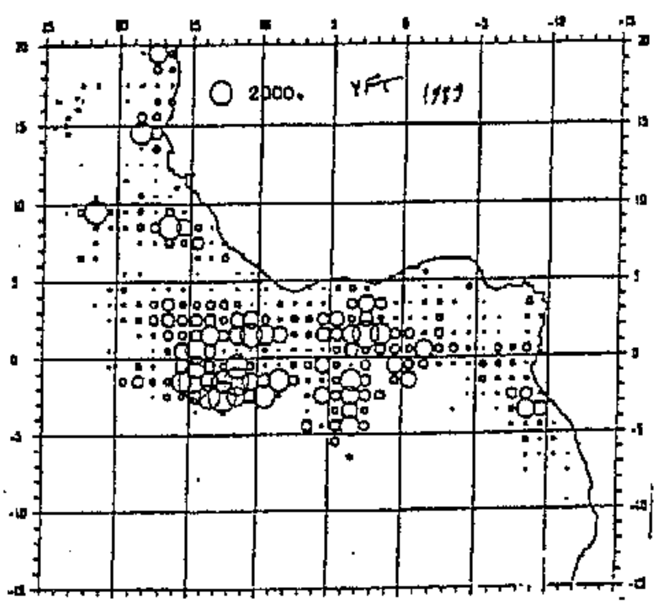


Fig. 9. Distribution of yellowfin catches in 1989 of FIS and Spanish purse seiners and FIS baitboats.

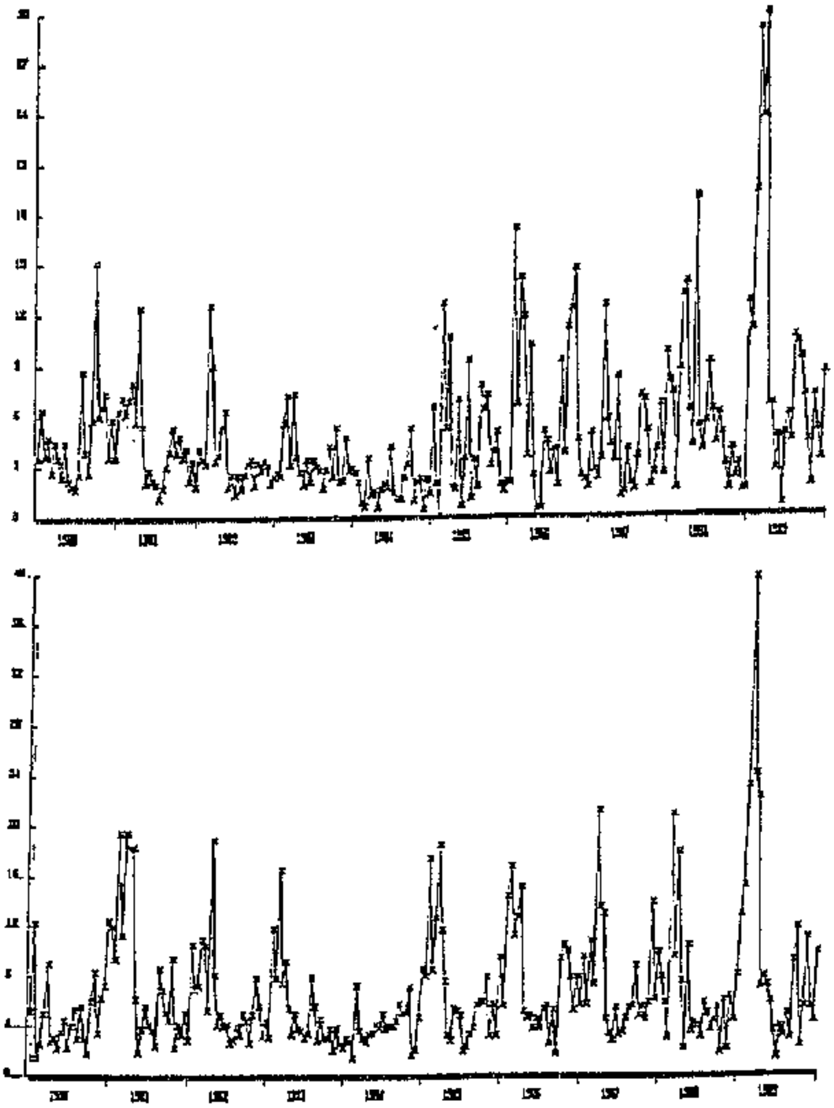


Fig. 10. CPUEs ($\Sigma C/\Sigma f$) by 15-day periods of yellowfin taken by the FIS (upper panel) and Spanish (lower panel) purse seine fleets in the east Atlantic.

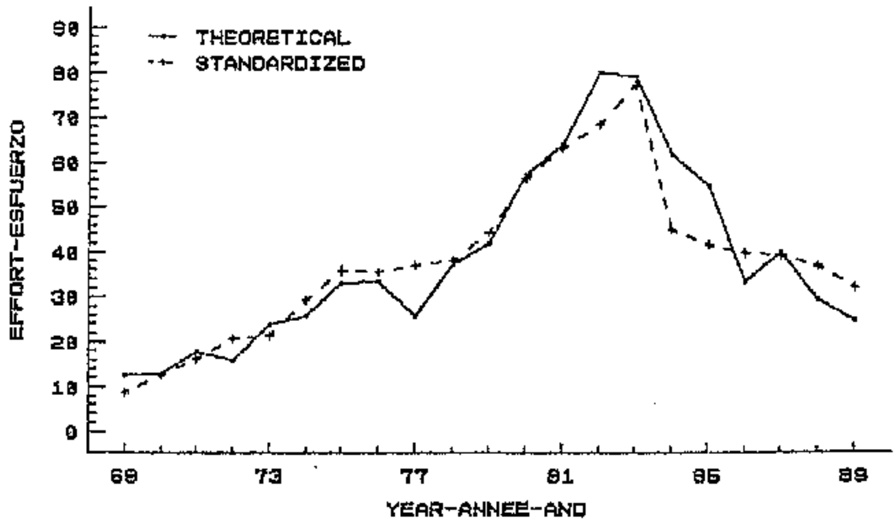


Fig. 11. Changes in theoretical effort (effort 1) estimated from mean CPUE by x square and 15-day period, and days fishing directly standardized to large FIS purse seiners (effort 2). This second effort was converted to make it comparable with the first.

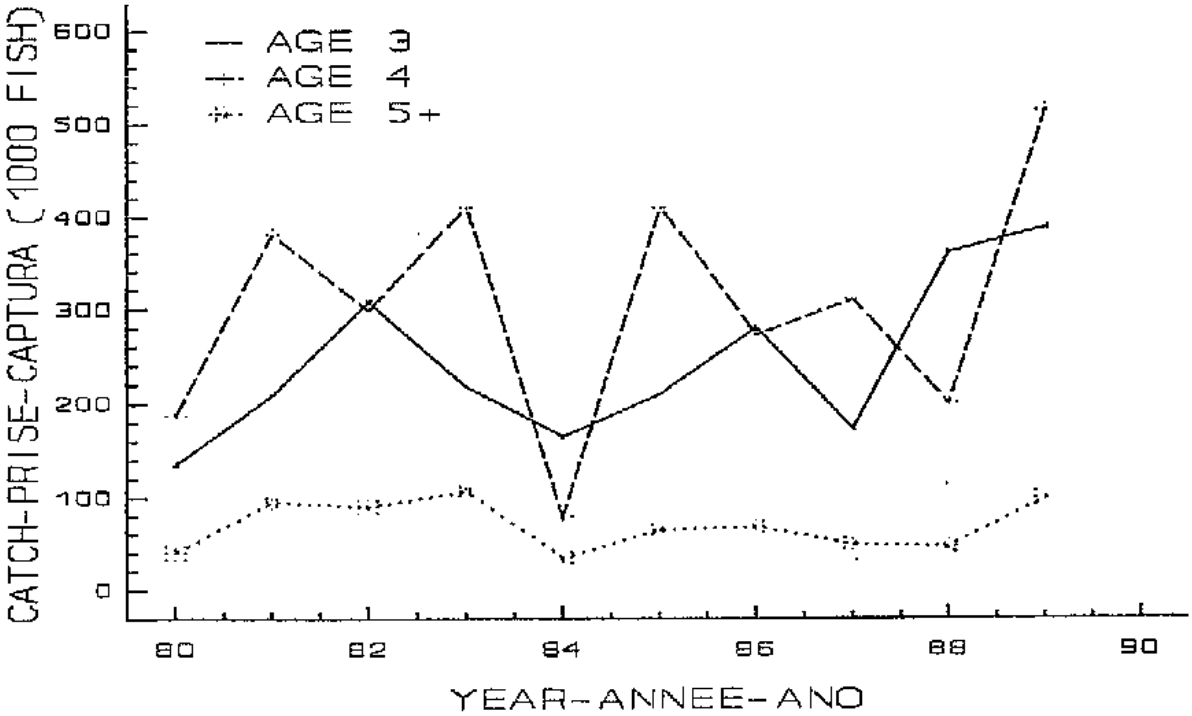


Fig. 12. Changes in the catch in number of age 3, 4, and 5 yellowfin in the east Atlantic.

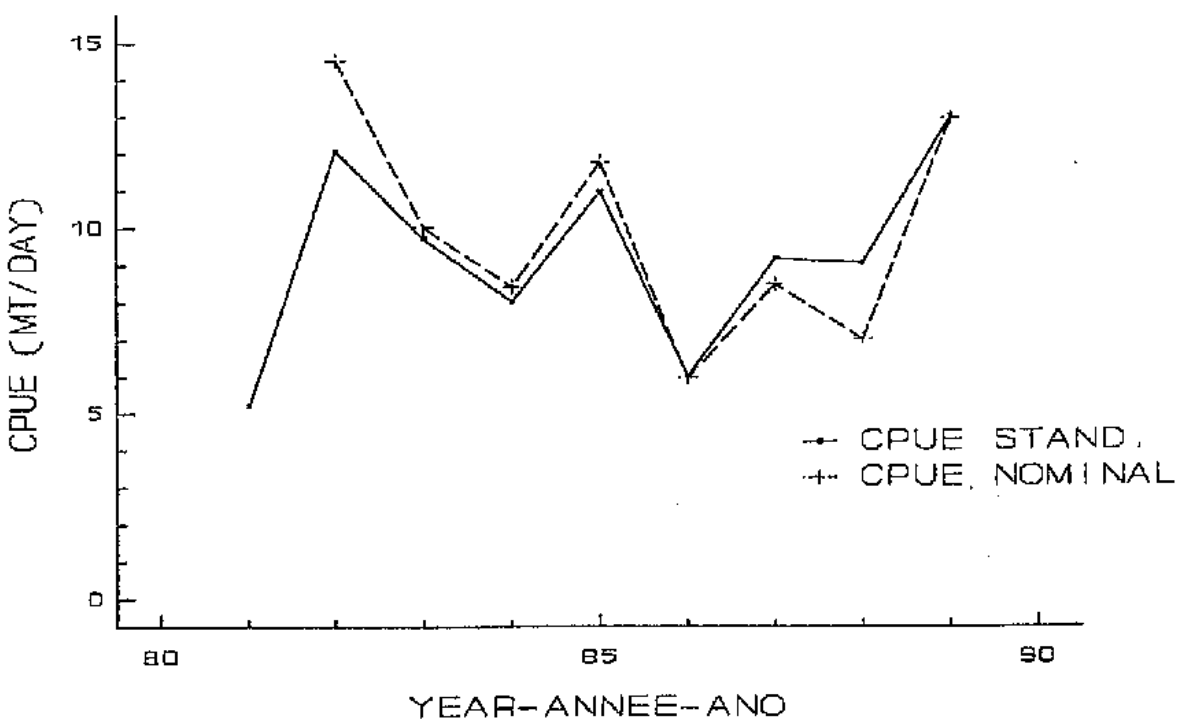


Fig. 13. Nominal and standardized yellowfin CPUE of large Venezuelan purse seiners (SCRS/90/100).

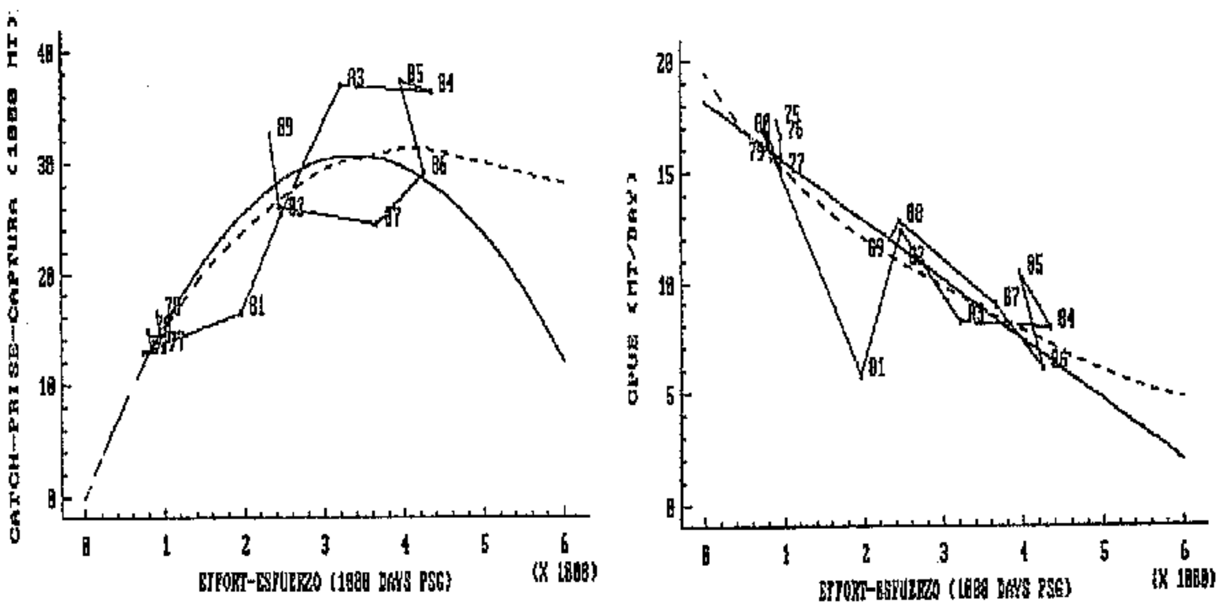


Fig. 14. Production model for west Atlantic yellowfin (SCRS/90/100).

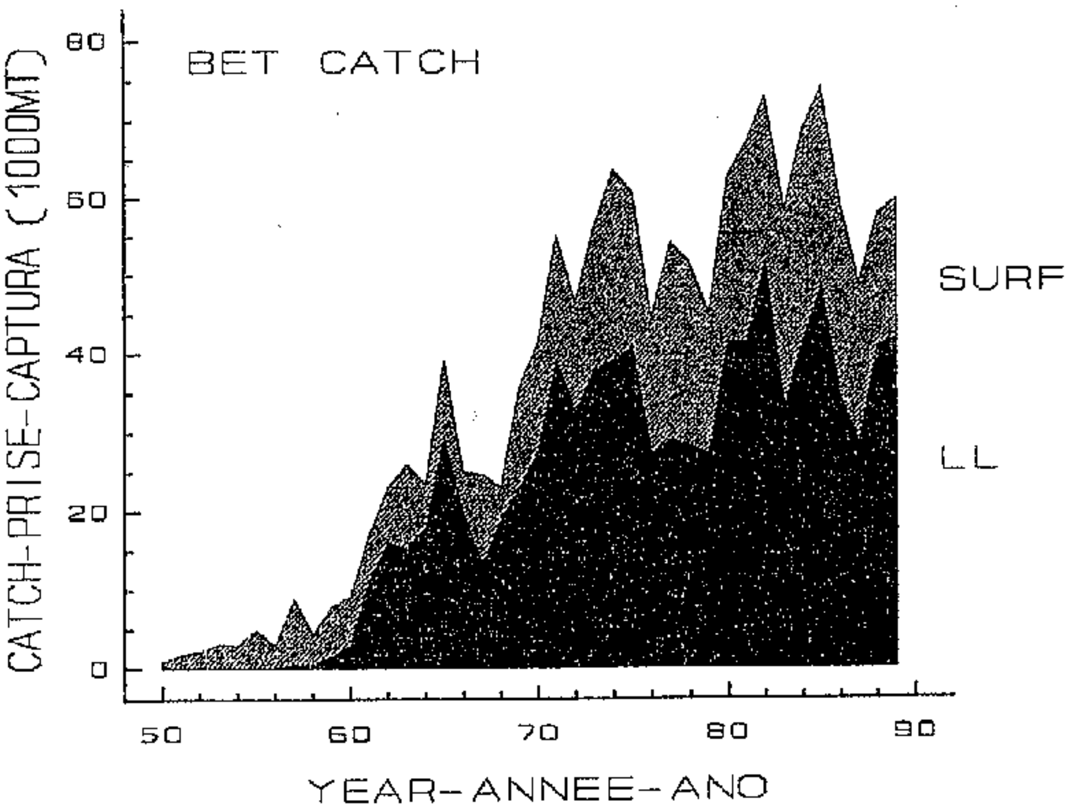


Fig. 15. Total bigeye tuna catches, entire Atlantic, surface and longline, 1950-89.

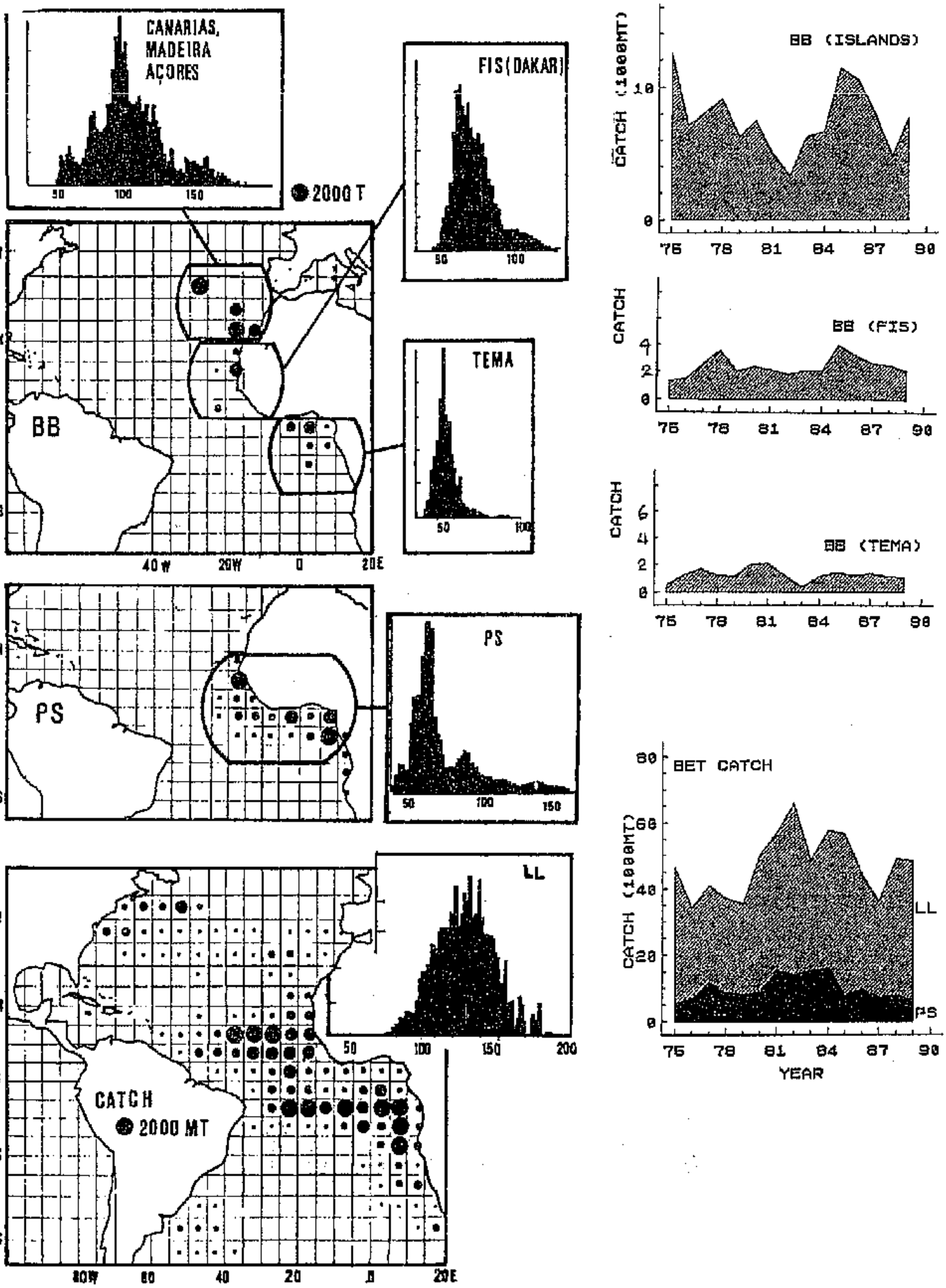


Fig. 16. Areas of operation, annual catches (1975-89) and size frequencies of the main bigeye fisheries in the Atlantic.

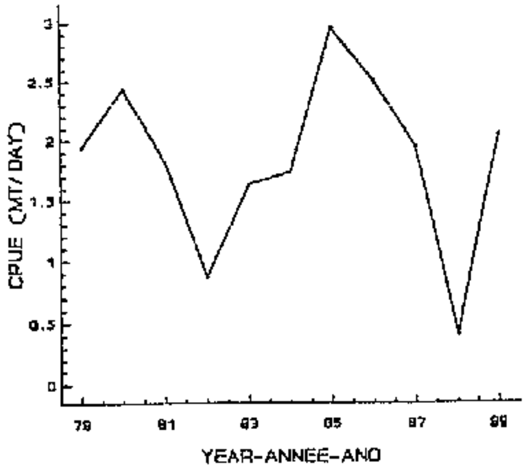


Fig. 17. Changes in bigeye CPUE of Azorean baitboats in the second quarter, from 1979 to 1989 (SCRS/90/92).

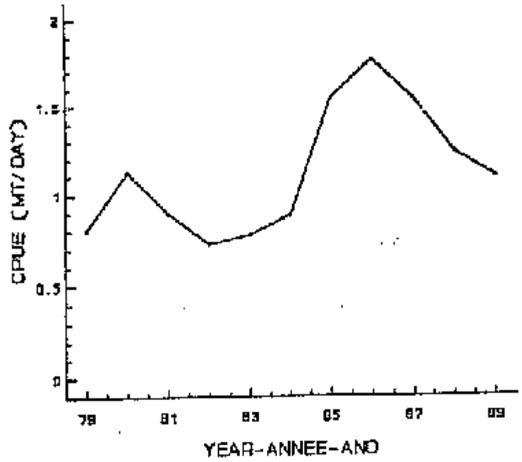


Fig. 18. Changes in bigeye CPUE of Dakar baitboats from 1979 to 1989 (SCRS/90/101).

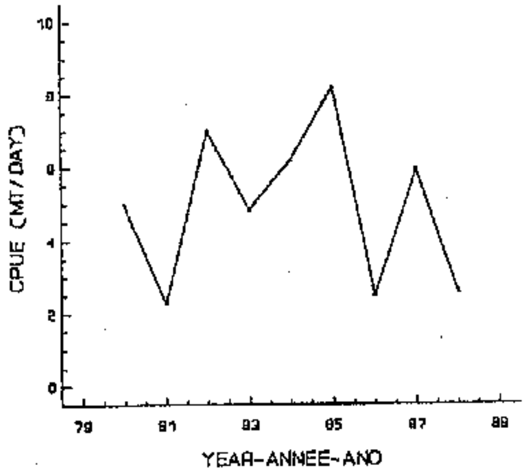


Fig. 19. Abundance indices of small bigeye tuna (less than 70 cm) by the tropical purse seine fleet from 1980 to 1988.

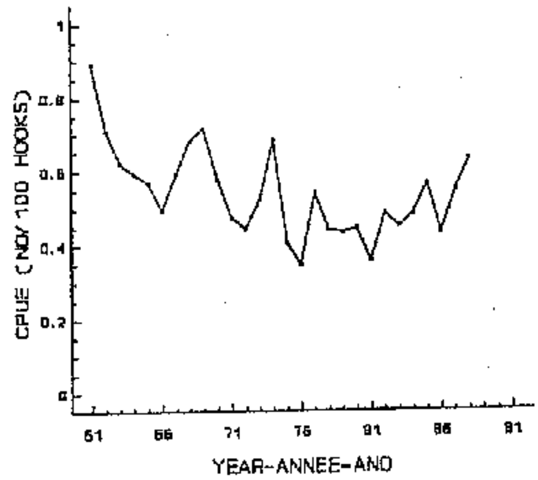


Fig. 20. Trend of annual CPUE of bigeye tuna caught by the Japanese longline fishery in the Atlantic Ocean, 1961-1988 (SCRS/90/91).

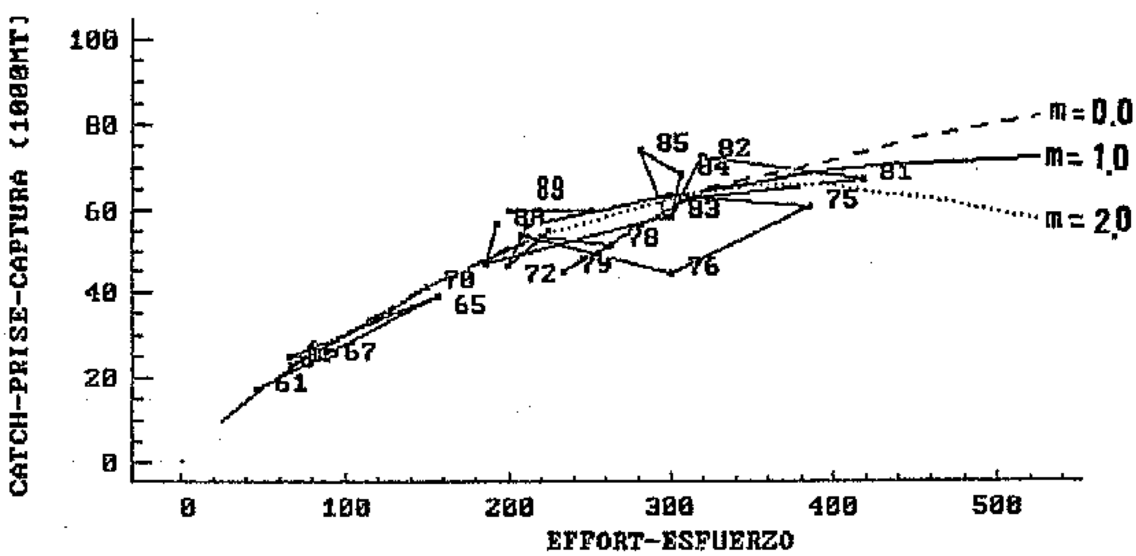


Fig. 21. Yield curves of the production model analysis for bigeye in the whole Atlantic, 1961-1988 (SCRS/90/91). Preliminary estimate for 1989.

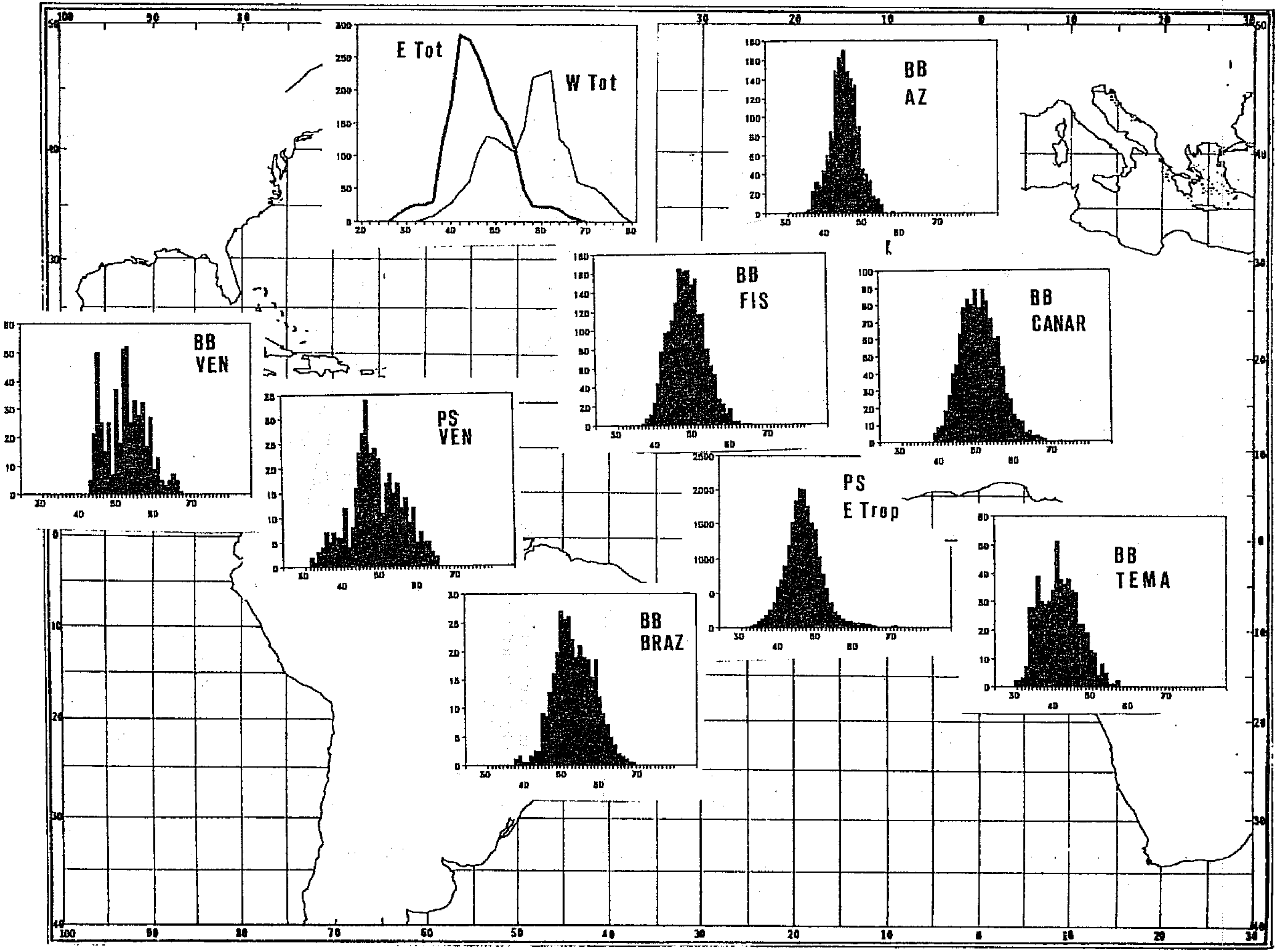


Fig. 22. Sizes of skipjack caught in the different Atlantic fisheries.

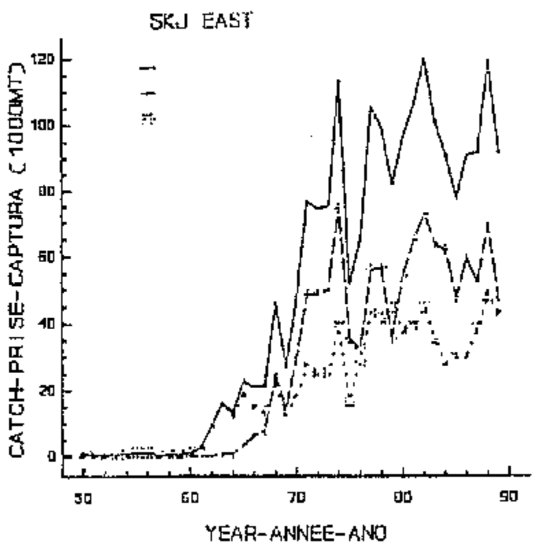


Fig. 23. Skipjack catches, by gear and total, for the east Atlantic.

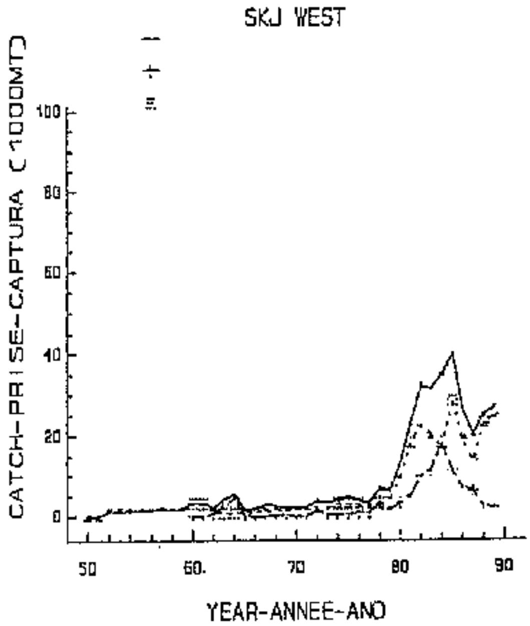


Fig. 24. Skipjack catches, by gear and total, for the west Atlantic.

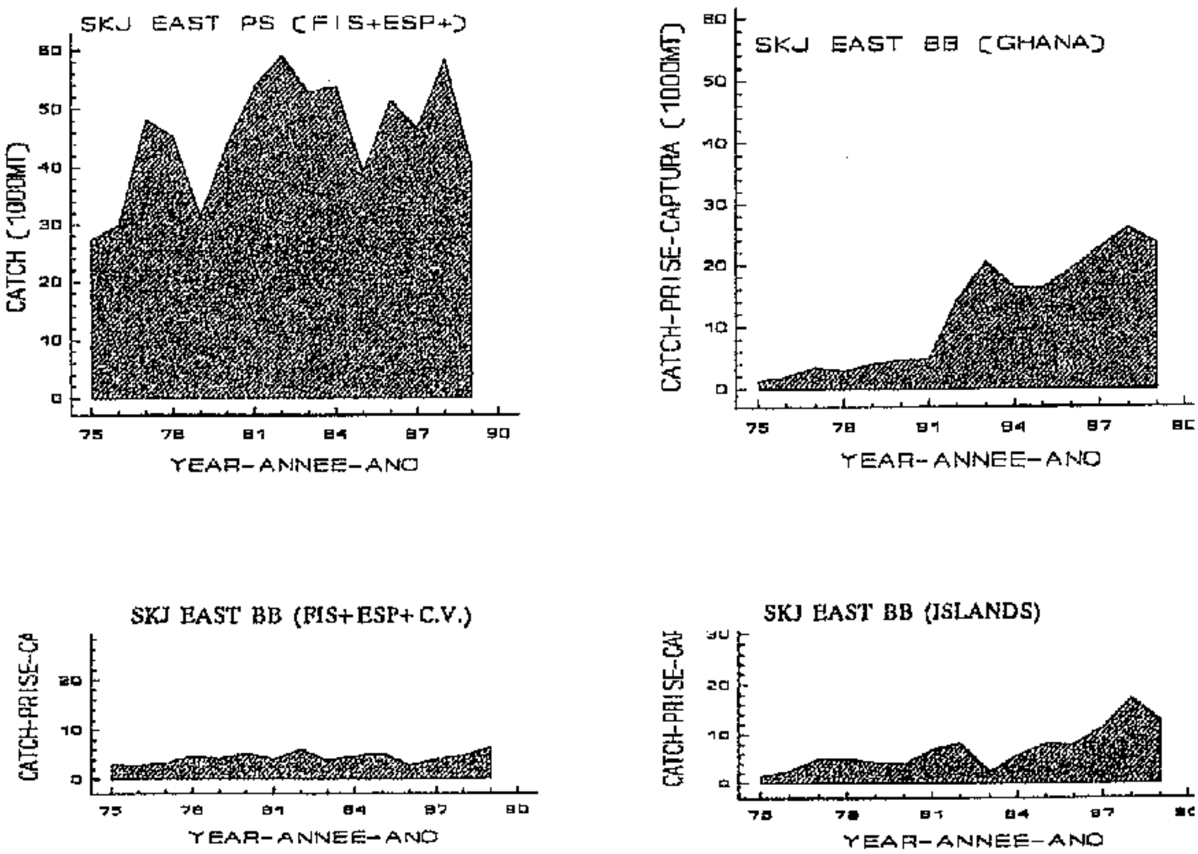


Fig. 25. Annual skipjack catches for the major east Atlantic fisheries for the period 1975-1989.

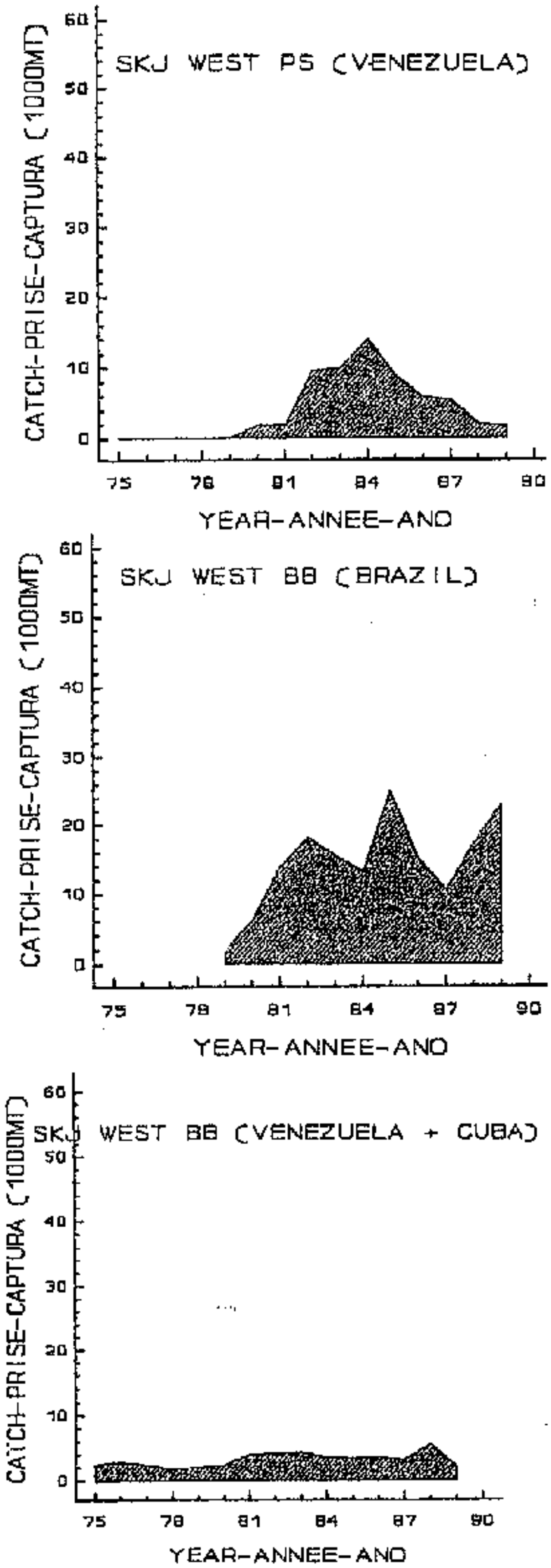


Fig. 26. Annual catches of skipjack for the major fisheries of the west Atlantic, for the period 1975-1989.

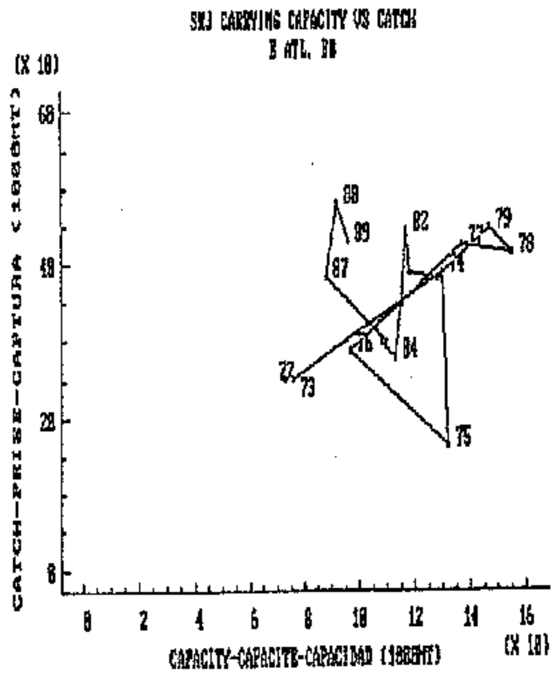


Fig. 27. Catches vs. vessel carrying capacity, for the east Atlantic baitboat fishery.

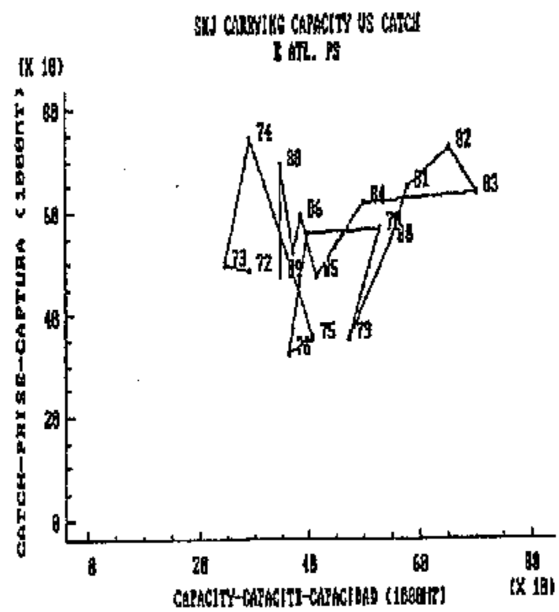


Fig. 28. Catches vs. vessel carrying capacity, for east Atlantic purse seiners.

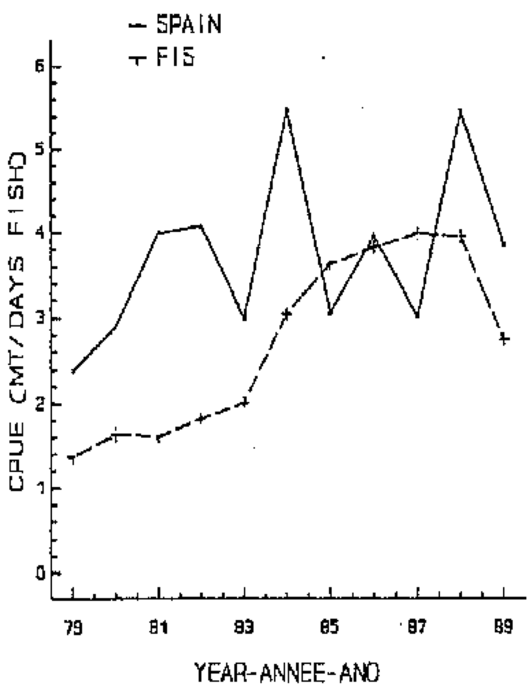


Fig. 29. Evolution of annual CPUE on skipjack tuna for the FISM and Spanish purse seine fleets in the east Atlantic.

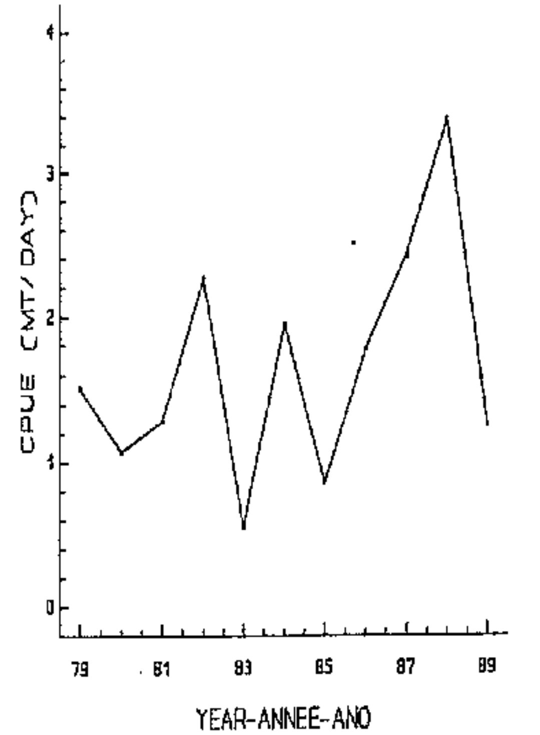


Fig. 30. Evolution of skipjack CPUE in the Azores baitboat fishery in the 3rd quarter of the year (SCRS/90/92).

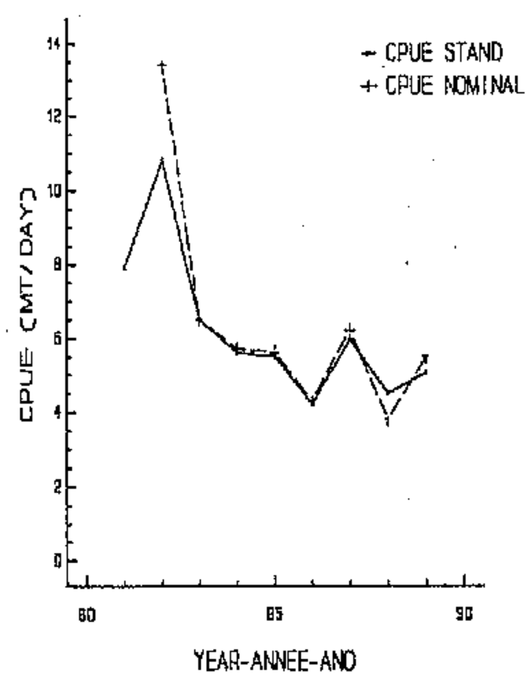


Fig. 31. Fluctuations in nominal and adjusted skipjack CPUE for "large Venezuelan purse seine" type tuna vessels (SCRS/90/100).

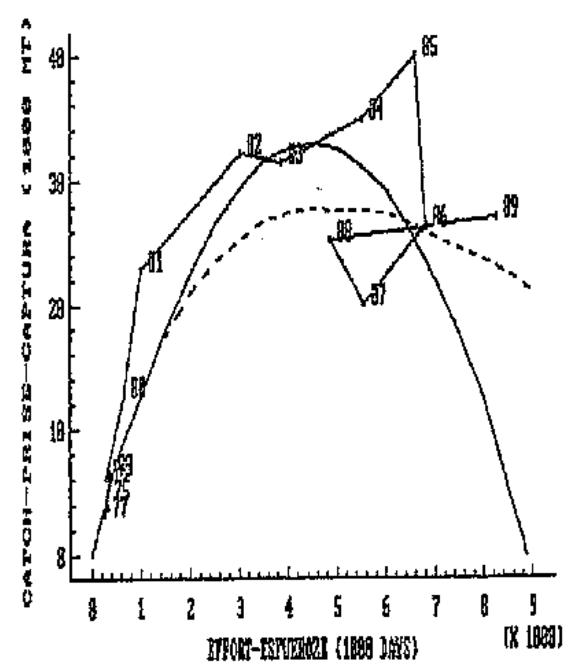


Fig. 32. Generalized production model for skipjack tuna in the west Atlantic obtained from CPUE data of the Venezuelan fleet (SCRS/90/100).

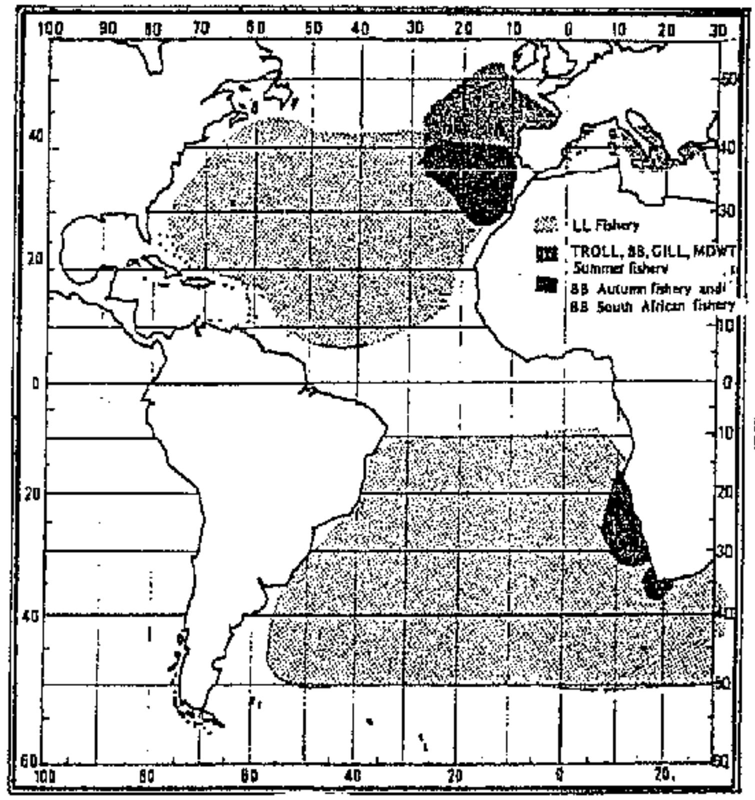


Figure 33. Main albacore fisheries for north and south Atlantic.

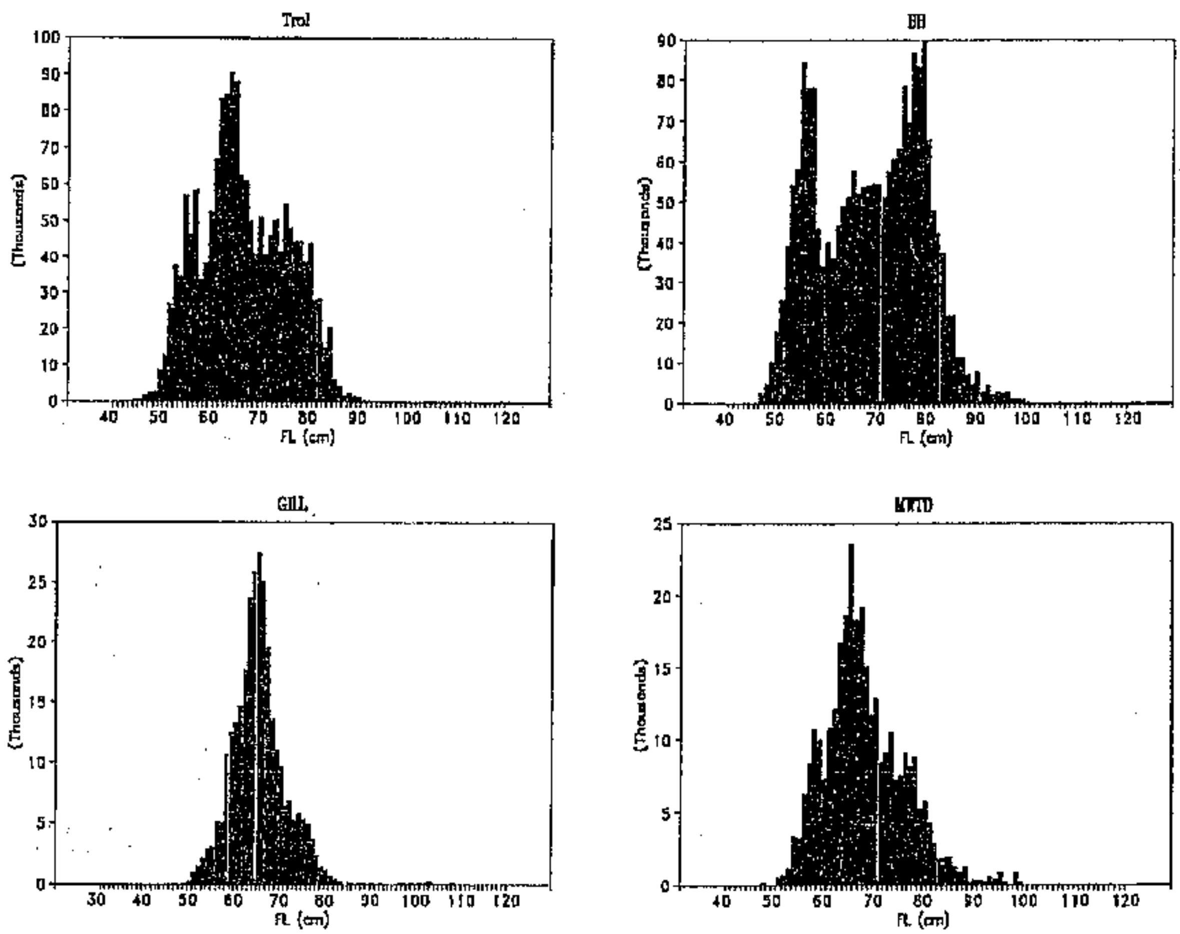


Figure 34. Total catch at size for four main surface gears (troll, mid-water trawl, gillnet and baitboat).

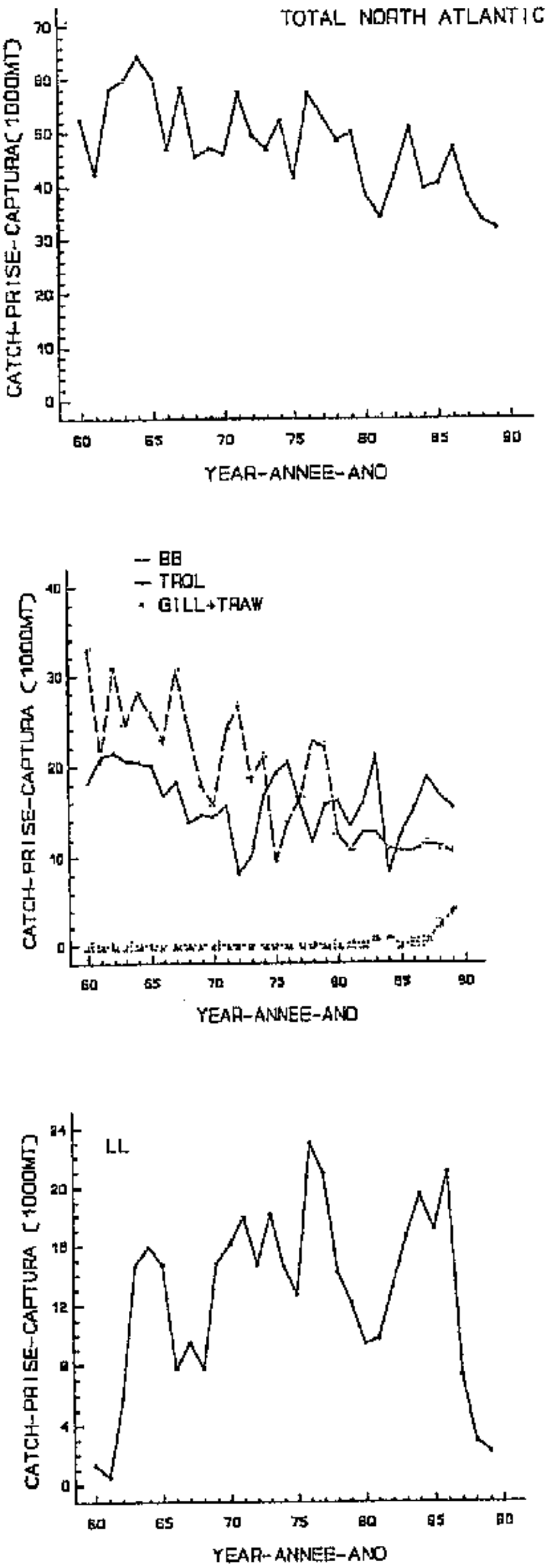


Fig. 35. Albacore catches in the North Atlantic, 1960-1989. (a) Total; (b) Surface gears (BB, TROL, GILL,TRAW); and (c) Longline.

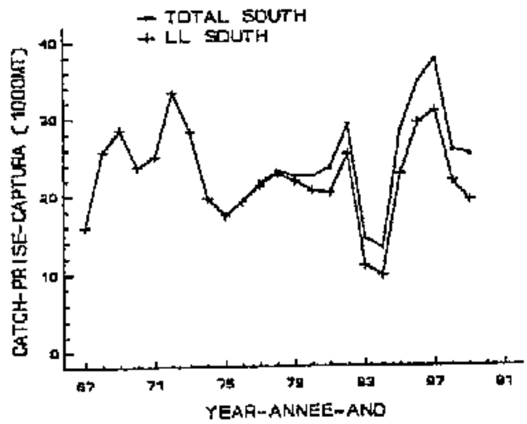


Fig. 36. Albacore catches in the south Atlantic, 1967-1989.

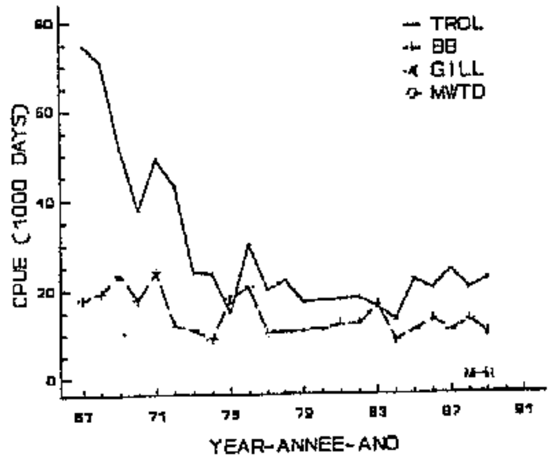


Fig. 37. Nominal effort of surface gears for albacore, 1967-1989, North Atlantic.

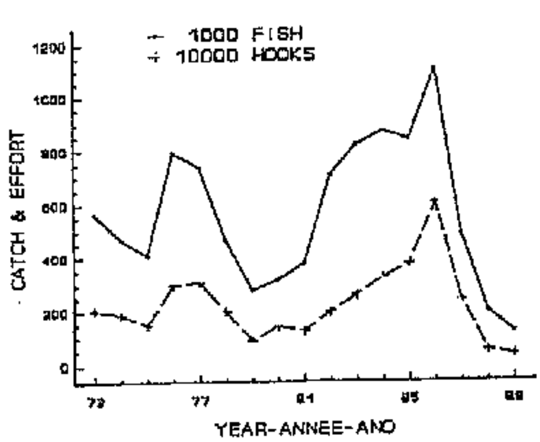


Fig. 38. Albacore nominal catch and effort of Taiwanese longline, 1973-1989, North Atlantic.

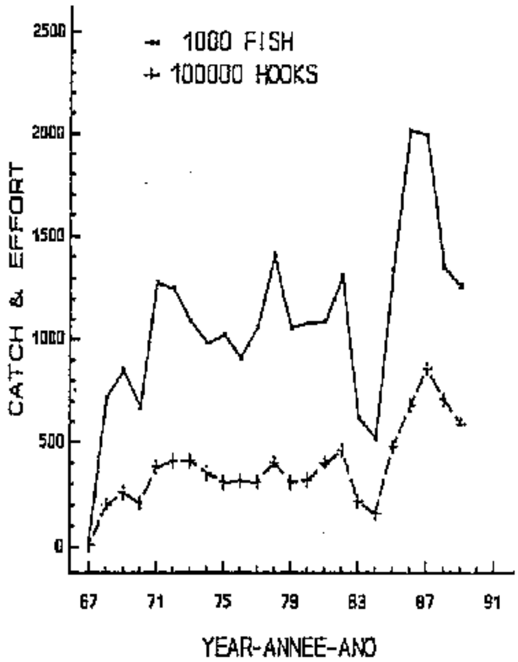


Fig. 39. Albacore catch and nominal effort of Taiwanese longline, South Atlantic, 1967-1989.

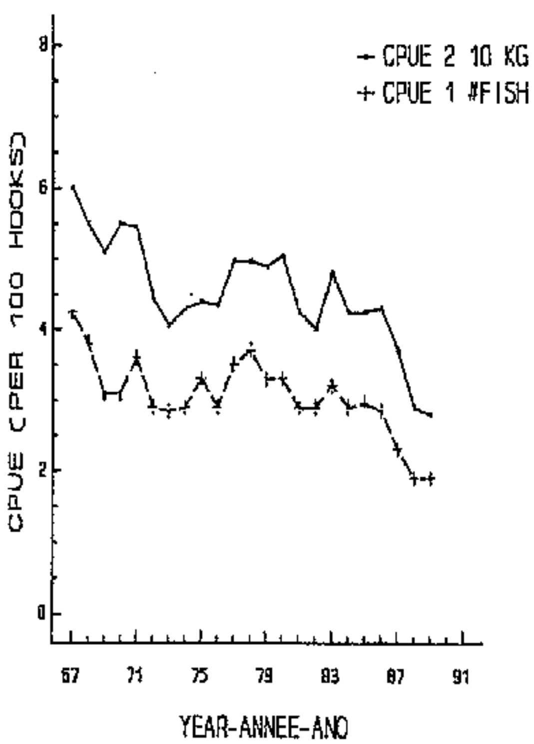


Fig. 41. Albacore catch rate for Taiwanese longline, South Atlantic, 1967-1988.

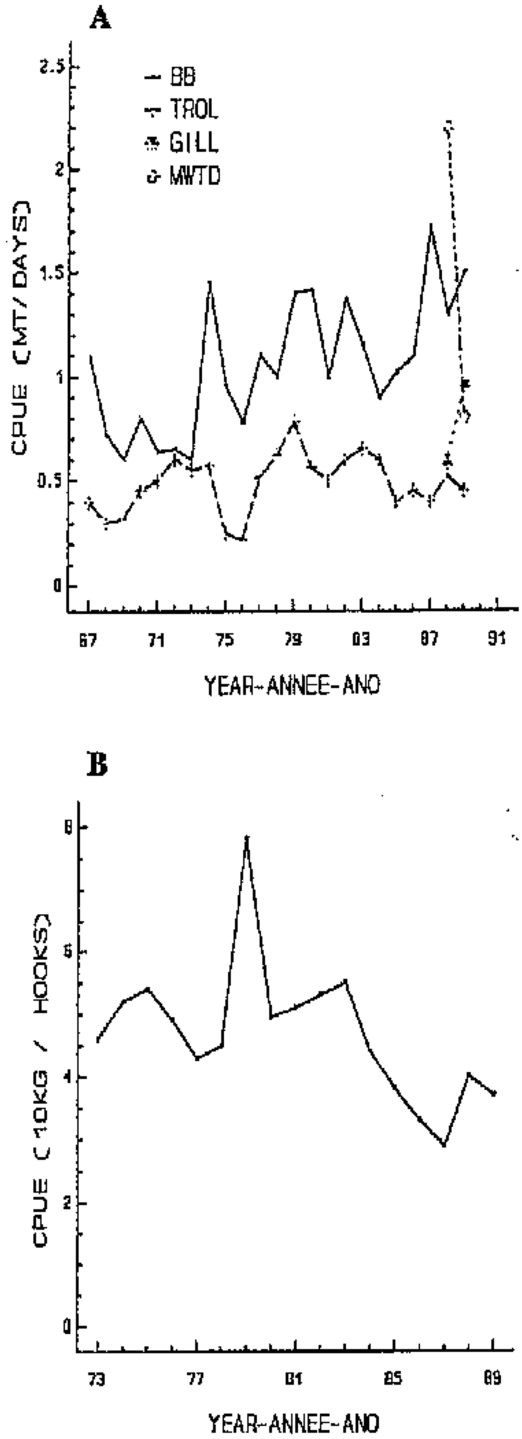


Fig. 40. Nominal catch rate for the main fisheries of North Atlantic albacore. (A) Surface gears (TROL, BB, GILL, TRAW) for 1967-1989; and (B) Longline for 1973-1989.

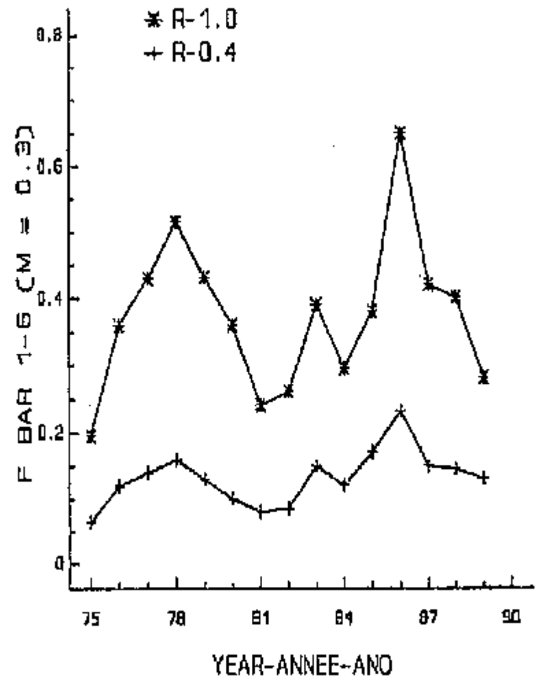


Fig. 42. Average albacore fishing mortalities (ages 1-6) for 1975-1989, computed by VPA under two hypotheses of the ratio F applied to the oldest age group. North Stock.

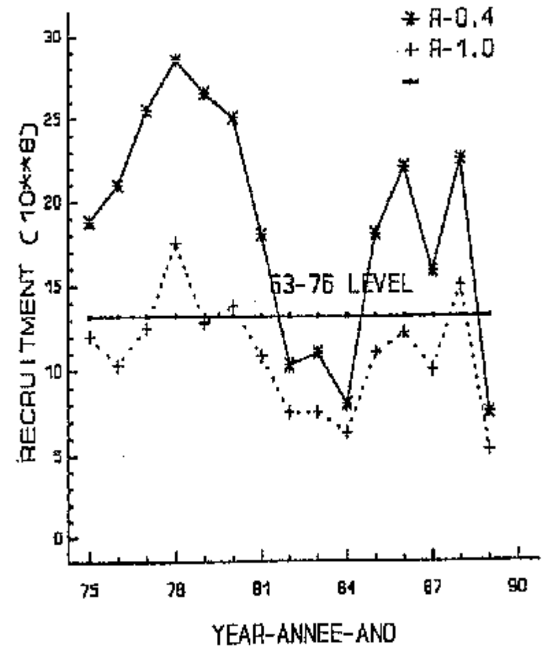


Fig. 43. Changes in albacore recruitment (in millions of fish) according to two hypotheses of average mortality of older fish. The mean level of recruitment calculated previously (1963-1976) is also shown in the figure.

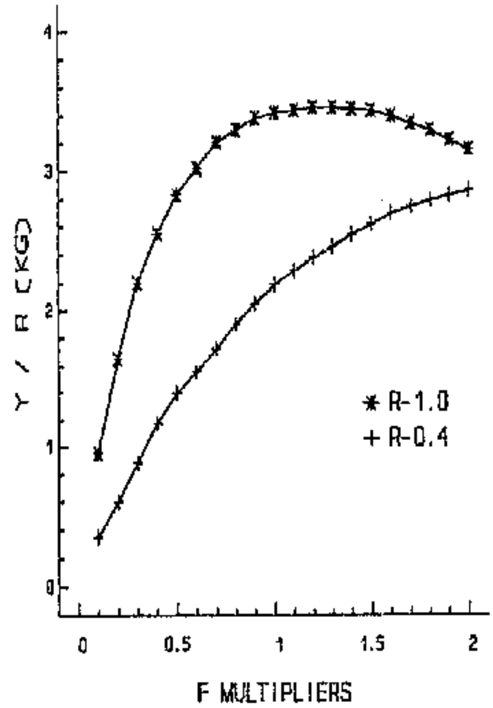


Fig. 44. Yield per recruit for North Atlantic albacore according to two hypotheses of average mortality of older fish. The present exploitation level is as $F_{mult.} = 1.0$.

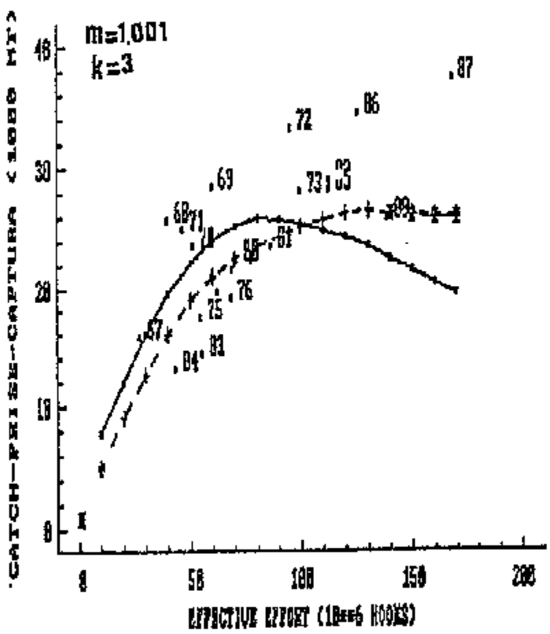


Fig. 45. Production model for South Atlantic albacore stock with three sets of standard years. (SCRS/90/59).

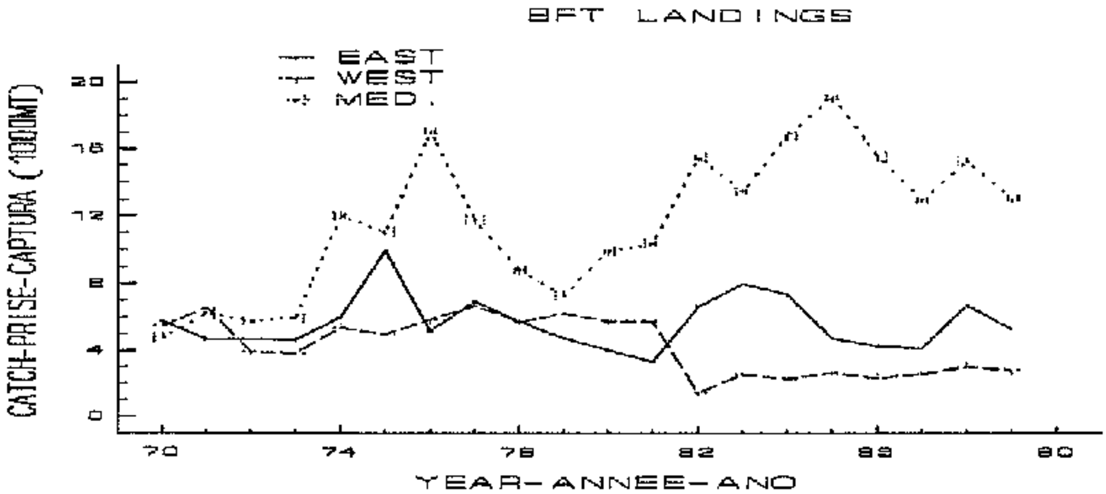


Fig. 46. Atlantic bluefin tuna landings by major fishery area from 1970 to 1989.

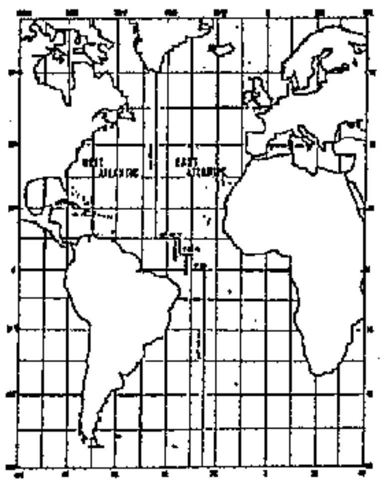


Fig. 47. Map of the Atlantic Ocean showing the line used to separate the eastern and western components of the Atlantic bluefin stock.

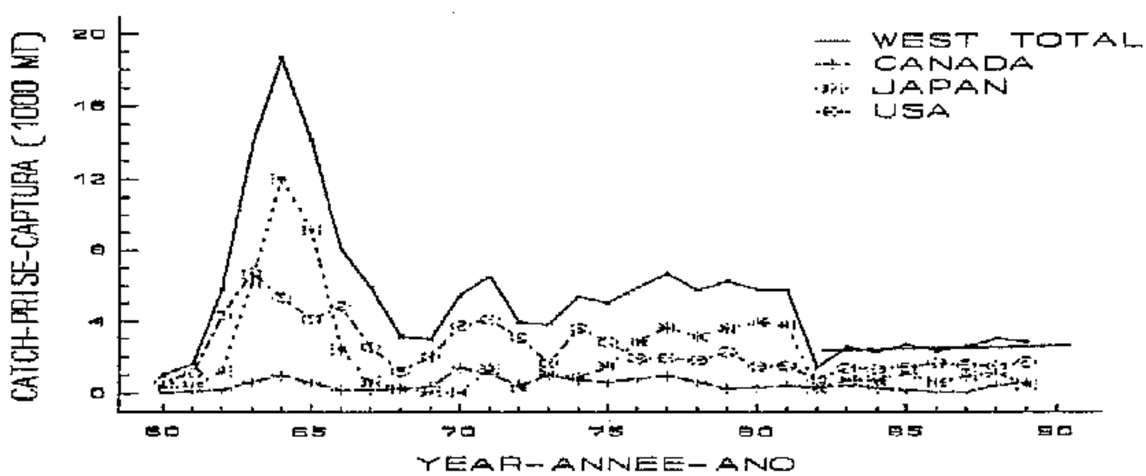


Fig. 48. West Atlantic bluefin tuna landings, 1960 to 1989. Landings by country for three major fishing nations of the west Atlantic. The scientific monitoring level of 2,660 MT from 1983 to 1990 is indicated as a solid horizontal line.

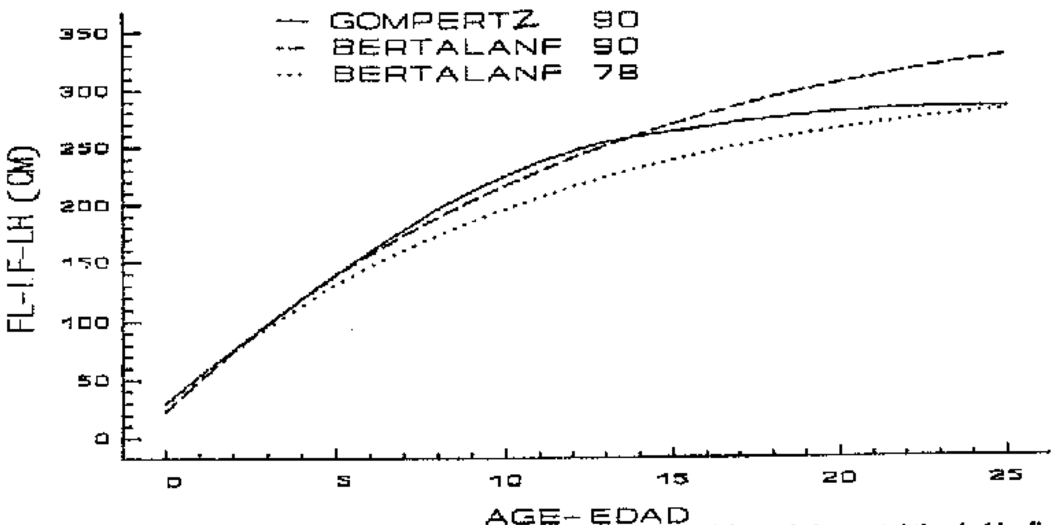
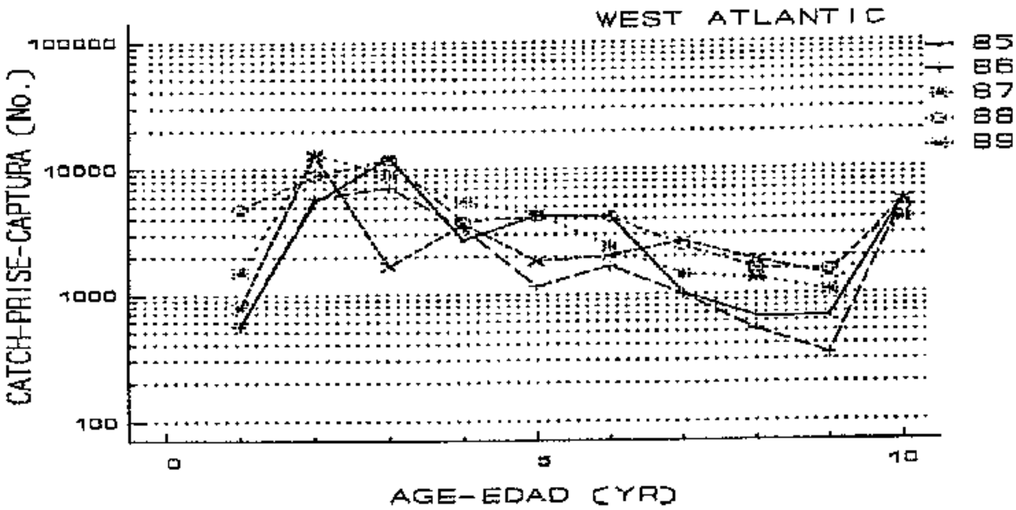


Fig. 49. Growth models considered by the 1990 SCRS for "age slicing" of the west Atlantic bluefin tuna. The von Bertalanffy (1978) model has been used in past assessments (SCRS/78/37).

Gompertz:	L_∞=287cm; g=0.216; k=2.120
von Bertalanffy 1990:	L_∞=380cm; k=0.079; t_0=0.731
von Bertalanffy 1978:	L_∞=313cm; k=0.09; t_0=0.96



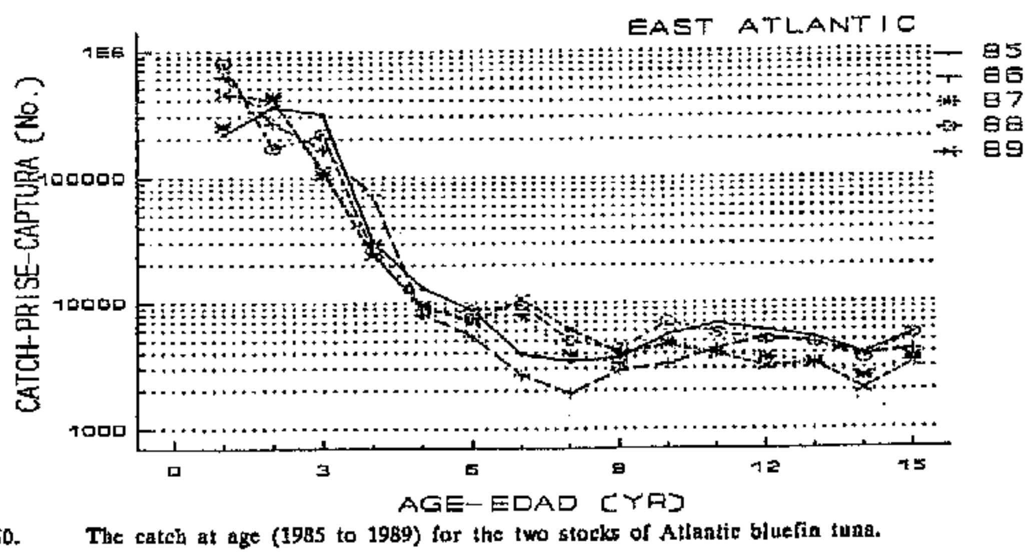


Fig. 50. The catch at age (1985 to 1989) for the two stocks of Atlantic bluefin tuna.

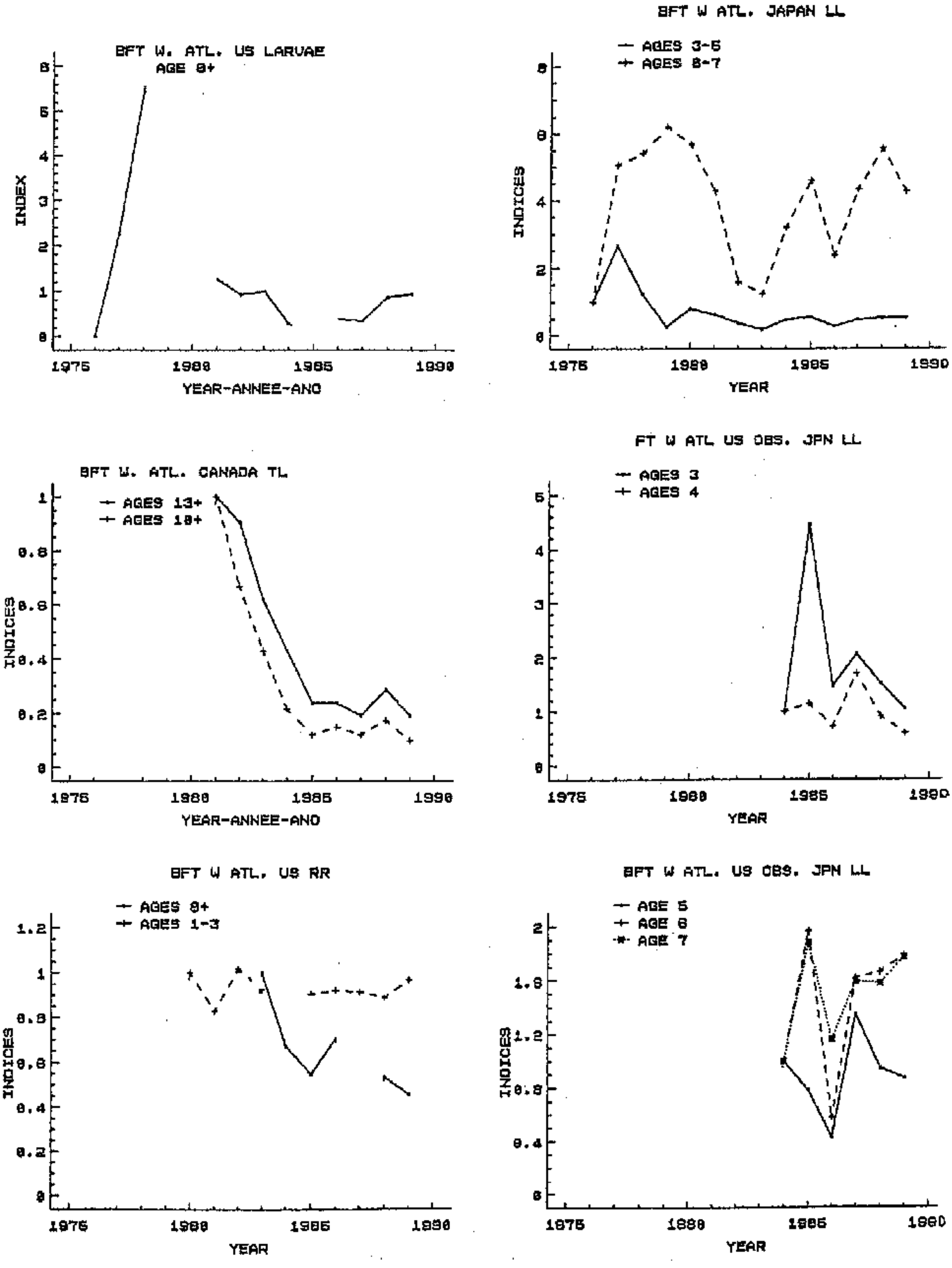


Fig. 51. Abundance indices considered for calibration of the west Atlantic bluefin tuna by the 1990 SCRS. Age indicates the age categories to which the index was applied.

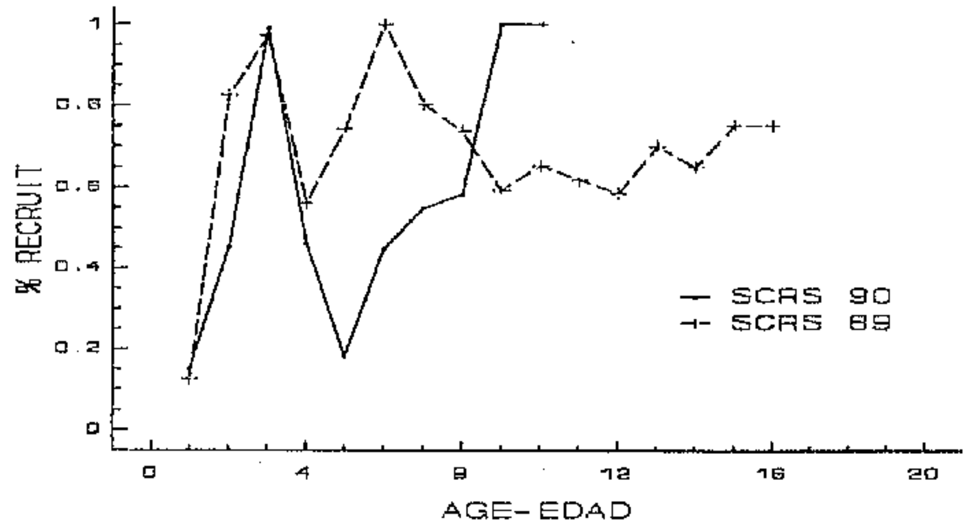


Fig. 52. Partial recruitment estimated by the 1990 SCRS for the west Atlantic bluefin tuna by the ADAPTive model. A comparison is made with the PR used by the 1989 SCRS which was estimated by SVPA.

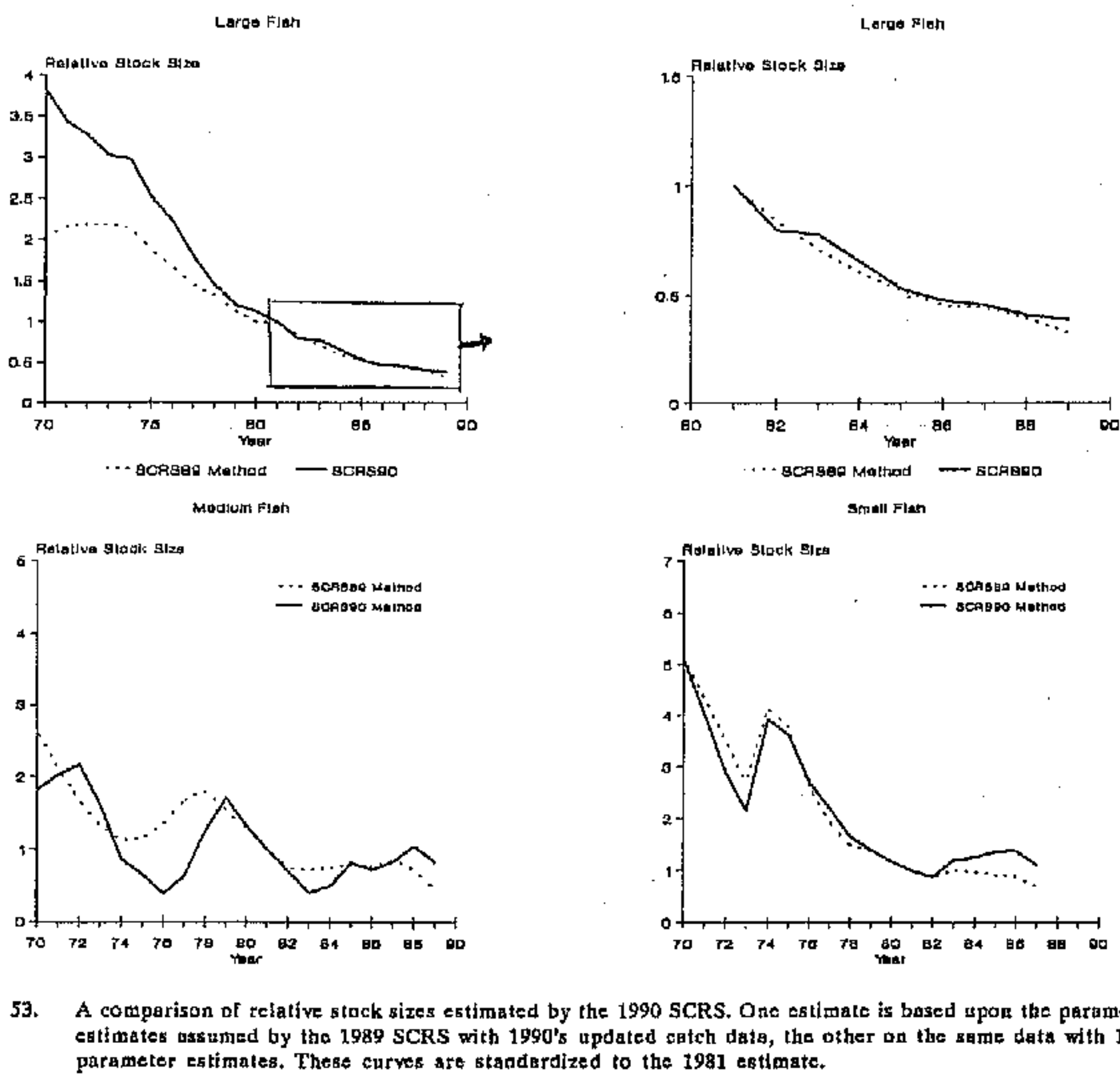


Fig. 53. A comparison of relative stock sizes estimated by the 1990 SCRS. One estimate is based upon the parameter estimates assumed by the 1989 SCRS with 1990's updated catch data, the other on the same data with 1990 parameter estimates. These curves are standardized to the 1981 estimate.

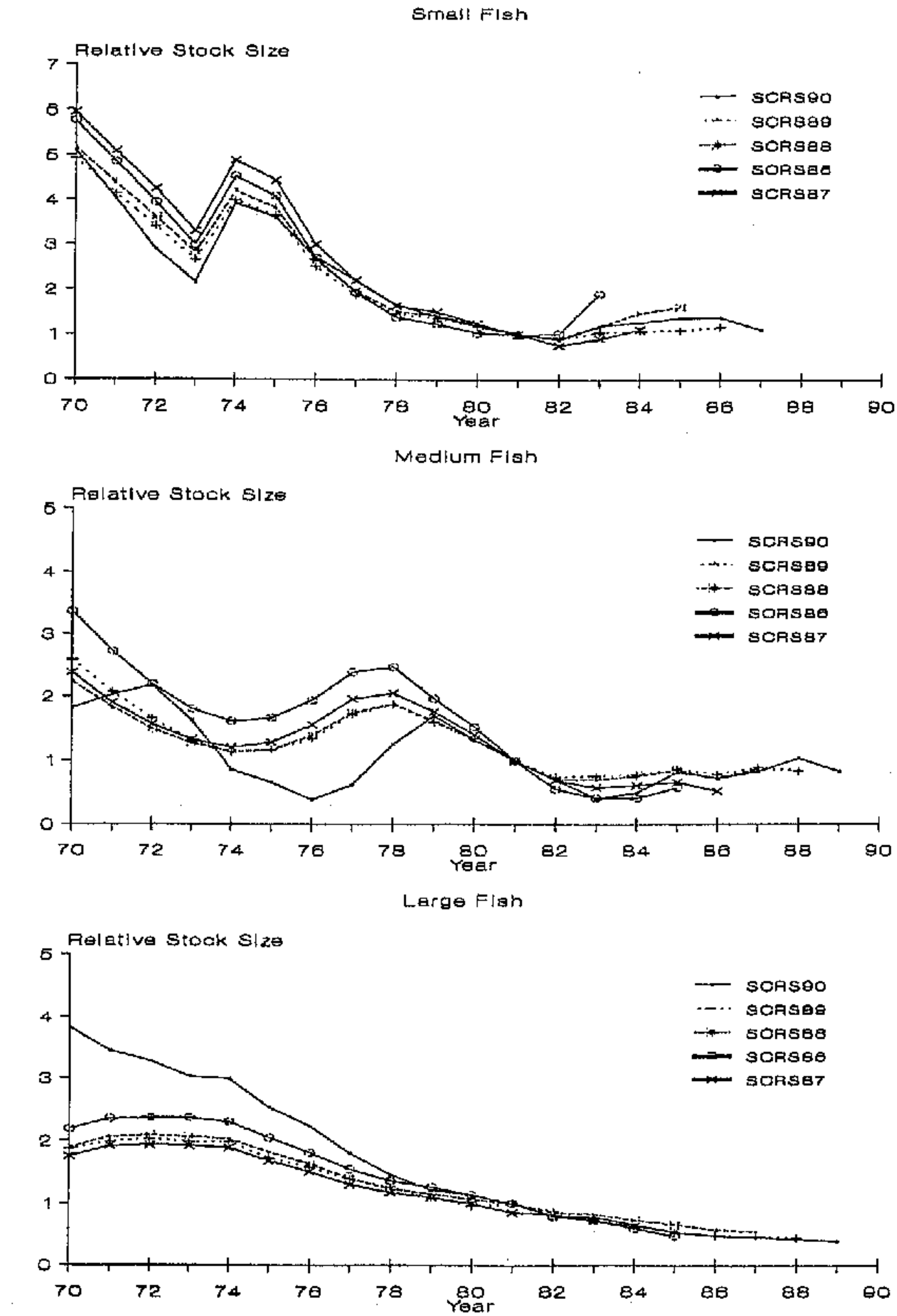


Fig. 54. Population estimates (number) from the current assessment compared to those of SCRS meetings 1986 through 1989.

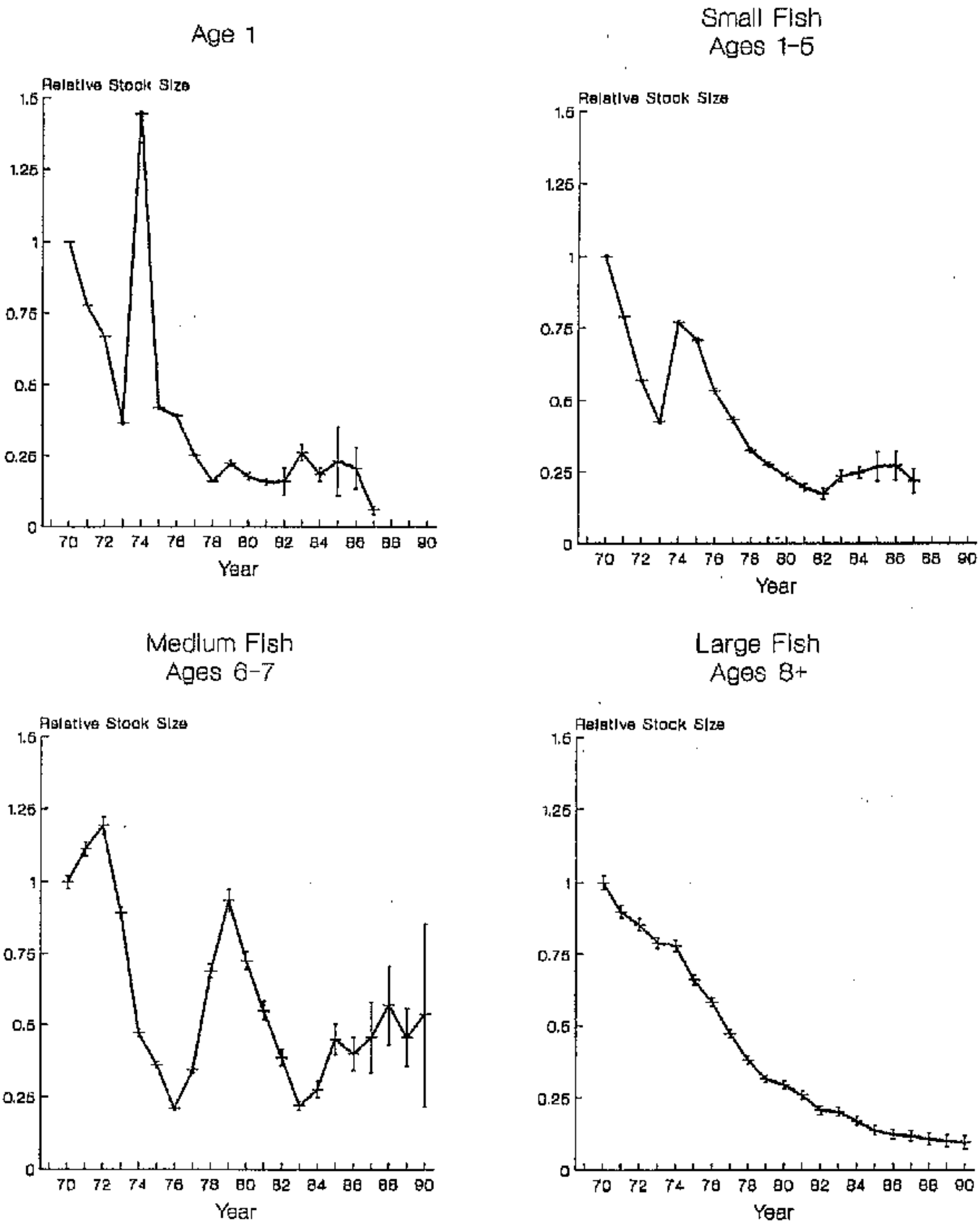


Fig. 55. Population estimates (in numbers) for the west Atlantic bluefin from VPA. The terminal year estimates for the younger ages are dependent on the input values. The vertical bars indicate 1 standard deviation above and below the mean, given the assumptions of the assessment. Additional unquantifiable uncertainty does exist due to many assumptions of the biology of this species (e.g. stock structure, growth, mortality, etc.).

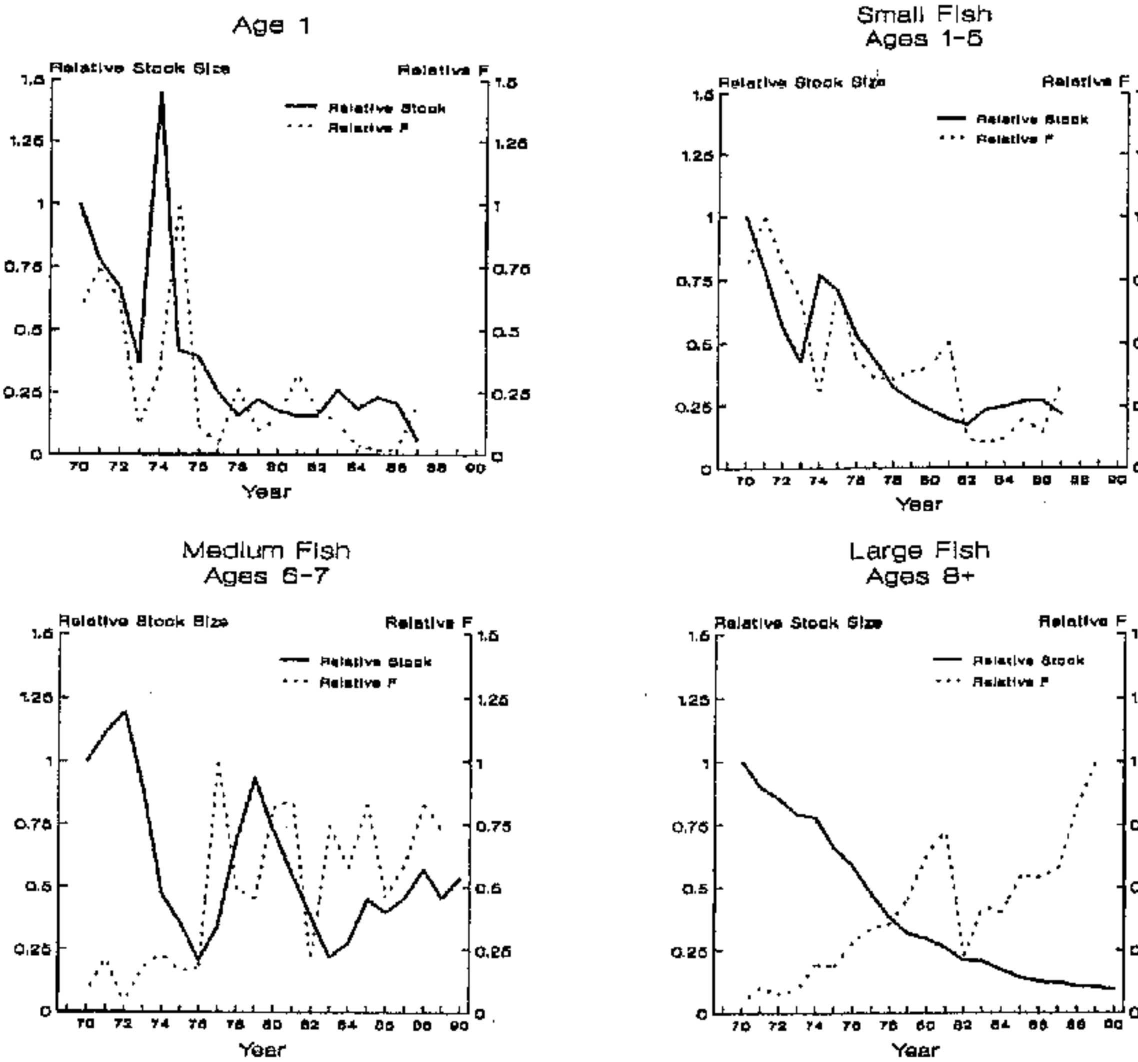


Fig. 56. Relative stock size from VPA and associated relative fishing mortality rates estimated by the 1990 SCRS. This comparison can be used to assess the effect of the 1982 catch limitations.

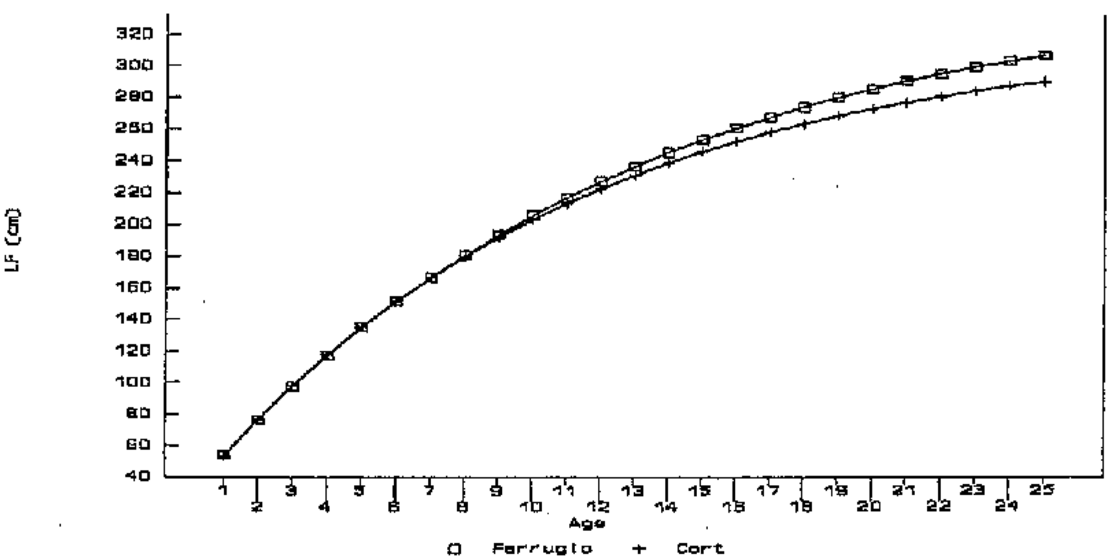


Fig. 57. Growth equations considered by the 1990 SCRS to convert length data into age.

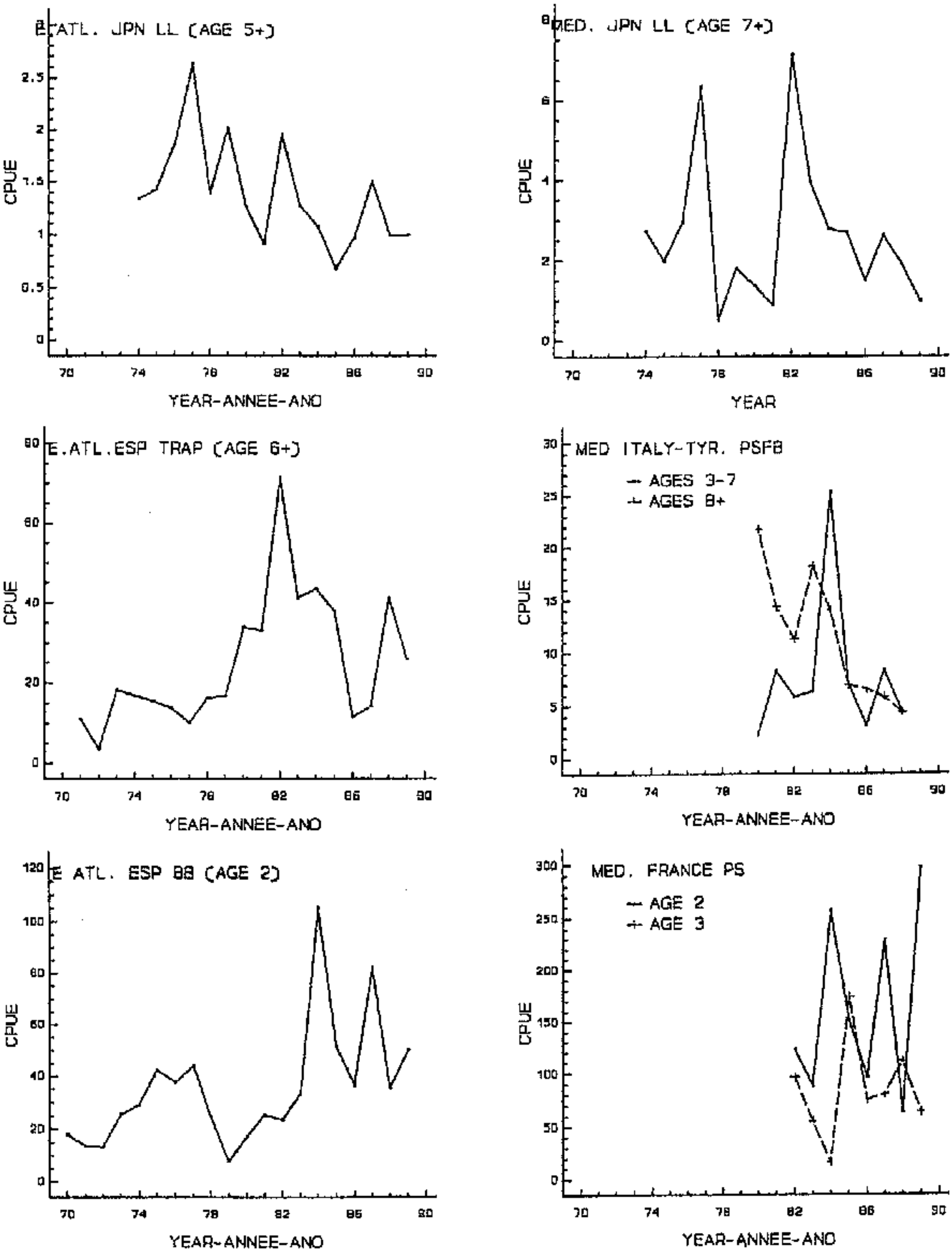


Fig. 58. Abundance indices for east Atlantic bluefin tuna.

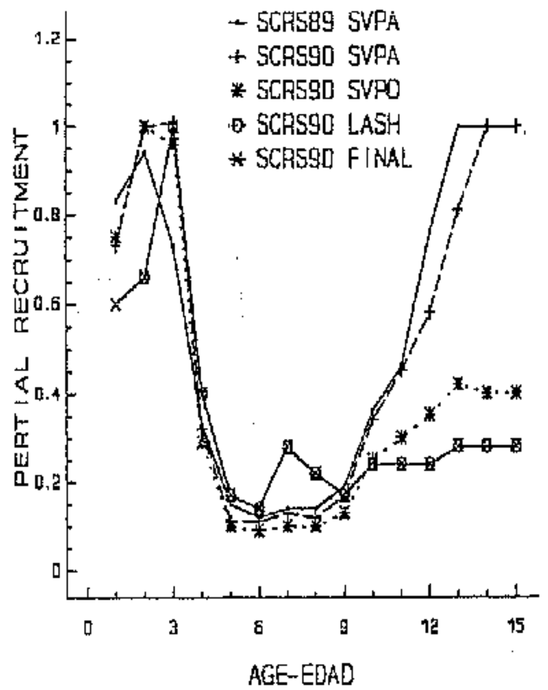
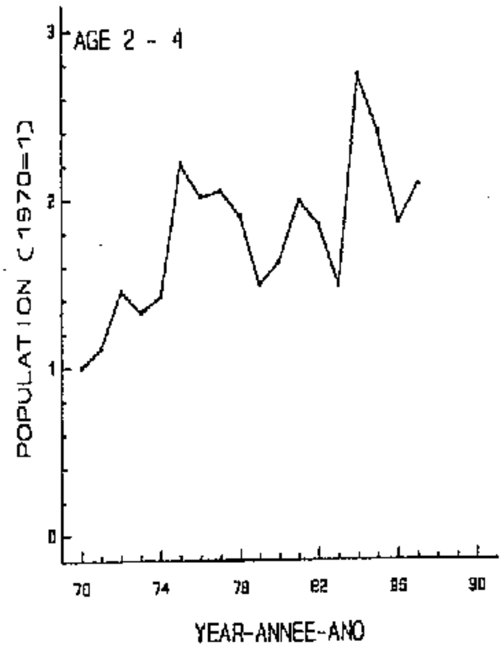


Fig. 59. Partial recruitment of east Atlantic bluefin tuna.



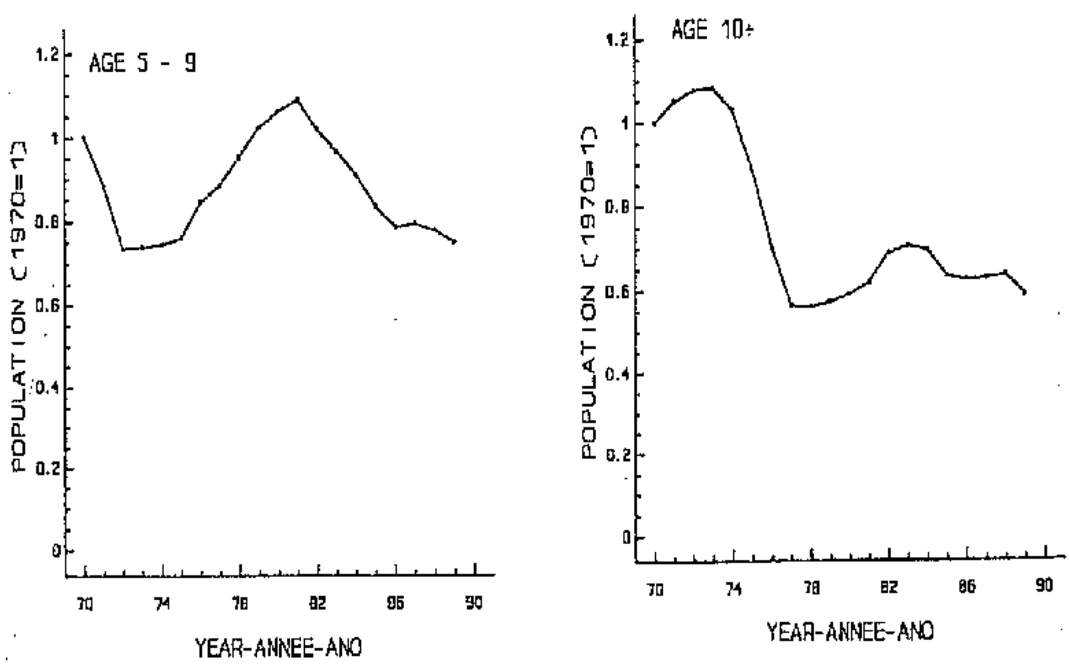


Fig. 60. Estimated stock size of east Atlantic bluefin tuna, relative to that of 1970, by age groups (2 to 4, 5 to 9 and 10+).

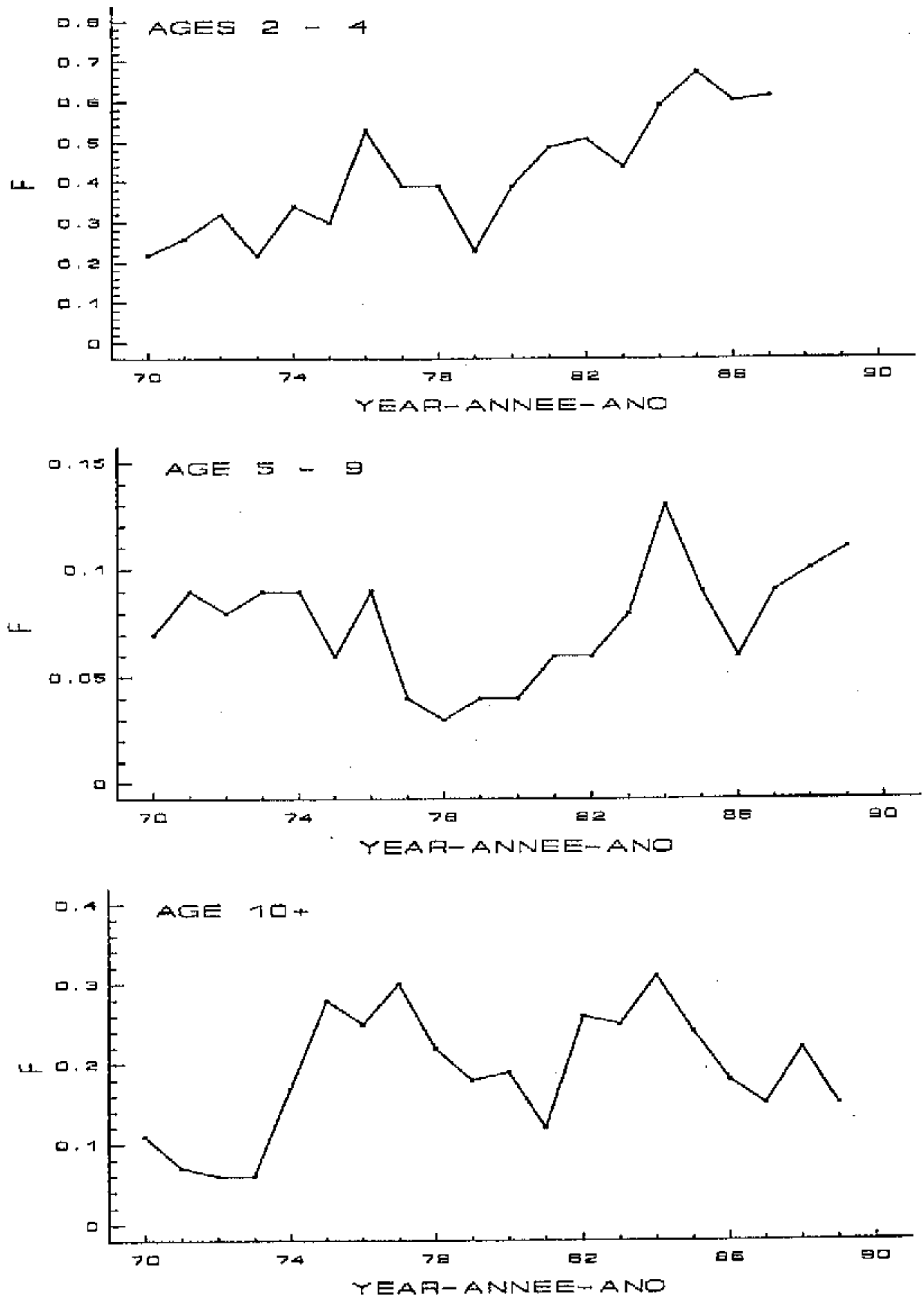


Fig. 61. Estimated fishing mortality by VPA raised to stock size (in number) for east Atlantic bluefin, by age categories (2 to 4, 5 to 9 and 10+).

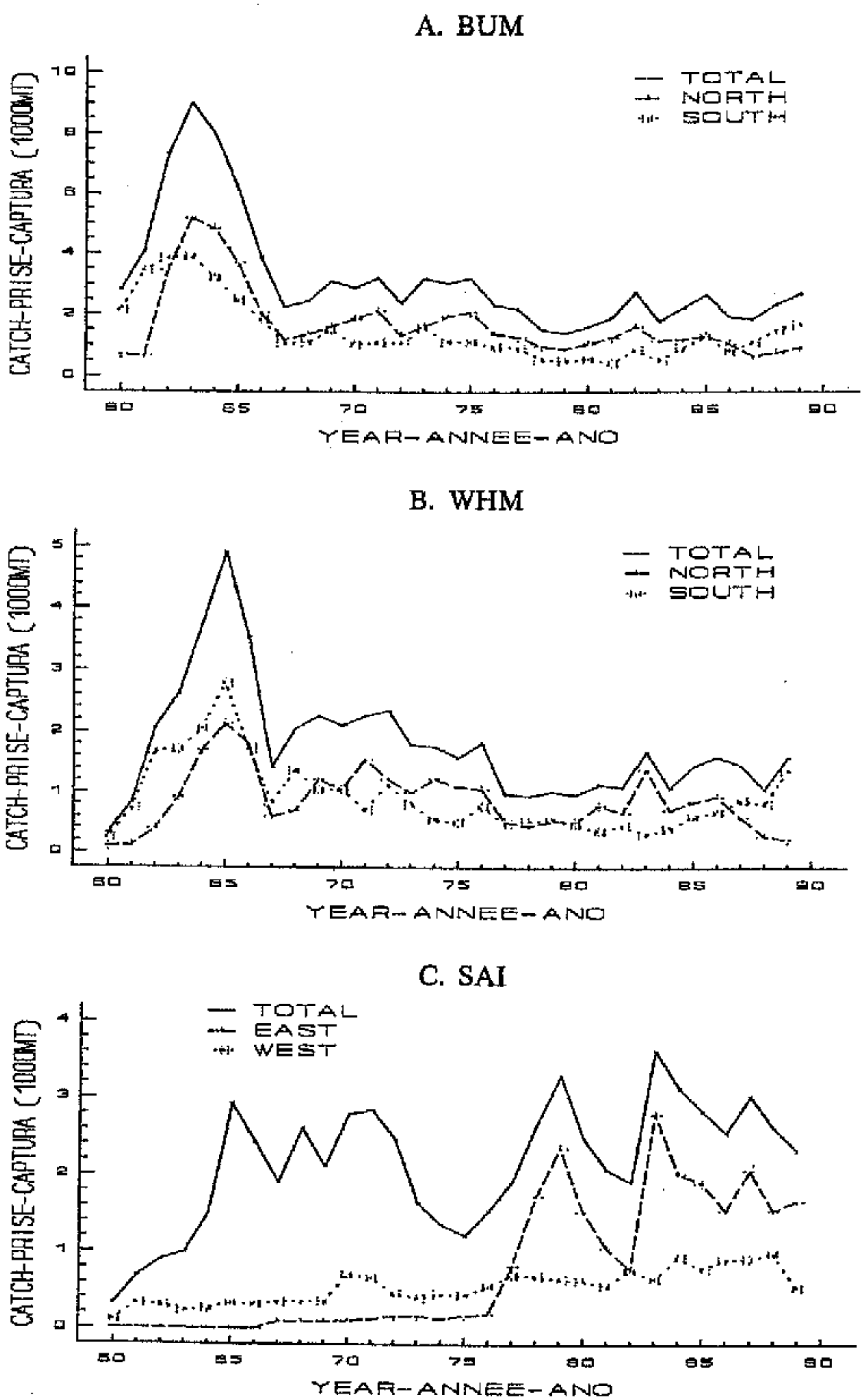


Fig. 62. Nominal landings for blue marlin (A), white marlin (B), and sailfish (C), 1960-1989.

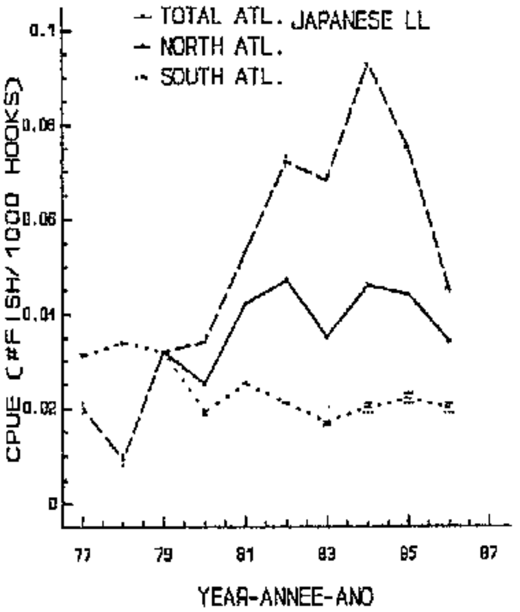


Fig. 63A. CPUE (number of fish per 1000 hooks) for blue marlin by the Japanese longline fishery in the north, south and whole Atlantic, 1977-1986.

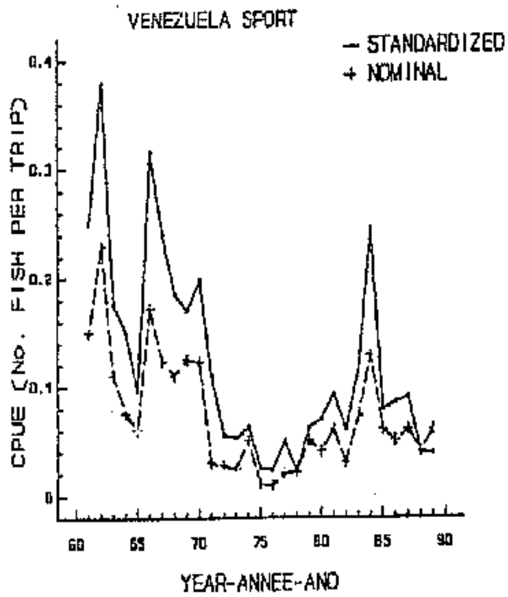


Fig. 63B. Annual nominal recreational CPUE (broken line) and standardized recreational CPUE (solid line) for blue marlin from Venezuela, 1960-1989.

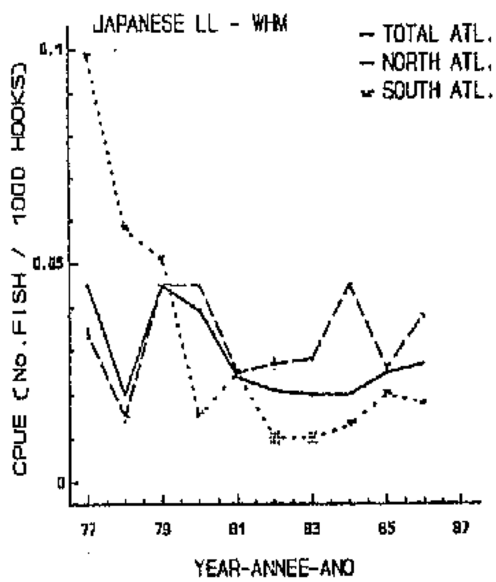


Fig. 64A. CPUE (number of fish per 1000 hooks) for white marlin by the Japanese longline fishery in the north, south and whole Atlantic, 1966-1986.

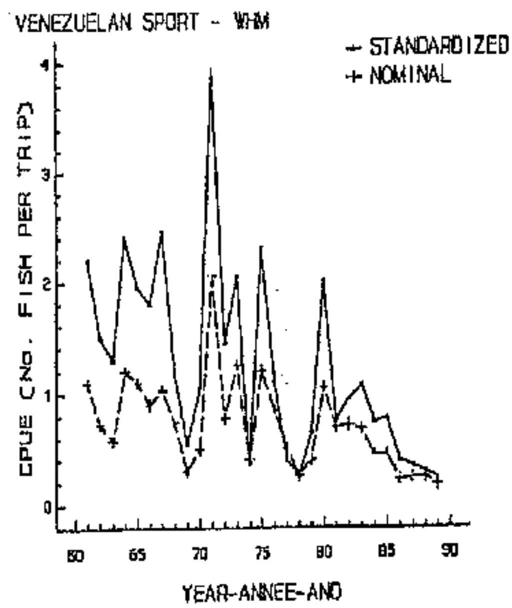


Fig. 64B. Annual nominal recreational CPUE (broken line) and standardized recreational CPUE (solid line) for white marlin from Venezuela, 1960-1989.

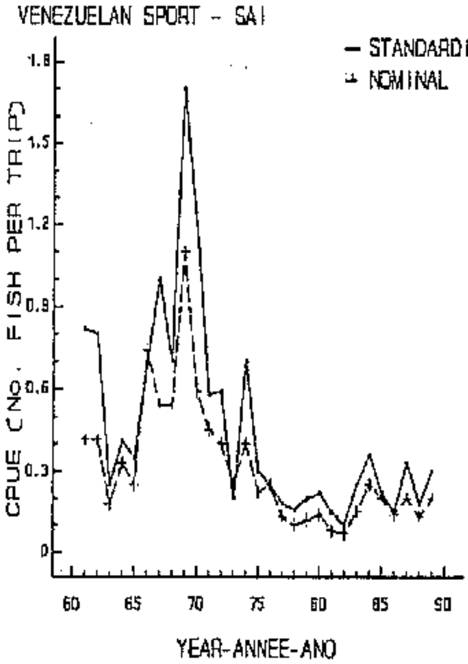


Fig. 65. Annual nominal recreational CPUE (broken line) and standardized recreational CPUE (solid line) for sailfish from Venezuela, 1960-1989.

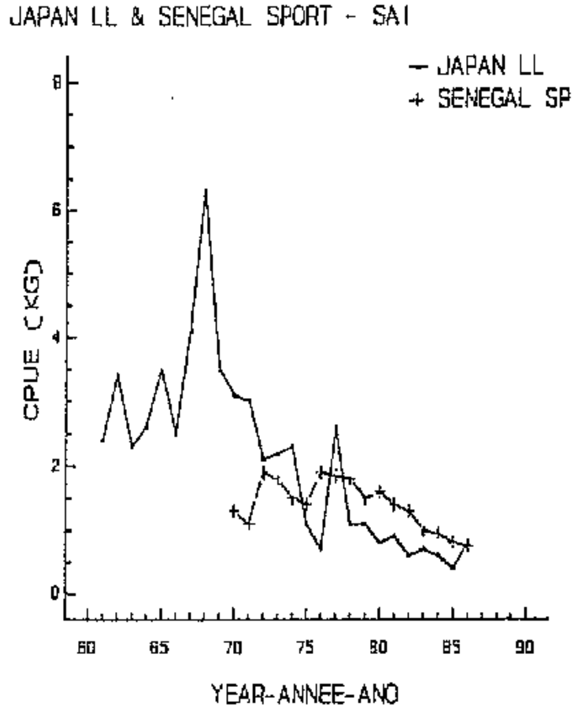


Fig. 66. Sailfish CPUE (in kg) calculated by the Honma method, for Japanese longline of the central and east Atlantic and for the Dakar-based recreational sailfish fishery, 1961-1986.

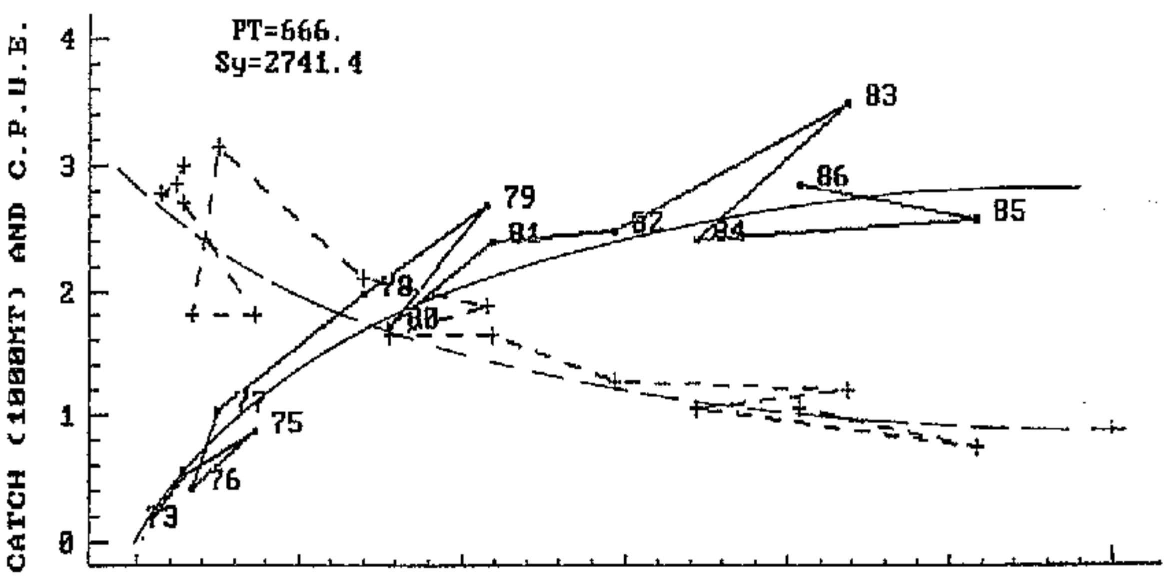


Fig. 67. Generalized production model (Pella and Thomlinson) with best parameters for the east Atlantic sailfish, 1971-1986 (m=0.39).

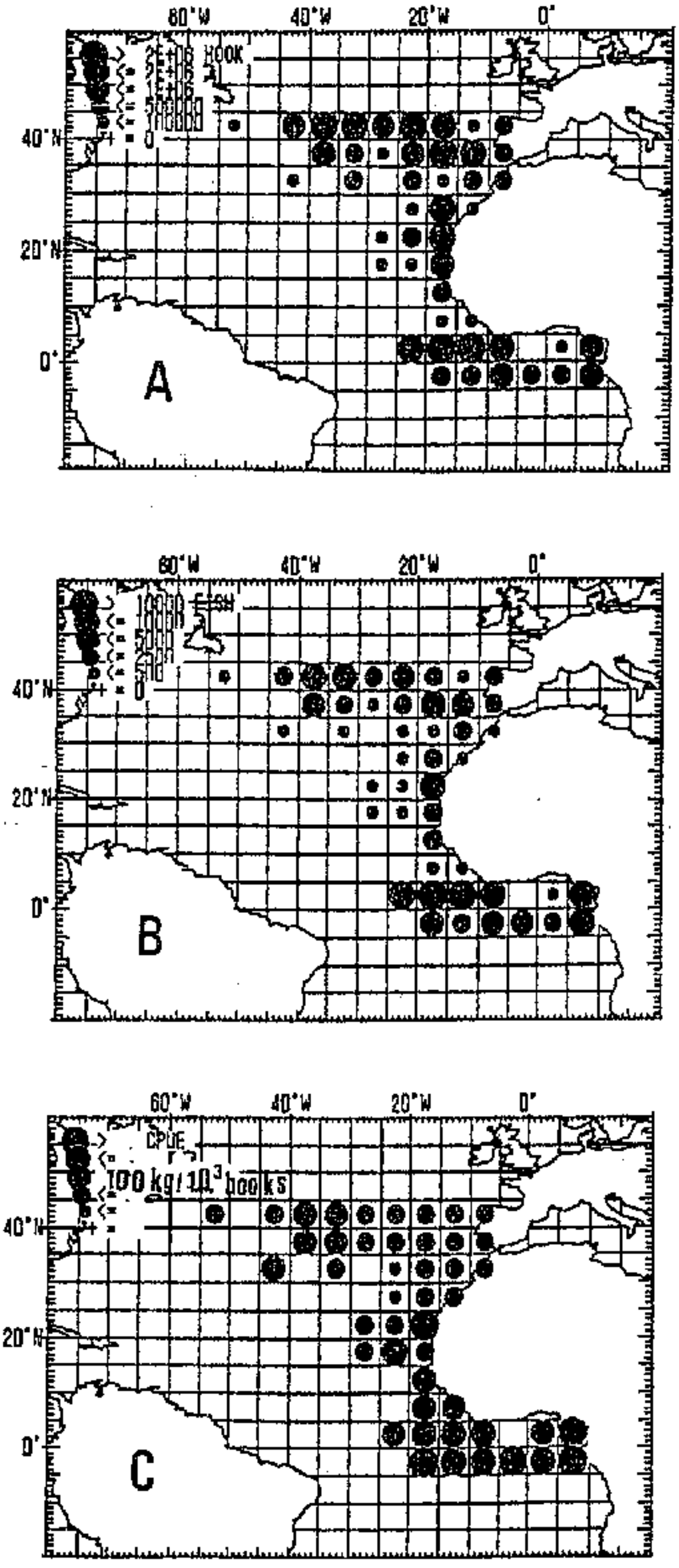


Fig. 68. Annual distribution of Spanish longline catch, effort and CPUE - 1989.

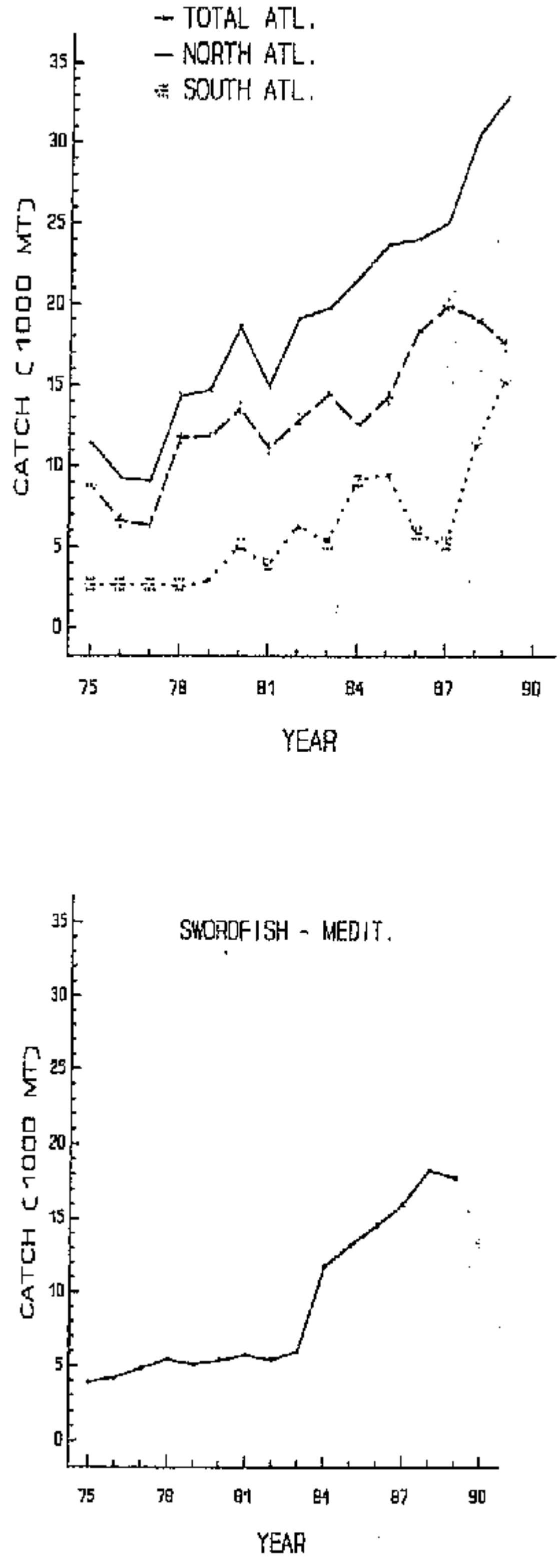


Fig. 69. Annual nominal catches of swordfish in the Atlantic and Mediterranean.

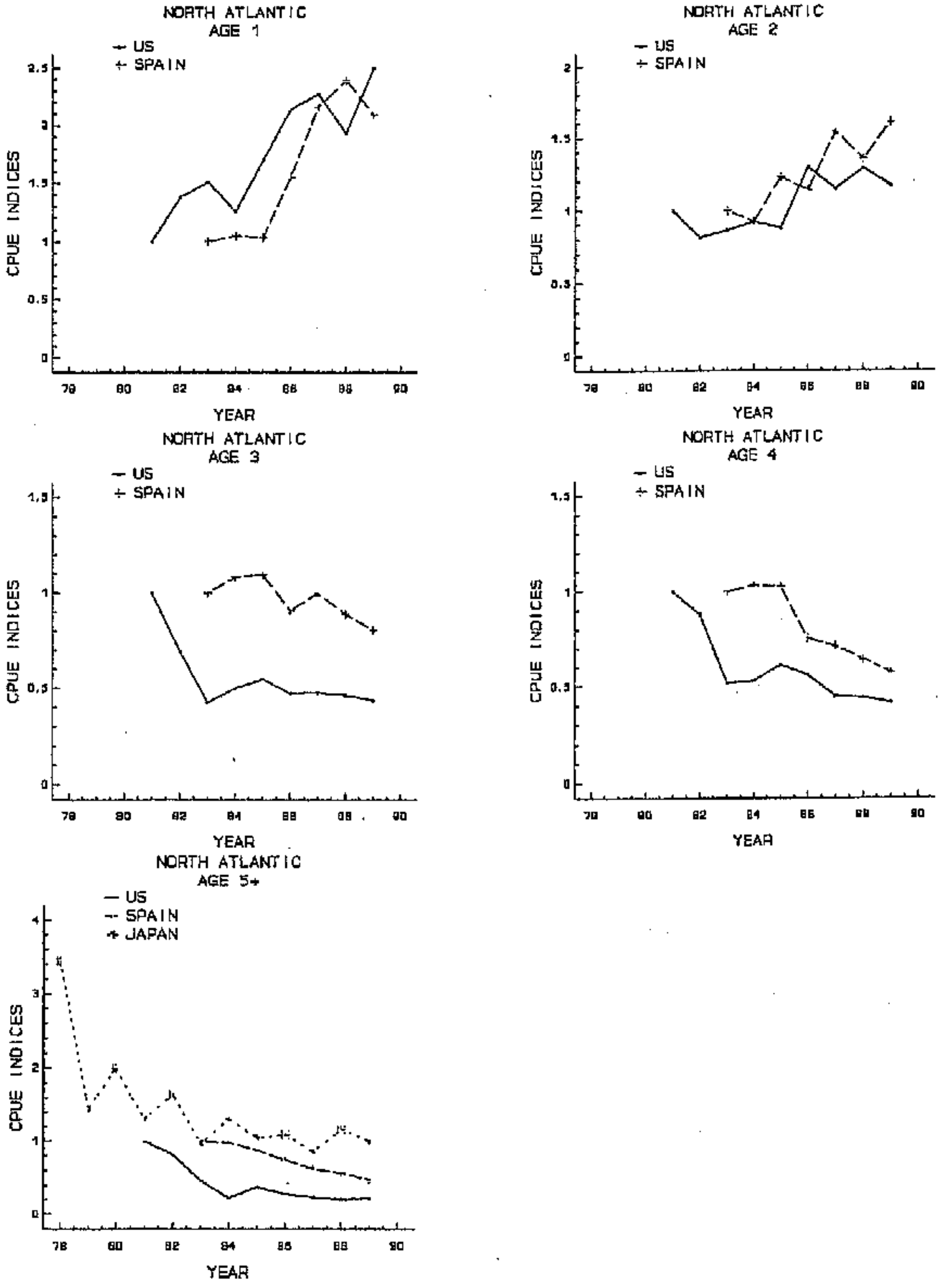


Fig. 70. Swordfish CPUE indices by age, for the entire North Atlantic.

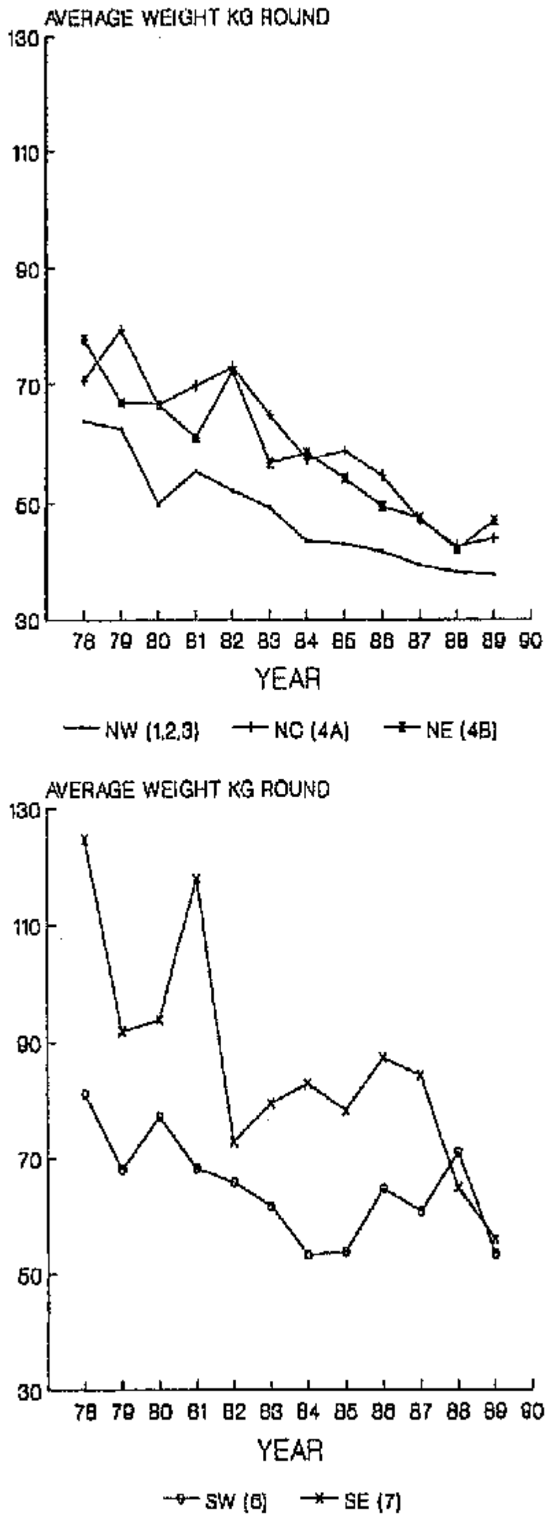


Fig. 71. Trends in average weight in the swordfish catch, by ICCAT areas 1, 2, 3, 4A, 4B, 6 and 7.

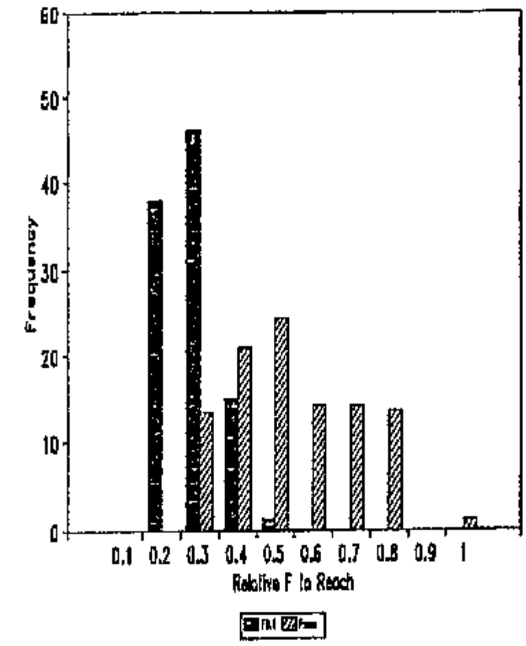


Fig. 72. Distribution of reductions in fishing mortality rate necessary to reach $F_{0.1}$ and F_{max} for the North Atlantic swordfish stock hypothesis.

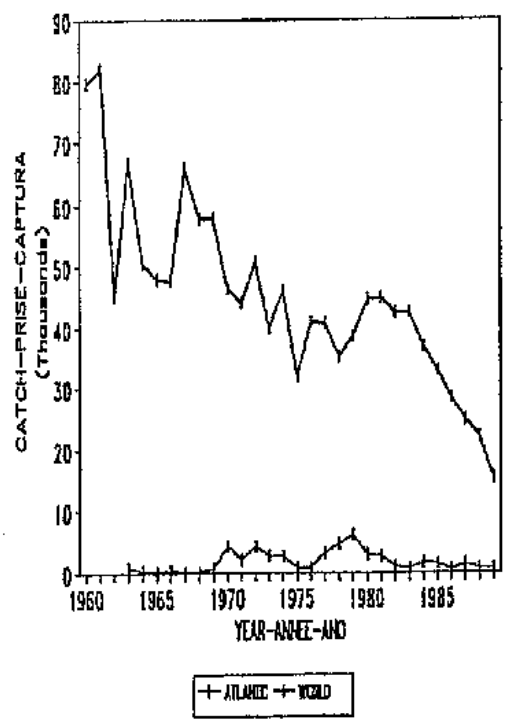


Fig. 73. Southern bluefin tuna catches in the Atlantic Ocean compared to the world-wide catches, 1960-1989.

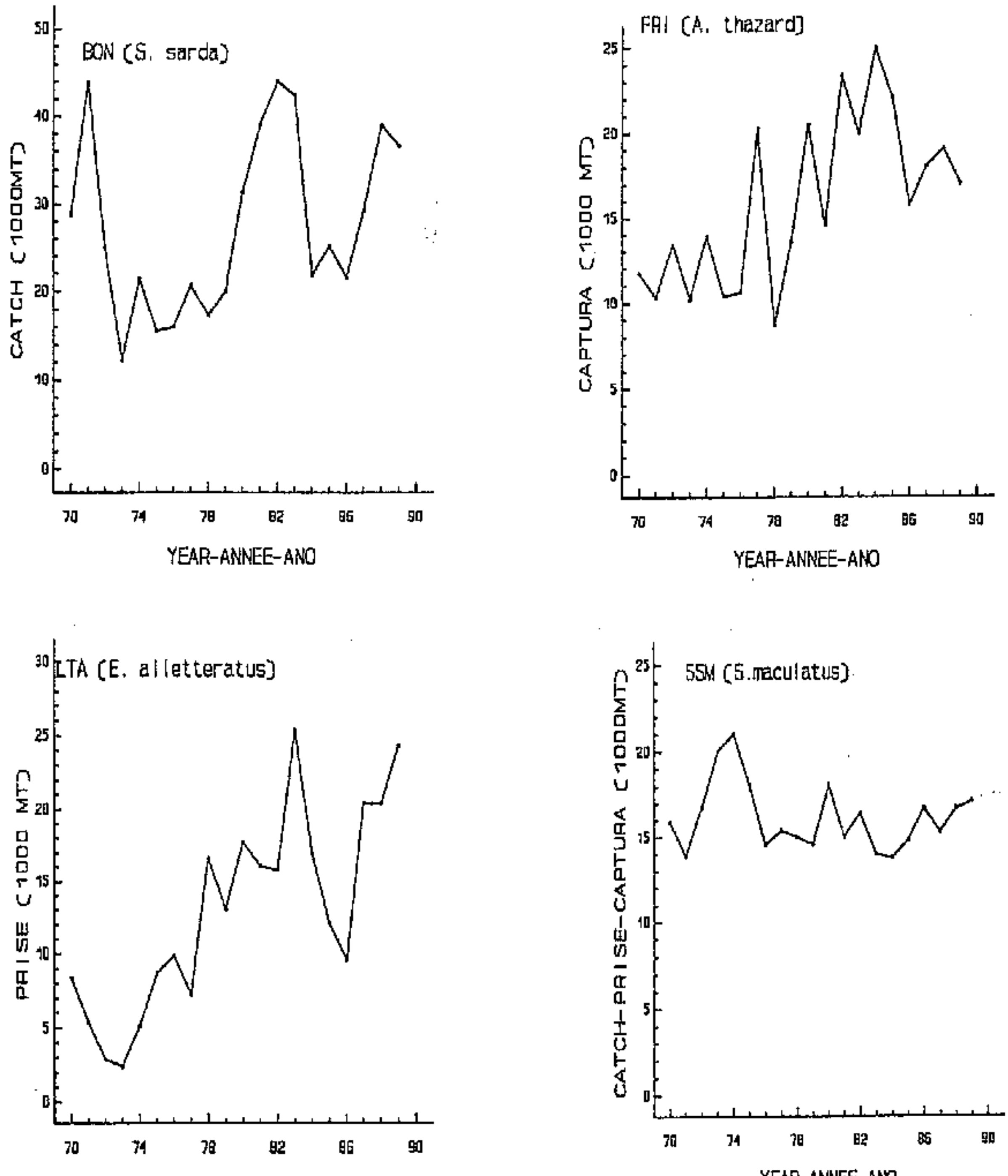


Fig. 74. Annual catches (in MT) of the major small tunas, by species, 1970-1989.

Appendix 1 to Annex 10

1990 SCRS AGENDA

1. Opening of the meeting
2. Adoption of Agenda and arrangements for the meeting
3. Introduction of delegations
4. Admission of observers
5. Admission of scientific papers
6. Review of national fisheries and research programs
7. Report of the Albacore Workshop
8. Review of the progress made by the Albacore Research Program
9. Report of the meetings in which ICCAT scientists were directly involved
    a) GFCM/ICCAT Joint Meeting on Stock Assessments of Large Pelagic Fish in the Mediterranean
    b) World Bluefin Meeting
10. Review of conditions of stocks:

    Tropical tunas: YFT-Yellowfin, BET-Bigeye, SKJ-Skipjack
    ALB-Albacore
    BFT-Bluefin
    BIL-Billfishes
    SWO-Swordfish
    SBF-Southern Bluefin
    SMT-Small Tunas
    MLT-Multi-species: Tropical and Temperate
11. Establishment of Sub-Committee on Environment
12. Review of species and gear interactions
13. Review of the progress made by the Program of Enhanced Research for Billfish
14. Report of the Sub-Committee on Statistics and review of Atlantic tuna statistics and data management system
15. Review of editorial and publication policy
16. Review of future SCRS research programs and consideration of SCRS meeting procedures
    a) Organization of SCRS meeting
    b) Intersessional meetings
    c) Research in countries not presently engaged in tuna fishing
    d) Other matters
17. Cooperation with other organizations
18. Recommendations
19. Other matters
20. Adoption of Report
21. Adjournment

Appendix 2 to Annex 10

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Appendix 3 to Annex 10

LIST OF SCRS DOCUMENTS

SCRS/90/1	1990 Tentative SCRS Agenda
SCRS/90/2	1990 SCRS Annotated Tentative Agenda
SCRS/90/3	1990 Tentative Agenda of the Sub-Committee on Statistics
SCRS/90/4	Organization of the 1990 SCRS Meeting
SCRS/90/5	1990 SCRS Document Policy
SCRS/90/6	Final Draft of the Report of the Yellowfin Year Program
SCRS/90/7	Substitution and raising done by the Secretariat for bluefin tuna for the 1990 SCRS - ICCAT Secretariat
SCRS/90/8	Swordfish data substitutions and raising made for 1990 SCRS - ICCAT Secretariat
SCRS/90/9	Substitution and raising done by the Secretariat for albacore for the 1990 SCRS - ICCAT Secretariat
SCRS/90/10	Secretariat Report on Statistics and Coordination of Research - ICCAT Secretariat
SCRS/90/11	Report of the 14th Session of the Coordinating Working Party on Atlantic Fishery Statistics and Report of the Second Ad Hoc Consultation on Global Tuna Statistics - FAO
SCRS/90/12	Stock assessment of bluefin tunas: Strengths and weaknesses - World Bluefin Meeting
SCRS/90/13	Number not used.
SCRS/90/14	Progress Report on the Program of Enhanced Research for Billfish - ICCAT Secretariat
SCRS/90/15	Program Plan for the ICCAT Program of Enhanced Research for Billfish - 1991
SCRS/90/16	Report of the Progress made by the Albacore Research Program
SCRS/90/17	Report of the 1990 ICCAT Albacore Workshop (Madrid, Oct. 3-9, 1990)
SCRS/90/18	Possible effects of driftnet fishing on tuna stocks
SCRS/90/19	Electronic mail - ICCAT Secretariat
SCRS/90/20	Progress of the ICCAT Enhanced Research Program for Billfish in Western Atlantic Ocean During 1990 - E. D. Prince
SCRS/90/21	Informe del Grupo de Trabajo sobre Modelos de Funcionamiento - Alternativos al Actual SCRS - P. Pallarés
SCRS/90/22	Report on the Working Group on the Environment

SCRS/90/23	Etude des pêcheries d'istiophoridés en Atlantique-est - T. Diouf
SCRS/90/24	Note sur l'assistance de l'ICCAT à l'ISPM pour la mise en place d'un programme d'échantillonnage biologique des thonidés et espèces voisines - A. Srour, J. M. de la Serna Ernst
SCRS/90/25	National Report of Korea - National Fisheries Research and Development Agency
SCRS/90/26	Some possible biases in swordfish VPAs due to sexually dimorphic growth - V. R. Restrepo
SCRS/90/27	A comparison of three methods for handling the "plus" group in virtual population analysis in the presence of ageing errors - V. R. Restrepo, J. E. Powers
SCRS/90/28	Incorporating uncertainty in VPA results via simulation - V. R. Restrepo, J. E. Powers, S. C. Turner
SCRS/90/29	Review of the age and growth of swordfish (*Xiphias gladius*) in the northwestern Atlantic - N. M. Erhardt
SCRS/90/30	Preliminary production model analysis of the North Atlantic swordfish resource - D. S. Vaughn, G. P. Scott
SCRS/90/31	Standardized catch rates for swordfish (*Xiphias gladius*) from the U.S. longline fleet through 1989 - G. P. Scott, A. Bertolino
SCRS/90/32	Tabulation of recent data on swordfish sex ratio at size collected from the U.S. fishery - D. Lee
SCRS/90/33	Swordfish size composition data from Spanish and United States North Atlantic longline fisheries - J. Hoey, J. Mejuto
SCRS/90/34	Sex ratio data for western North Atlantic swordfish - J. Hoey
SCRS/90/35	Comparación de pesquerías de pez espada (*Xiphias gladius*) en el Atlántico sudoccidental - O. Mora, C. Arfelli, J. N. Antero, A. F. Amorim, C. Gregorio
SCRS/90/36	Literature review of differential growth and mortality in Atlantic swordfish, *Xiphias gladius* - J. M. Porter, S. C. Smith
SCRS/90/37	Literature review of ageing in Atlantic swordfish, *Xiphias gladius* - J. M. Porter, S. C. Smith
SCRS/90/38	Preliminary study on reproducing observed sex ratio by size for Atlantic swordfish - Z. Suzuki, N. Miyabe
SCRS/90/39	An updated standardized CPUE for Atlantic swordfish caught by the Japanese longline fishery - N. Miyabe
SCRS/90/40	Pêcherie thonière dans la Mediterranée marocaine - A. Srour
SCRS/90/41	Brief note on swordfish tagging by the Spanish commercial fleet in the Atlantic (1984-1990) - J. Mejuto

SCRS/90/60	Aspectos comparativos de la pesquería cubana de tunidos y afines en el Atlántico centroriental y centroccidental - A. Rodríguez, S. Nieto, P. O. Castro
SCRS/90/61	A comparative study of yellowfin tuna in the eastern Pacific and in the eastern Atlantic - A. Fonteneau
SCRS/90/62	Análisis de las capturas de atún rojo (*Thunnus thynnus*) por las almadrabas españolas en 1988 y 1989 - J. M. de la Serna, E. Alot
SCRS/90/63	Report on South African Tuna Fishing and Research during 1989 - A. J. Penney
SCRS/90/64	National Report of the United States: 1990 - NMFS, Southeast Fisheries Center
SCRS/90/65	Alcance de los estudios sobre la pesca deportiva de los istiophoridae en Venezuela - D. Gaertner, J. J. Alio, F. Arocha
SCRS/90/66	Age and growth of the bluefin tuna, *Thunnus thynnus* (L.) of the northeast Atlantic - J. L. Cort
SCRS/90/67	Analyse des contenus stomacaux des albacores (*Thunnus albacares*) pêchés à la senne dans le Golfe de Guinée - F. X. Bard, O. Pézennec
SCRS/90/68	Facteurs d'accroissement de la puissance de pêche des senneurs tropicaux. Français et espagnols entre 1985 et 1989 - A. Hervé, F. X. Bard, F. Gonzáles-Costas
SCRS/90/69	Possible uses of injury marks caused by fishing for estimation of various population parameters - J. F. Caddy
SCRS/90/70	Note sur le signalement de dauphins en association avec les thons tropicaux en Atantique est - F. X. Bard, A. Hervé
SCRS/90/71	Bluefin tuna (*Thunnus thynnus* L.) and albacore (*Thunnus alalunga* Bonn.) fishery in the southern Tyrrhenian Sea: 1985-1989 surveys - A. Di Natale
SCRS/90/72	National Report of the U.S.S.R. - V. Ovchinnikov, V. Z. Gaikov, M. E. Grudtsev
SCRS/90/73	Aspectos biológicos del *Katsuwonus pelamis* en aguas del archipiélago canario: Reproducción - A. J. González Ramos, I. Ramírez, J. Pajuelo
SCRS/90/74	Comparison of population characteristics of world bluefin stocks in special reference to West Atlantic bluefin stock - Z. Suzuki, Y. Ishizuka
SCRS/90/75	An updated standardized CPUE of bluefin tuna in the western Atlantic caught by Japanese longline fishery - N. Miyabe
SCRS/90/76	A mark-recapture experiment on blufin tuna (*Thunnus thynnus* L.) from the Browns-Georges Banks region of the Canadian Atlantic - J. M. Porter, W. E. Hogans
SCRS/90/77	Indices of larval bluefin (*Thunnus thynnus*) abundance from icthyoplankton surveys in the Gulf of Mexico - G. P. Scott, S. C. Turner, C. B. Grimes, W. J. Richards, E. B. Brothers

SCRS/90/78	A review of the growth of Atlantic bluefin tuna, *Thunnus thynnus* - S. C. Turner, V. R. Restrepo, A. M. Eklund
SCRS/90/79	Standardized catch rates of large bluefin tuna in the New England (U.S.) rod and reel/handline fishery - J. Cramer, C. A. Brown
SCRS/90/80	Standardized catch rates of bluefin tuna from the Japanese longline fishery in the Exclusive Economic Zone of the United States - Revised - J. Cramer
SCRS/90/81	Standardized catch rates of small bluefin tuna in the Virginia (U.S.) offshore rod and reel fishery - C. A. Brown, J. A. Lucy
SCRS/90/82	Preliminary analysis of otoliths and vertebrae from nine tag-recaptured Atlantic blufin tuna (*Thunnus thynnus*) - D. W. Lee, E. D. Prince
SCRS/90/83	Billfish bycatch observer data of the U.S. swordfish longline fleet, St. Croix, U.S. Virgin Islands - 1988 and 1989 - W. Tobias
SCRS/90/84	Ageing young Atlantic blue marlin from otolith microstructure - E. D. Prince, D. W. Lee, J. R. Zweifel, E. B. Brothers
SCRS/90/85	Trends in the recreational billfish fishery in the U.S. Virgin Islands - A. Friedlander
SCRS/90/86	A statistical procedure for estimating the mortality on discarded billfish caught by longline gear - M. I. Farber, D. W. Lee
SCRS/90/87	Determination of the sensitivity and specificity of rabbit polyclonial antisera produced against sailfish albumin - J. X. Hartmann, E. A. Rossi, J. C. Poyer, R. E. Waldner
SCRS/90/88	Interactions environnement-thonidés: Difficultés de modelisation de l'agregation des bancs - M. Petit, J. M. Stretta, M. Simier
SCRS/90/89	Evaluation of sex and species specificity of polyclonal antibodies against egg-yolk protein from an istiophorid fish - R. V. Simon
SCRS/90/90	Rapport National du Portugal - J. Pereira
SCRS/90/91	Production model analysis on Atlantic bigeye tuna as of 1988 - J. Pereira
SCRS/90/92	Statistiques de la pêche thonière açorienne - J. Pereira
SCRS/90/93	Indices de détection et taille des thons dans les bancs associés à objets flottants - J. Pereira
SCRS/90/94	National Report of Canada - D. Clay, T. Hurlbut, J. M. Porter
SCRS/90/95	Conversion factors for whole and dressed bluefin tuna (*Thunnus thynnus*, L.) from the northwest Atlantic - D. Clay, T. Hurlbut
SCRS/90/96	Nota sobre la presencia de mamíferos marinos en la pesquería de túnidos al cerco en el atlántico este intertropical - J. C. Santana, J. Ariz, P. Pallarés, A. Delgado de Molina
SCRS/90/97	Campaña de marcado de listado en las islas canarias en 1990 - A. Delgado de Molina, J. C. Santana, J. Ariz

SCRS/90/98	Estadísticas españolas de la pesquería atunera tropical en el atlántico este - A. Delgado de Molina, P. Pallarés, J. Ariz, J. C. Santana
SCRS/90/99	Revisión de la relación LD1-LF para el rabil del atlántico este - P. Pallarés, A. Delgado de Molina, J. Ariz, J. C. Santana, F. González
SCRS/90/100	Evolution des indices d'abondance de l'albacore (*Thunnus albacares*) et du listao (*Katsuwonus pelamis*) de la flottille Vénézuélienne et extrapolation à l'ensemble de l'Atlantique ouest - D. Gaertner
SCRS/90/101	Statistique de la pêcherie thonière FISM durant la période 1969 à 1989 - T. Diouf, A. Fonteneau
SCRS/90/102	Pêche et recherche concernant les stocks hauturiers au Sénégal en 1989 - T. Diouf
SCRS/90/103	Etat du stock d'albacore de l'Atlantique est au 30 septembre 1990 - T. Diouf
SCRS/90/104	La prise par unité d'effort comme indice d'abondance locale dans les pêcheries de thonidés tropicaux - E. Foucher
SCRS/90/105	Sampling activities for the ICCAT Enhanced Research Program in Grenada, 1990 - P. Phillip, C. Isaac
SCRS/90/106	Rapport d'activités - Programme de recherches intensives sur les Istiophoridés en Atlantique-est - T. Diouf
SCRS/90/107	Informe Nacional de España - Instituto Español de Oceanografía
SCRS/90/108	National Report of Ghana - 1989

Appendix 4 to Annex 10

DOCUMENTATION OF WEST ATLANTIC BLUEFIN TUNA ASSESSMENT WORK

1. DERIVATION OF PARAMETERS

1.a Catch and Effort

The ICCAT Secretariat presented documentation (SCRS/90/7) on updates to both the total landings and size data available for 1988 and 1989; at the same time the substitutions used to develop the 1990 SCRS catch at age were presented and discussed. The changes to the catch used by SCRS in 1989 were minor, the only significant update was the exclusion of the catches for the Dominican Republic. These were dropped from the ICCAT Task I data series pending official confirmation of the species and size composition.

Anecdotal information from the Canadian bluefin tuna fishery off southwest Nova Scotia indicated the 1989 catch and effort data are more accurate than those of 1988. Fishermen in this mid-shore area caught 2,222 of the reported 2,580 fish landed by the traditional inshore fisheries. Additional unreported catch has been estimated by the working group from data reported in a Japanese trade statistics report. This report indicated that 455 MT dressed weight (590.2 MT round weight) of fresh Canadian origin bluefin were sold in Japanese markets during 1989. The reported Canadian catch of fresh bluefin was 566.5 MT (total reported catch less longline catch and discards). Thus the excess (or potentially unreported) Canadian catch sold in Japan was estimated to be 23.7 MT. This catch was added to the 1989 catch at age and sized from the Canadian Task 2 data for the same fishery.

Catch has been restricted to 2,660 MT in the west Atlantic from 1983 to 1990 and therefore little scope is available for increased effort (Figure 48).

1.b Catch at length

Catch at length was obtained from i) the actual number of fish caught (nearly all fisheries), ii) estimates of the numbers in some U.S. fisheries, and iii) some reports of catch weight. In some instances, size samples were not available for a specific fishery/month and the less desirable practice of substituting a sample from a similar gear/area/time period was followed.

1.c Catch at age

New growth model and "ageing" methodology

The Parrack and Phares (SCRS/78/37) growth equation has been used in previous assessments to obtain age estimates of the catch. Over a decade of additional tag and recapture data were available for this revision of the growth model (SCRS/90/78). These additional data provided not only more points for analysis but also growth information on individuals that had been free for longer periods of time. This expanded data set was analyzed using both the von Bertalanffy and Gompertz growth models (Figure 49). The Gompertz model gave results similar to the revised von Bertalanffy model up to about age 13. The results of the two models could not be differentiated within the range of available data, no objective decision could be made as to which model was superior. To reduce the possible sources of change from previous assessments, the working group selected the von Bertalanffy model.

In previous assessments the growth model was applied on a monthly (seasonal) basis with variable to in the equation (SCRS/84/40). This was intended to account for annual growth fluctuations - particularly for the youngest ages. In recent SCRS assessments no to estimates have been calculated for recent year-classes. Ageing with any single growth equation does not account for possible annual and seasonal differences in growth of the small fish (ages 1 to 3). Therefore, the 1990 SCRS adopted the concept of assigning ages using the growth model and, where possible, visually assigning ages by modal analysis from monthly length frequencies up to a maximum age of 3 (APP-Table BFT-W-1).

APP-Table BFT-W-1 indicates information on the limits on length at age used in the age slicing process. Upper limits for all but the oldest age group were established using estimated values calculated from the revised growth curve. For the first 3 age groups, values determined from examination of modes in the catch at size were used if they differed from the growth curve estimate. Lower limits for an age were calculated from the upper limits at the next older age. The lowest limit for age 0 was set at 1 cm and the upper limit for ages 14+ was set at 600 cm.

The new von Bertalanffy model was used to allocate the estimated catch at length to catch at age when visual modal analysis was not possible (model parameters are listed on Figure 49). As no decision could be made upon which curve was correct beyond the data range, the working group initially decided to pool the catch at age for fish over 13 years (the crossover point of the two models) -resulting in a matrix with ages 1 to 13 and 14+.

The final catch-at-age table for the west Atlantic bluefin (Table 13) was produced by age slicing as was done for the east Atlantic bluefin. Preliminary VPA analysis indicated some anomalies in the F-table that were considered to be due to errors in age assignment among ages 10 through 13. For the purposes of our assessment the numbers at age for ages 10 to 30 were pooled into a single plus group (10+), this compression of the catch at age has been carried out in recent assessments in order to reduce the variability caused by the small numbers of fish in the older age groups and the high uncertainty in estimating the age of these larger fish. The working group considered age 9 as the maximum age at which 'age slicing' could be considered "accurate".

1.d Weight at age

Mean weight at age of the catch was calculated using length-weight relationships for various seasons, areas and sizes as recommended by the 1988 SCRS. The catch numbers at length were converted to catch biomass at length and then using the standard SCRS software it was converted from catch biomass at age (APP-Tables BFT-W-2 and

3) to weight at age (APP-Table BFT-W-4). It was considered this would provide a more accurate indication of annual year variation in mean weight at age compared to the previous use of a single growth equation.

1.e Natural mortality

Recent assessments have used an M of 0.1 for the western Atlantic bluefin and 0.18 for the eastern bluefin stock. This year concern was again expressed about the difference in M used for the two stocks. Thus, after extensive discussion, it was agreed to use the mid-range (0.14) for both stocks until better data are made available to revise this assignment of M.

1.f Partial recruitment

Partial recruitment (PR) was investigated, as in previous assessments, using separable VPA (SVPA). The first assumption of this method is that the years used in the analysis have had a stable exploitation pattern. As a general principle, if the fishery has remained fundamentally unchanged over a series of years, then those years should be included in the analysis. This premise recognizes the inherent variability of these fisheries with their many different countries and gears. In previous assessments, individual years have been excluded when patterns of residuals indicated inconsistencies in the data.

The group identified 1983 to 1989 as a basically stable period in the fishery, over this time a recommended catch limitation of 2,660 MT has been in effect (Table 16). Ages 1 to 13 with a reference age of 5, an F_r = 0.2, a selectivity on the oldest age of 2 times that of the reference age, and an M = 0.14 were used in the analysis. No smoothing was carried out on the estimate. The PR was similar in pattern to that used in last year's assessment. Further analysis (as discussed in this Appendix, Section 1.c) indicated a possible problem with the age allocation above ages 9 or 10. The resulting decision to pool the catch at age to age over 10 required the group to either re-estimate the PR or truncate the PR at age 9 and re-standardize. The working group decided upon the latter alternative.

Subsequent analysis resulted in the final PR being estimated from the ADAPTive model (see BFT-W Report: Section BFT-W2.d). The actual values are:

age	1	2	3	4	5	6	7	8	9	10+
PR	0.15	0.45	0.99	0.46	0.18	0.45	0.55	0.58	1.00	1.00

1.g F on the oldest age (F oldest)

F on the oldest age groups (age 9 and 10+) was estimated by back calculating the population for ages 9+ to ages 10+ using the Baranov catch equation to estimate F on age 9+ (SCRS/89/43). F on age 9 was assumed equal to F on age 10+. This method differs from the "pooled Z" method used by the 1989 SCRS. The "pooled Z" method (SCRS/89/43) uses stock size estimates of several younger, equally-recruited ages to estimate Z on the oldest age. Given the compression of the age structure in this year's analysis (i.e. use of a 10+ group) combined with variable partial recruitment for ages younger than age 9, the group considered the "pooled Z" method might not be appropriate. Both methods are described in SCRS/89/43.

1.h Terminal F

It was decided by the working group to use software based on the ADAPTive framework (SCRS 1988, SCRS/89/43). The method estimates stock size at the beginning of 1990 and the fishing mortality (F) in the terminal year (1989) of the catch data. The group utilized this methodology to estimate age-specific population estimates of ages 3 to 9 and 10+ at the beginning of 1990. These estimates and the associated F values in 1989 for ages 2-8 and 9+ are given in Tables 17 and 18. Summary data are provided in APP-Table BFT-E-5.

1.i General comments on tuning of VPA's for bluefin tuna

The best estimate from a series of fishing mortality rates at age is selected through the use of indices of abundance representing different age components of the stock. A number of these indices have been developed, discussed, and utilized in varying degrees in previous assessments, they are described in Section II of this Appendix. The SCRS has endeavored to develop objective criteria for accepting or rejecting each of these indices and the assignment of a weight to each of those employed in a particular VPA calibration. The methods for accepting an index and determining its weighting have evolved over time.

The indices considered for tuning this year are listed in Table 15. These are plotted in Figure 49. Each may contain information on the apparent abundance of certain age groups in the western bluefin stock. Included with this information is together with random variability and perhaps bias resulting from a multitude of difficulties. Initially the SCRS established arbitrary criteria for inclusion (or rejection) of each index. Those indices that passed these criteria were given equal weight in the tuning process. Later it was agreed that this procedure did not take into account the varying degrees of statistical confidence that could be placed on an each index. Therefore, in 1988 the Committee decided to weight each "acceptable" index by the inverse of its variance when tested separately against exploited stock sizes. (See Section 3 of this Appendix for details of index selection criteria and weighting.)

The information used to conduct the VPA this year differs in many respects from the data used in 1989. This has caused shifts in the relative importance (weighting) of individual indices (Table 15).

The tuning procedures can impact the estimates of stock size of the age groups being monitored and on the interpretation of the effectiveness of management measures. Although theoretical studies have been attempted, the SCRS has not yet been able to complete a study of all possible sources of error on the estimates of stock sizes and trends. However, studies conducted to date indicate estimates of population trends from VPA are less sensitive to variations in inputs than the absolute estimates.

2. ABUNDANCE INDICES

Eleven indices of abundance were examined. This year, new or updated data were provided for all indices; all, except the Canadian index, were re-analyzed. A new index for the U.S. small fish rod and reel fishery was presented (Table 15, Figure 51).

2.a Larval bluefin survey (Gulf of Mexico)

The larval bluefin tuna index was re-analyzed in response to a request by the SCRS (SCRS/90/77). This index was applied to the mid-year biomass of ages 8+ using mid year weight at age.

2.b Canadian inshore fishery (Gulf of St. Lawrence)

This index (SCRS/90/94) is derived from the tended line catch rates of large adults (ages 13+) over the past nine years.

Because the catch at age has been compressed to ages 10+ this index was transformed by the working group. It was adjusted by the ratio of the catch at age 13+ to the catch at age 10+. (Figure 49 has two curves for this index).

2.c Japanese longline (2 indices)

These indices, similar to those used by the 1989 SCRS are based on the Japanese fishery year (August 1 to July 31) (SCRS/90/75). The age allocation of these indices were prepared with the 1989 SCRS growth equation. A re-allocation of fish into age groups was conducted by the working group after examination of the new growth equation. Age ranges 3 to 5 and 6 to 7 are used for the two indices covering the period 1976 to 1989. The Japanese longline catch-at-age data were used to estimate the relative proportion of individual age-classes contributing to the annual index value for the age groups (3 to 5 and 6 to 7) as in previous SCRS assessments.

2.d U.S. observer CPUE (Continental shelf of the U.S.)

Five age-specific and two grouped indices were presented. These indices for 3- to 7-year-old bluefin caught by Japanese longliners within the U.S. EEZ were calculated from set by set data on a fishing year with January 1 as the mid-point (SCRS/90/80). It was considered that these indices generally represented a subset of the Japanese longline CPUE index (SCRS/90/75) and were not used in the final calibration of this assessment.

2.e U.S. rod and reel and handline - large fish (U.S. Atlantic coast)

This index represents large fish over 200 cm (8+) (SCRS/90/79). Revision of this index has resulted in changes in the index from last year.

2.f U.S. rod and reel - small fish (U.S. Atlantic coast)

This new index was applied to ages 1 to 3 (SCRS/90/81). The annual age composition from this fishery derived with the new growth equation was used to estimate relative selectivity of those ages.

3. ANALYSIS

3.a Index selection criteria and weighting

It was agreed to weight each index in the final VPA. The results of VPA runs with each index alone were examined to determine the mean square error of the relationship between the index and the estimated stock size. Weights were derived from the inverse of this mean square error (SCRS/89/43). Each index was standardized by dividing each value in the index by the mean for that index. Weights were scaled such that all the weights used in the final VPA summed to 1 (Table 15).

3.b Projections

Projections of the abundance of medium (ages 6 to 7) and large fish (ages 8+) to the beginning of 1992 were conducted from the VPA population estimates for 1990. The projected catch in weight for 1990 and 1991 was set equal the catch of 1989 where reasonable. The 1989 catch level was selected, because of the recent increase in catches by some nations. For the projections, the PR's from 1987 to 1989 were averaged. The 1989 average weight at age was used to compute yield from catch in number. The catches for two age groups (ages 6 to 7, and 8+) were harvested by age group. The catch was harvested by age for the two year-classes that would recruit into the age 6 to 7 group in 1991 and 1992, so that the abundance levels of younger ages (ages 1 to 3) would not influence the projections. The population estimate for age 4 in 1990 was the lowest for any age since 1970. Therefore, the 1990 and 1991 catches were arbitrarily set at 20 and 40 MT, respectively, rather than at the 1989 level (142 MT). These analyses were conducted to provide a relative indication of the possible effects in the near future of our current management.

The projected stock sizes at the beginning of 1991 and 1992 were below the 1990 estimate from the VPA. The working group noted that a substantial decrease in projected stock size of medium fish in 1992 was due to the recruitment of the small 1986 year-class. The working group noted that the constant catch assumption resulted in projected increases in the fishing mortality rate on large fish to above the 1990 estimate from the

VPA. The projected fishing mortality rate on medium fish in both years was below the VPA estimate for 1990. The working group noted that the accuracy of the projection results was dependent on the accuracy of the initial conditions and the assumptions about 1990 and 1991, and that incorporation of uncertainty about the initial conditions and assumptions would provide the Committee with a means of evaluating the probability of the projected trends.

App-Table BFTW-1A. Upper limits of length at age by month used to determine age by visual modal examination (see text)

YEAR	AGE	MON	UPPER LIMIT CURVE	UPPER LIMIT MODES
70	1	6	64	60
		7	66	61
		8	68	61
		9	70	65
		10	73	65
70	2	6	88	83
		7	90	85
		8	92	85
		9	94	85
		10	96	85
70	3	7	112	113
		8	114	113
		9	116	113
		10	117	113
71	1	7	66	61
		8	68	64
		9	70	66
71	2	7	90	88
		8	92	88
71	3	7	112	107
72	1	7	66	66
		8	68	66
		9	70	66
72	2	7	90	88
		8	92	88
		9	94	88
73	1	7	66	64
		8	68	64
		9	70	64
73	2	7	90	89
		8	92	89
		9	94	89
74	2	5	86	91
		6	88	91
		7	90	87
		8	92	89
		9	94	89
75	1	6	64	65
		7	66	65
		8	68	65
		9	70	66
76	2	6	88	87
		7	90	87
		8	92	87
77	2	10	96	94
		11	98	94
		12	99	94
77	3	10	117	115
		11	119	115
		12	121	115
79	1	7	66	72
		8	68	77
80	1	6	64	71
		7	66	71
		8	68	71
80	2	6	88	93
		7	90	93
81	1	8	68	76
		9	70	76
		10	73	82
		11	75	82
		12	77	82
81	2	1	78	80
		10	96	100
		11	98	100
		12	99	100
81	3	1	101	106
		2	103	106
		3	105	106
		5	109	117
		6	110	117
		7	112	117
		10	117	124
		11	119	124
		12	121	124
83	1	8	68	72
		9	70	74
83	3	2	103	107
85	2	1	78	75
		2	80	75
87	3	9	116	118

App-Table BFTW-1B. Upper and lower limits* of length at age from the von Bertalanffy growth equation used by the 1990 SCRS

MONTH AGE	1	2	3	4	5	6	7	8	9	10	11	12
0	1	1	1	1	1	1	1	1	1	1	1	1
	27	29	32	34	36	38	41	43	45	47	49	52
1	26	28	31	33	35	37	40	42	44	46	48	51
	54	56	58	60	62	64	66	68	70	73	75	77
2	53	55	57	59	61	63	65	67	69	72	74	76
	78	80	82	84	86	88	90	92	94	96	98	99
3	77	79	81	83	85	87	89	91	93	95	97	98
	101	103	105	107	109	110	112	114	116	117	119	121
4	100	102	104	106	108	109	111	113	115	116	118	120
	122	124	126	127	129	131	132	134	136	137	139	140
5	121	123	125	126	128	130	131	133	135	136	138	139
	142	143	145	147	148	150	151	153	154	156	157	159
6	141	142	144	146	147	149	150	152	153	155	156	158
	160	161	163	164	166	167	168	170	171	173	174	175
7	159	160	162	163	165	166	167	169	170	172	173	174
	177	178	179	181	182	183	184	186	187	188	190	191
8	176	177	178	180	181	182	183	185	186	187	189	190
	192	193	194	196	197	198	199	200	202	203	204	205
9	191	192	193	195	196	197	198	199	201	202	203	204
	206	207	209	210	211	212	213	214	215	216	217	218
10	205	206	208	209	210	211	212	213	214	215	216	217
	219	220	221	223	224	225	226	227	228	229	230	231
11	218	219	220	222	223	224	225	226	227	228	229	230
	232	233	234	234	235	236	237	238	239	240	241	242
12	231	232	233	233	234	235	236	237	238	239	240	241
	243	244	245	245	246	247	248	249	250	251	252	252
13	242	243	244	244	245	246	247	248	249	250	251	251
	253	254	255	256	256	257	258	259	260	260	261	262
14	252	253	254	255	255	256	257	258	259	259	260	261
	600	600	600	600	600	600	600	600	600	600	600	600

* Each pair of numbers, i.e., 28 and 56 for age 1 month 2, indicates the lower (28cm) and upper (56cm) bounds of length for that age (1) and month (2). These bounds are estimated from the growth equation.

App-Table BFTW-2. Catch biomass (yield) of west Atlantic bluefin tuna

AGE	YEAR 70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
1	208	220	200	19	201	170	21	6	26	15	16	34	14	16	4	2	2	6	19	3
2	883	1288	956	661	198	1288	200	231	117	118	197	106	40	25	84	56	58	127	102	142
3	2168	813	652	634	364	198	1370	196	430	354	231	356	35	65	44	213	145	207	250	38
4	781	1473	144	283	238	404	93	1126	225	586	313	170	18	34	78	90	139	219	145	142
5	223	42	230	123	178	51	155	268	564	172	159	320	20	48	125	203	66	252	239	100
6	77	129	10	122	58	44	29	263	308	264	238	275	59	75	146	293	139	181	331	169
7	20	213	58	97	93	35	22	104	68	284	602	296	55	160	67	98	114	153	256	297
8	17	196	81	228	121	79	177	65	72	87	523	461	71	192	106	84	76	179	225	260
9	91	191	44	98	179	273	87	177	56	91	187	457	147	184	180	110	59	176	273	246
10+	1016	1604	1569	1289	3710	2651	3911	3973	3821	3790	3938	3535	985	1788	1400	1571	1602	1163	1368	1525
1+	5484	6169	3944	3555	5341	5193	6065	6409	5686	5762	6404	6010	1443	2587	2233	2720	2401	2664	3208	2922
2+	5276	5949	3744	3536	5140	5023	6044	6403	5661	5747	6389	5976	1429	2571	2229	2718	2398	2658	3189	2918
3+	4394	4661	2788	2875	4941	3735	5844	6172	5543	5629	6191	5870	1389	2546	2145	2661	2341	2531	3088	2777
4+	2226	3847	2137	2241	4577	3537	4473	5976	5113	5275	5960	5514	1354	2481	2101	2448	2196	2324	2838	2739

App-Table BFTW-3. Percent composition of the catch biomass (yield) of western bluefin tuna as used by the 1990 SCRS

AGE	YEAR 70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
1	.0379	.0357	.0507	.0053	.0377	.0327	.0035	.0009	.0045	.0025	.0025	.0057	.0098	.0063	.0018	.0008	.0010	.0024	.0059	.0010
2	.1609	.2088	.2424	.1860	.0372	.2480	.0330	.0360	.0206	.0205	.0308	.0176	.0278	.0095	.0376	.0207	.0241	.0478	.0317	.0484
3	.3953	.1318	.1652	.1784	.0682	.0382	.2260	.0306	.0757	.0615	.0361	.0592	.0241	.0250	.0196	.0783	.0604	.0776	.0779	.0128
4	.1424	.2387	.0364	.0797	.0446	.0778	.0153	.1758	.0396	.1017	.0488	.0283	.0122	.0133	.0349	.0329	.0578	.0823	.0452	.0485
5	.0407	.0067	.0584	.0347	.0334	.0098	.0255	.0418	.0992	.0299	.0248	.0532	.0138	.0184	.0558	.0747	.0273	.0947	.0746	.0341
6	.0141	.0210	.0025	.0342	.0108	.0085	.0048	.0411	.0541	.0459	.0372	.0457	.0410	.0291	.0654	.1077	.0581	.0678	.1032	.0577
7	.0037	.0345	.0148	.0274	.0174	.0067	.0036	.0162	.0120	.0493	.0940	.0493	.0381	.0618	.0302	.0359	.0476	.0575	.0799	.1018
8	.0031	.0317	.0206	.0641	.0226	.0151	.0291	.0101	.0127	.0152	.0817	.0767	.0491	.0744	.0473	.0308	.0318	.0673	.0701	.0891
9	.0166	.0310	.0112	.0277	.0336	.0525	.0144	.0277	.0098	.0158	.0292	.0761	.1018	.0711	.0806	.0405	.0246	.0660	.0852	.0843
10+	.1852	.2600	.3978	.3625	.6946	.5106	.6449	.6199	.6719	.6577	.6150	.5882	.6824	.6910	.6268	.5777	.6675	.4367	.4265	.5221
2+	.9621	.9643	.9493	.9947	.9623	.9673	.9965	.9991	.9955	.9975	.9975	.9943	.9902	.9937	.9982	.9992	.9990	.9976	.9941	.9990
3+	.8012	.7554	.7069	.8087	.9251	.7193	.9635	.9631	.9749	.9770	.9667	.9767	.9625	.9842	.9606	.9786	.9749	.9498	.9624	.9505
4+	.4059	.6236	.5417	.6303	.8570	.6811	.7375	.9325	.8992	.9155	.9306	.9175	.9384	.9592	.9410	.9003	.9146	.8722	.8845	.9377
5+	.2635	.3849	.5053	.5506	.8124	.6033	.7223	.7567	.8596	.8138	.8818	.8892	.9261	.9459	.9061	.8673	.8568	.7900	.8394	.8892
6+	.2227	.3782	.4469	.5159	.7790	.5935	.6968	.7149	.7605	.7839	.8571	.8360	.9123	.9275	.8502	.7926	.8295	.6953	.7648	.8551

App-Table BFTW-4. Average weights at age (Kg) in the catch of west Atlantic bluefin tuna.

	YEAR																			
AGE	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
1	3.2	3.5	4.4	3.7	3.6	3.9	3.9	4.4	5.0	5.3	5.0	5.6	4.0	3.9	4.7	3.7	4.2	4.2	3.9	3.9
2	8.4	8.4	9.7	8.9	10.0	8.7	10.2	10.3	10.8	11.2	12.2	11.0	10.8	10.1	11.2	10.2	9.8	9.6	11.3	11.0
3	17.0	21.2	19.3	20.8	17.1	23.8	18.9	20.7	21.7	21.9	21.3	21.5	21.1	19.9	23.6	17.3	20.2	22.7	21.1	22.4
4	37.2	32.0	40.4	39.8	36.7	34.1	33.6	35.1	35.1	39.1	35.2	34.3	34.0	37.8	39.2	33.0	41.0	39.8	38.0	39.1
5	55.0	59.1	57.1	61.4	56.8	56.7	51.0	51.8	54.1	50.4	52.3	51.6	59.2	58.3	59.1	48.2	56.4	58.2	57.2	54.1
6	78.9	81.1	84.5	76.3	81.1	77.5	78.5	74.0	73.0	77.6	83.0	76.3	81.0	82.6	85.4	70.2	83.5	74.6	80.0	83.5
7	112.3	106.5	113.7	118.0	101.5	112.5	115.4	95.9	103.8	104.6	113.5	104.6	113.5	115.2	115.5	96.3	114.9	107.9	106.4	112.5
8	147.0	132.1	135.3	140.3	137.1	139.2	151.6	133.7	141.8	138.0	138.0	138.3	147.0	146.9	146.8	127.8	147.2	133.7	141.3	140.1
9	168.1	166.8	167.7	167.9	166.8	162.4	169.6	162.8	177.5	175.2	183.1	170.9	178.5	181.8	177.5	166.8	177.0	167.0	176.0	174.1
10+	268.9	266.4	282.8	287.0	294.9	277.1	277.2	291.8	317.6	306.8	319.6	325.3	310.6	310.3	296.9	278.1	298.4	297.7	290.5	281.6

App-Table BFTW-5. Summary statistics for the analysis conducted upon west Atlantic bluefin tuna

YEAR	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
CATCH AT AGE BY AGE GROUPS																					
Ages 1	64869	62999	45403	5102	55957	43556	5412	1274	5133	2744	3160	6088	3528	4173	868	568	563	1512	4850	786	
Ages 3-5	152578	85086	41348	39611	30916	21078	78302	46744	36664	34588	22770	27706	2505	4978	5955	19240	11721	18946	19840	7139	
Ages 6-7	1161	3595	630	2419	1630	881	558	4641	4869	6121	8177	6436	1213	2301	2294	5187	2663	3842	6545	4662	
Ages 8+	4434	8649	6412	6700	14536	11811	15789	15184	12852	13506	17134	16877	4477	8085	6450	6970	6220	6301	7854	8690	
FISHING MORTALITY RATE BY AGE GROUPS																					
Ages 1	0.2337	0.3008	0.2452	0.0456	0.1330	0.4033	0.0454	0.0164	0.184	0.0400	0.0591	0.1316	0.0736	0.0524	0.0152	0.0079	0.0087	0.0845	0.0518	0.0584	
Ages 3-5	0.6387	0.5810	0.5151	0.5614	0.4404	0.2160	0.3981	0.3113	0.225	0.3534	0.3475	0.5401	0.0467	0.0739	0.0806	0.2203	0.1334	0.2026	0.2473	0.1416	
Ages 6-7	0.0204	0.0579	0.0092	0.0483	0.0621	0.0434	0.0472	0.2674	0.114	0.1206	0.2175	0.2278	0.0561	0.1987	0.1550	0.2229	0.1231	0.1578	0.2222	0.1954	
Ages 8+	0.0150	0.0328	0.0255	0.0288	0.0645	0.0619	0.0953	0.1140	0.197	0.1538	0.2149	0.2435	0.0747	0.1425	0.1343	0.1828	0.1822	0.1943	0.2796	0.3374	
STOCK SIZE AT BEGINNING OF YEAR BY AGE GROUPS																					
Ages 1	332661	259007	223101	122644	480724	139971	130689	83974	5379	74957	59007	52810	53229	87597	61660	77390	69294	19978	102821	14826	0
Ages 3-5	343000	204630	109046	97914	92523	115867	253987	186426	15924	123937	82713	70694	58769	74796	82342	104000	100402	110447	96710	57826	82129
Ages 6-7	61528	68461	73365	54947	29004	22186	12957	21128	4218	57634	44705	33770	23793	13651	17088	27743	24594	28156	35109	28082	33118
Ages 8+	318930	287301	273098	252517	249141	210610	185850	150805	12198	101349	94695	83435	66596	65136	54901	44605	39916	38151	34398	32384	30384

Appendix 5 to Annex 10

DOCUMENTATION OF EAST ATLANTIC BLUEFIN TUNA ASSESSMENT WORK

1. DERIVATION OF PARAMETERS

1.a Catch and effort

The ICCAT Secretariat presented documentation (SCRS/90/7) on updates to the total landings and size data available for 1988 and 1989, as well as the substitutions used to derive the 1990 SCRS catch at age. A notable improvement was made in Mediterranean data for 1988 at the joint GFCM/ICCAT meeting (Bari, Italy, June, 1990, Col. Vol. XXXIII), where some countries which are not members of ICCAT presented their data. In contrast, some 1989 data on Mediterranean catches are not available. For these missing data, 1988 catches have been used for 1989. These substitutions represent 24 percent of the total catches of the eastern stock.

East Atlantic catch and effort

No significant changes in effort directed at bluefin tuna were reported for the east Atlantic. By-catches of the new gears targeting albacore remain low.

It was noted that there were reports from scientists at the GFCM/ICCAT meeting that Italian purse seine effort in the Tyrrhenian Sea on large fish decreased, because of recent low catch rates.

Mediterranean catch and effort

Japan provided information on imports from Mediterranean nations, which proved useful in estimating total catches and size compositions.

France reported last year experimental work by ORSTOM with SAR (Synthetic Aperture Radar) to identify tuna schools in the Gulf of Lyon. This will have to be considered in the standardization of CPUE series if it is used in the future. According to the countries, the number of purse seiners is stable or slightly lower in the western basin of the Mediterranean.

1.b Catch at age

The delay or lack of reporting of bluefin tuna catches for 1989 is a serious problem, as is the non-availability or absence of size sampling of landed fish. This caused the group to make a large number of both catch and size sample substitutions when measurements had not been made.

The catch at size was created by extrapolating the sampled catches to the Task I nominal catch data. The substitutions had to be made on essentially all the catches of Greece, Italian purse seine, Yugoslavian small fish in the Adriatic and Japanese longline in the Mediterranean and Atlantic. Substitutions which were different from last year's involve the Moroccan surface fisheries for which it was preferred to use Spanish trap data instead of Spanish handline data for the Atlantic and French purse seine data for the Mediterranean. This seems more realistic as regards the size of the fish caught.

These substitutions, made from size data available on fish of the same size in the same year, or worse, the previous year, affect the catch-at-age table of the eastern stock (Table 21). In contrast, a significant improvement was noted for 1988, as a significant number of countries around the Mediterranean provided size samples for their fisheries.

The catch at age was calculated from catch by size, by applying a new growth equation proposed by J. L. Cort instead of the one by H. Farrugio (1980) which was used for many years. Cort's equation, calculated from the reading of the first spine of the dorsal fin, is based on a large sample of individuals (530) for ages 1 to 15 years. The L-infinity obtained (319 cm), is 32 cm below that of Farrugio and leads to a difference in estimated size at age between the two curves; which resulted in differences in catch at age from age-15 (Table 20 and Figure 57) and could lead to serious errors in the development of the catch-at-age table.

The possibility of assigning age from size of age-1 and age-2 fish from modal distributions in the ICCAT data base rather than applying the traditional slicing method was discussed. The lower and upper limits calculated by the Cort growth equation (APP-Table BFT-E-1) generally encompass well the extremes of the modes and, therefore, the catch at age was calculated only using the equation.

Taking into account the aforementioned comments concerning the very serious uncertainties on the catch level of small, age-0 fish, the group felt that the catch at age used for the evaluations should include ages 1 to 14 and that all ages over 14 should be grouped together (age-15+ group).

1.c Weight at a given age

The mean weight at age of the catch was calculated by using the reported length-weight for various sectors, and by converting the numeric catch by size into caught biomass by size, then by using standard software to convert the caught biomass by age in weight into mean weight at age. APP-Table BFT-E-5 summarized the year-to-year variation in the mean weight by age of the catch for the eastern stock.

1.d Natural mortality

The natural mortality rates (M) used in previous years were 0.1 for the west Atlantic and 0.18 for the east Atlantic and the Mediterranean (for the initial difference, see 1984 and 1985 Bluefin Workshop Reports). However, it seems unlikely that a single species with two stocks with the capability of mixing, could have such different mortality rates. The 0.18 value used earlier for the eastern stock was calculated by Rodríguez-Roda (1974) using the M/k comparison of Pacific yellowfin and the growth coefficient (k) of east Atlantic bluefin. However, the M/k comparison of yellowfin has been changed, so those earlier calculations are no longer valid. It was decided to use only one value of M (0.14) for both stocks. This change in the value of natural mortality of the east Atlantic stock may affect the values of catchability (q) and the fishing mortality (F) for different ages, as these three parameters are closely related. Taking into account the uncertainty of the real value of M for this species, it follows that the stock evaluations should still be considered as being relative, not absolute.

1.e Partial recruitment

The exploitation pattern or partial recruitment (PR) is usually needed for initializing the calculation of fishing mortality by age. It has been studied for several years by using separable VPA (SVPA). The first premise of this method is that, taking into account the inherent variability of the fisheries with their many different countries and gear, the years used in the analyses have a stable exploitation pattern. In general, as there are available only a very low number of years corresponding to these criteria, the group decided that, in principle, all years in the period initially thought to have a stable pattern, should be considered useful unless the study of the residuals indicates inconsistencies in the data. The group considered the years 1985 to 1989 as an essentially stable period of the fishery and used that catch at age for the SVPA.

The SVPA for years 1985 to 1989 and for ages 1 to 14 (reference age 2, M = 0.14, F-terminal = .40, Final S = 0.40 (Table 23, Figure 59) was discussed by the group. The partial recruitment of the age groups seems low as regards the data from the catch table. It seems, however, that the present exploitation of large-sized fish has changed in all recent years and that many fisheries exploiting these age groups have reduced their effort.

No smoothing of the estimate of the exploitation pattern was done and the study of the variations of the parameter M in an interval of 0.1 - 0.18 led to the conclusion that M has little influence on the estimated pattern, on the form of the partial recruitment curve.

Another approach was used this year to estimate partial recruitment for the most recent years. The virtual population analytical program by Laurec/Shepperd gives an estimate of mean F, calculated from F's of different fisheries. The analysis was done from CPUE indices combined with the catch at age. Using the eight CPUE series and the catch at a given age for 1970 to 1989 for ages 1 to 15+, estimates of fishing mortality of different ages for the terminal year were calculated with a natural mortality of M = 0.14.

The analysis of the changes in the logarithm of the catchability to different ages and for the different fleets did not show any trend for either small or large fish. The series of Italian purse seiners in the Tyrrhenian Sea, age 3 to 7, has a significant standard error which caused rather high variation coefficients for the fishing mortality values calculated for these ages. Elimination of this series would lead to a loss of information on the F of age 5 and the group decided to use this information.

From the partial recruitment of this analysis, it was seen that fish over 13 years had as selective as age 13 fish; it is very probable, in fact, that these fish are submitted to an almost identical fishing mortality. The PR of the youngest age groups is very important in the assessments. The abundance indices of ages 2 and 3 alone contribute significantly to the calibration of the fishery for recent years. Fishing mortality of age 1, which was not calculable by this method, was derived from a separable virtual population analysis (SVPA).

The different PRs studied and the one finally used are shown in Table 23 and Figure 59.

1.f F of older ages (Terminal F ages)

The Laurec/Shepperd program offers the possibility of estimating fishing mortality vectors of older ages by the simply calculating the mean F on two or more ages. This method assumes that the exploitation pattern remains constant on the mean ages. The results gave very low F values compared with the partial recruitment adopted in previous years.

The F of the group of older ages (age 14) and the plus group was calculated by the Baranov method, by back calculating the population for ages 15+ of the year N, and for ages 14+ of year N-1. An overall estimate of Z is derived from the ratio of these two values. This value minus M (0.14) was applied to ages 14 and 15+.

2. ABUNDANCE INDICES

The best estimate from a series of starting fishing mortality rates is selected through the use of abundance indices representing different age components of the stock. Some of these indices were developed, processed and used these terminal years in different ways. The methods of accepting or rejecting an index and of determining its important have evolved over time. The raising used this year in the Laurec/Shepperd program to establish the fishing mortality vector was the inverse of the catchability variance of a fleet during the years for which the index was available.

Table 22 lists the indices considered this year in tuning. they are shown in Figure 58. Each of them contains information on the apparent abundance of certain age groups of the stock of bluefin tuna, with random variability and perhaps bias from a multitude of sampling problems.

Eight indices were presented to the SCRS. Two, which were for age 1, have not been represented this year, taking into account the uncertainties concerning the catch at age for these fish.

The indices were reviewed for inclusion in the 1990 evaluation. Three of them were based on medium or older fish, and five other were for young fish (Figure 47 and Table 13).

2.a Japanese longline (2 indices) (East Atlantic and Mediterranean)

Two indices were developed from Japanese longline data, one for the east Atlantic and another for the Mediterranean. Data from 1974 to 1989 were studied at the meeting. The age ranges which are assumed to represent the fish in each index were kept as the age above which 90 percent of the fish (in number) are observed. In the east Atlantic, this age range was 5+, and in the Mediterranean, 7+.

The Atlantic index is based on eight areas and the data available for the model.

The Mediterranean index is based on a model using data from available years and two months (April, May). The years 1978 to 1981 presented very low catches of bluefin tuna although the effort level was comparable to prior and later years. The data of these years should be studied for the relation with the rest of the series (see Recommendations).

2.b Spanish traps (Atlantic, southeast coast of Spain)

This index, from Spanish trap data in Barbate, was chosen as the most representative of the traps in the Atlantic sector. The data are in number of fish by fishing day for the years 1971 to 1989.

2.c Spanish baitboats (Atlantic, Bay of Biscay)

This series represents age-2 bluefin tuna CPUE from Spanish baitboats which catch albacore and bluefin tuna in the Bay of Biscay. The data in this series are separated in age groups by age-size keys based on the age determination by bone structures. Effort was calculated with a higher degree of precision by defining effort which seasonally targets bluefin tuna in this fishery.

2.d Italian purse seines (2 indices) (Mediterranean, Tyrrhenian)

These indices come from a single series of purse seine catches in weight by day at sea. Based on information from Italian scientists, the group eliminated the years 1972 to 1979 for which the effort presented was not as precise as in the rest of the series. The bi-modal size structure of the catches being known, two indices have been derived from the catch-at-size table, separating them at 173 cm, which corresponds to the break between individuals aged 7 and over. The two indices thus created correspond, therefore, to the number of fish by day at sea, for ages 3 to 7 and for 7+.

2.e French purse seiners (2 indices) (Mediterranean, Gulf of Lyon)

These indices represent the CPUE at age 2 and at age 3 of French purse seiners operating in the Mediterranean. These series were obtained by dividing the number of fish of each age concerned by the number of successful fishing days. These indices begin in 1982, the year in which spotter aircraft began to be used in a permanent fashion. An exhaustive study of a new set of these data did not provide a standardized index, because of uncertainties in the real effort of the vessels.

3. ANALYSES

3.a VPA

The group decided to use a traditional cohort analysis by introducing the exploitation pattern vector (PR) calculated by the Laurec/Shepperd program to initialize the calculation of the terminal year, and that of F on the terminal ages produced by the Baranov method. The results of the analysis are presented in Tables 24 and 25, APP-Tables BFT-E-1 to 6 and are shown in Figure 60 and 61.

The capacity to use annual weight at a given age of the fisheries to calculate the biomass, as well as the use of a plus group of older ages reduced the errors in the estimation of the stock size.

Nevertheless, there are still great uncertainties on the development of the basic vectors of the analysis. These uncertainties related to the poor knowledge of age 1 and 2 recruitment make it seem impossible to provide advice on the state of the stocks in absolute terms, but simply to consider the present state compared to a reference situation.

3.b Projections

No projection was attempted due to the uncertainties in the assessments.

App-Table BFTE-1. Upper limits by age of fork length (cm) of east Atlantic bluefin tuna

A) According to the growth equation by Farrugio (1980)

	MONTHS											
AGE	1	2	3	4	5	6	7	8	9	10	11	12
1	57.4	59.4	61.3	63.3	65.2	67.1	69.0	70.8	72.7	74.6	76.4	78.2
2	80.0	81.8	83.6	85.4	87.2	88.9	90.7	92.4	94.1	95.8	97.5	99.2
3	100.9	102.6	104.2	105.9	107.5	109.1	110.7	112.3	113.9	115.5	117.1	118.6
4	120.2	121.7	123.2	124.8	126.3	127.8	129.2	130.7	132.2	133.6	135.1	136.5
5	138.0	139.4	140.8	142.2	143.6	145.0	146.3	147.7	149.1	150.4	151.7	153.1
6	154.4	155.7	157.0	158.3	159.6	160.8	162.1	163.4	164.6	165.9	167.1	168.3
7	169.5	170.7	171.9	173.1	174.3	175.5	176.7	177.8	179.0	180.1	181.3	182.4
8	183.5	184.6	185.7	186.8	187.9	189.0	190.1	191.2	192.2	193.3	194.4	195.4
9	196.4	197.5	198.5	199.5	200.5	201.5	202.5	203.5	204.5	205.5	206.4	207.4
10	208.4	209.3	210.3	211.2	212.1	213.1	214.0	214.9	215.8	216.7	217.6	218.5
11	219.4	220.2	221.1	222.0	222.8	223.7	224.5	225.4	226.2	227.1	227.9	228.7
12	229.5	230.3	231.1	231.9	232.7	233.5	234.3	235.1	235.9	236.6	237.4	238.1
13	238.9	239.6	240.4	241.1	241.9	242.6	243.3	244.0	244.7	245.5	246.2	246.9
14	247.6	248.2	248.9	249.6	250.3	251.0	251.6	252.3	253.0	253.6	254.3	254.9
15	255.6	256.2	256.8	257.5	258.1	258 7	259.3	259.9	260.5	261.1	261.7	262.3
16	262.9	263.5	264.1	264.7	265.3	265.8	266.4	267.0	267.5	268.1	268.6	269.2
17	269.7	270.3	270.8	271.4	271.9	272.4	272.9	273.5	274.0	274.5	275.0	275.5
18	276.0	276.5	277.0	277.5	278.0	278.5	279.0	279.5	279.9	280.4	280.9	281.4
19	281.8	282.3	282.7	283.2	283.7	284.1	284.6	285.0	285.4	285.9	286.3	286.8
20	287.2	287.6	288.0	288.5	288.9	289.3	289.7	290.1	290.5	290.9	291.3	291.7

B) According to the growth equation by Cort (1990)

	MONTHS											
AGE	1	2	3	4	5	6	7	8	9	10	11	12
1	56.9	59.0	61.0	63.0	65.0	66.9	68.9	70.8	72.7	74.6	76.5	78.4
2	80.2	82.1	83.9	85.7	87.5	89.3	91.1	92.9	94.6	96.4	98.1	99.8
3	101.5	103.2	104.8	106.5	108.1	109.8	111.4	113.0	114.6	116.2	117.7	119.3
4	120.8	122.4	123.9	125.4	126.9	128.4	129.9	131.3	132.8	134.2	135.6	137.1
5	138.5	139.9	141.2	142.6	144.0	145.3	146.7	148.0	149.3	150.6	152.0	153.2
6	154.5	155.8	157.1	158.3	159.6	160.8	162.0	163.2	164.4	165.6	166.8	168.0
7	169.2	170.3	171.5	172.6	173.7	174.9	176.0	177.1	178.2	179.3	180.4	181.4
8	182.5	183.6	184.6	185.6	186.7	187.7	188.7	189.7	190.7	191.7	192.7	193.7
9	194.7	195.6	196.6	197.5	198.5	199.4	200.3	201.2	202.1	203.1	204.0	204.8
10	205.7	206.6	207.5	208.3	209.2	210.0	210.9	211.7	212.6	213.4	214.2	215.0
11	215.8	216.6	217.4	218.2	219.0	219.8	220.5	221.3	222.0	222.8	223.5	224.3
12	225.0	225.7	226.5	227.2	227.9	228.6	229.3	230.0	230.7	231.4	232.0	232.7
13	233.4	234.1	234.7	235.4	236.0	236.7	237.3	237.9	238.6	239.2	239.8	240.4
14	241.0	241.6	242.2	242.8	243.4	244.0	244.6	245.2	245.7	246.3	246.9	247.4
15	248.0	248.5	249.1	249.6	250.2	250.7	251.2	251.7	252.3	252.8	253.3	253.8
16	254.3	254.8	255.3	255.8	256.3	256.8	257.3	257.8	258.2	258.7	259.2	259.6
17	260.1	260.6	261.0	261.5	261.9	262.3	262.8	263.2	263.7	264.1	264.5	264.9
18	265.4	265.8	266.2	266.6	267.0	267.4	267.8	268.2	268.6	269.0	269.4	269.8
19	270.2	270.5	270.9	271.3	271.7	272.0	272.4	272.7	273.1	273.5	273.8	274.2
20	274.5	274.9	275.2	275.5	275.9	276.2	276.6	276.9	277.2	277.5	277.9	278.2

App-Table BFTE-2. Catch biomass (MT) at age for east Atlantic and Mediterranean bluefin tuna

AGE	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	596	48	515	560	768	2957	427	896	777	341	523	704	4070	3597	915	1107	3046	1290	3906	2459
2	791	899	1583	684	1439	3140	2254	3259	1829	349	1769	3707	2932	2234	7085	3988	3183	4634	1949	4278
3	579	1036	1624	1573	1219	769	5331	973	3183	1959	2289	2003	4005	2299	1179	7053	3327	2045	4468	2399
4	588	523	430	215	2270	750	1426	2144	686	1696	979	412	811	816	1300	1171	2516	1029	967	874
5	539	673	472	184	411	319	1083	132	282	366	501	781	273	668	1035	708	443	515	455	497
6	606	263	518	242	357	322	388	392	112	171	338	414	236	240	765	660	391	544	670	507
7	461	457	401	673	281	304	302	378	275	208	286	361	476	995	593	378	253	773	933	1078
8	426	1274	267	980	535	408	246	285	221	443	264	527	1000	681	774	414	228	460	598	710
9	831	825	490	1223	1636	811	590	351	178	500	338	490	723	643	1458	548	420	479	623	582
10	1080	278	180	282	877	899	450	532	609	596	590	521	840	2384	1939	986	567	857	1212	812
11	1327	278	220	297	730	1091	704	713	399	494	781	782	1264	1092	1693	1380	868	801	1144	789
12	940	271	299	356	1011	1666	895	727	512	337	712	714	1512	959	1754	1363	1206	839	1159	714
13	551	460	541	510	1581	2452	1706	1068	772	615	851	642	1443	1410	2074	1329	1220	829	1187	838
14	561	757	700	622	1577	2171	1393	1213	701	815	888	349	2220	1168	1048	1113	1086	707	963	556
15+	1058	3039	2338	2471	4678	5893	5821	6000	4475	3383	2530	1249	2146	1771	2265	1902	1404	1224	1873	1140
TOT	10933	11083	10577	10873	19371	23951	23018	19063	15011	12272	13639	13656	23952	20957	25875	24099	20160	17026	22108	18231

SUMMARY BY AGE GROUPS

1	596	48	515	560	768	2957	427	896	777	341	523	704	4070	3597	915	1107	3046	1290	3906	2459
2-4	1958	2458	3637	2472	4928	4659	9012	6377	5698	4003	5037	6122	7748	5348	9564	12211	9026	7708	7384	7551
5-9	2862	3492	2148	3303	3219	2164	2610	1537	1067	1687	1727	2573	2708	3226	4625	2708	1736	2770	3280	3373
10+	5517	5084	4277	4539	10455	14171	10969	10253	7468	6241	6352	4257	9425	8785	10771	8073	6352	5258	7539	4848

App-Table BFTE-3. Mean biomass at age (MT) for east Atlantic and Mediterranean bluefin tuna

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	2131	2675	2106	2116	4747	3683	3994	3111	2520	2780	4410	3493	4628	9173	5062	3923	6169	3362	8890	7070
2	3042	3134	4493	3392	3775	8372	4674	6650	4381	3628	4629	6466	6023	4480	10146	6249	5160	6401	4365	11180
3	2694	3821	4008	4918	4925	4983	7503	5165	6601	5389	4182	4364	5686	4698	4855	8363	5118	4091	4621	4138
4	4507	3212	5390	4497	5743	6269	5785	6790	6451	6525	5892	4426	5263	4907	5273	5069	5635	4995	4807	3768
5	6030	5230	3872	6530	6044	5796	6665	6926	8023	7389	7497	7479	5775	6268	5773	5694	5594	5899	5794	5040
6	6590	6524	5476	3942	7295	6501	6942	7298	7594	8890	8877	8375	8162	6726	6844	6130	5962	5964	6593	6244
7	9500	7357	7104	5860	4278	7738	6965	7064	7796	8210	9871	9522	8762	9232	7431	6985	6341	6463	6163	6638
8	10071	9812	6932	7358	5601	4319	8335	7080	7646	7739	8790	10195	9233	8927	8455	7569	7185	6532	6169	5569
9	11847	10057	8806	6660	6615	5327	4251	8089	7479	7101	8041	9032	10284	9357	8397	8524	7485	7328	6323	5905
10	10087	11514	9693	8336	5979	5279	4711	3508	8434	7146	7195	7933	8735	9228	8283	7660	8082	7089	6576	5834
11	7826	9405	11286	9596	8018	4826	4441	4017	3077	7562	6652	6540	6986	7646	7189	6819	6740	7435	6034	5670
12	7964	6842	9059	10678	8686	6508	3810	3579	3388	2643	6898	5738	5135	5734	6228	5633	5452	5759	6344	5131
13	5951	6977	6299	8461	9592	6619	4689	2704	2700	2780	1990	5929	4384	3499	4140	4547	4186	4192	4447	5162
14	8149	5129	6057	5454	7010	7153	4507	3076	1712	1853	1910	1326	3968	2956	2279	2458	3229	3042	3074	3424
15+	15353	20578	20240	21655	20788	19415	18826	15212	10930	7692	5444	4749	3837	4483	4927	4201	4175	5267	5978	7022
TOT	111744	112267	110821	109454	109096	102788	96097	90269	88731	87328	92278	95569	96860	97316	95285	89824	86512	83821	86178	87793

SUMMARY BY AGE GROUPS

1	2131	2675	2106	2116	4747	3683	3994	3111	2520	2780	4410	3493	4628	9173	5062	3923	6169	3362	8890	7070
2-4	10243	10167	13891	12807	14443	19624	17961	18605	17433	15542	14704	15256	16971	14085	20274	19681	15913	15488	13793	19086
5-9	44039	38980	32189	30351	29833	29681	33158	36457	38537	39330	43076	44603	42216	40511	36902	34902	32566	32186	31043	29396
10+	55331	60445	62635	64180	60073	49800	40983	32096	30241	29676	30089	32216	33044	33547	33047	31319	31864	32785	32452	32242

App-Table BFTE-4. Female spawning stock biomass at age (MT) for east Atlantic and Mediterranean bluefin tuna

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	1127	803	1347	1124	1436	1567	1446	1697	1613	1631	1473	1106	1316	1227	1318	1267	1409	1249	1202	942
5	3015	2615	1936	3265	3022	2898	3332	3463	4011	3694	3748	3739	2887	3134	2887	2847	2797	2950	2897	2520
6	3295	3262	2738	1971	3648	3250	3471	3649	3797	4445	4438	4187	4081	3363	3422	3065	2981	2982	3297	3122
7	4750	3679	3552	2930	2139	3869	3483	3532	3898	4105	4935	4761	4381	4616	3716	3492	3170	3232	3082	3319
8	5035	4906	3466	3679	2800	2160	4168	3540	3823	3870	4395	5098	4617	4463	4228	3784	3592	3266	3084	2784
9	5924	5028	4403	3330	3307	2663	2125	4045	3739	3551	4021	4516	5142	4679	4199	4262	3742	3664	3162	2953
10	5044	5757	4847	4168	2990	2640	2355	1754	4217	3573	3597	3966	4367	4614	4142	3830	4041	3545	3288	2917
11	3913	4703	5643	4798	4009	2413	2221	2008	1539	3781	3326	3270	3493	3823	3595	3410	3370	3717	3017	2835
12	3982	3421	4529	5339	4343	3254	1905	1790	1694	1322	3449	2869	2568	2867	3114	2816	2726	2879	3172	2565
13	2976	3488	3150	4230	4796	3309	2344	1352	1350	1390	995	2965	2192	1750	2070	2274	2093	2096	2223	2581
14	4075	2564	3029	2727	3505	3576	2253	1538	856	927	955	663	1984	1478	1140	1229	1615	1521	1537	1712
15+	7676	10289	10120	10827	10394	9708	9413	7606	5465	3846	2722	2375	1918	2242	2464	2101	2087	2633	2989	3511
TOT	50811	50515	48760	48390	46389	41308	38517	35974	36002	36134	38055	39516	38946	38256	36293	34378	33624	33734	32949	31761

App-Table BFTE-5. Mean weight at age from the catch (kg) for east Atlantic and Mediterranean bluefin tuna

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	4.5	4.6	4.4	3.9	4.1	4.2	4.4	4.1	5.1	4.5	4.7	4.7	5.8	5.1	5.3	5.1	4.9	5.1	4.8	5.4
2	10.3	10.1	10.6	10.2	11.0	10.8	11.9	11.2	9.4	10.4	11.0	11.0	13.0	13.2	11.0	11.1	11.9	10.6	11.5	10.5
3	21.4	19.4	20.9	18.7	21.3	22.0	18.8	21.4	20.8	19.7	18.7	18.1	20.9	19.0	24.1	22.3	19.9	19.1	20.1	20.8
4	35.6	35.5	37.7	34.2	35.8	37.6	35.8	33.4	35.7	34.6	32.5	31.9	34.5	32.9	35.8	36.7	33.8	35.0	37.1	35.9
5	54.1	54.1	56.8	55.5	56.0	52.6	52.9	56.6	54.5	50.9	54.1	54.4	51.4	53.9	52.9	53.7	54.6	53.8	54.0	52.1
6	73.5	71.9	72.9	73.0	74.1	73.5	76.6	74.4	72.6	71.4	73.5	73.7	73.1	71.8	75.5	74.7	71.2	72.9	76.0	72.5
7	101.1	102.0	94.5	99.6	97.1	94.5	94.9	94.7	95.6	92.1	93.4	94.2	93.4	101.7	96.6	96.4	95.8	97.3	97.7	100.3
8	119.6	131.1	116.3	123.6	121.7	122.1	121.2	115.7	122.9	114.3	116.6	115.5	112.9	116.8	118.4	121.1	119.1	119.9	119.1	116.8
9	146.5	146.1	148.7	143.2	154.1	150.5	155.2	140.3	145.2	137.9	143.6	143.7	142.4	143.9	142.9	148.5	145.6	146.6	145.2	144.6
10	170.2	171.8	170.5	169.4	174.6	174.7	173.5	170.3	178.2	168.2	173.4	171.9	172.2	172.4	169.8	174.6	173.2	173.1	171.0	173.4
11	197.4	195.7	198.0	199.0	199.3	194.9	199.3	194.7	197.9	196.9	199.0	200.4	196.5	195.2	197.9	200.2	201.0	200.2	197.6	199.6
12	224.9	221.0	223.7	221.2	222.7	220.4	222.8	221.1	222.8	222.4	224.6	222.8	221.5	220.9	225.2	226.4	227.4	226.5	226.8	228.1
13	243.0	248.7	249.0	251.7	251.7	247.0	248.0	247.7	244.3	252.8	251.6	246.8	244.1	245.0	252.9	251.9	252.3	248.2	246.4	252.4
14	267.3	271.3	271.7	273.9	275.6	271.7	272.4	273.1	269.5	275.5	278.8	274.2	260.6	271.2	281.8	278.9	281.3	274.6	269.3	271.3
15+	301.9	323.2	320.9	326.5	326.8	324.4	339.3	342.1	334.3	343.1	334.3	339.3	347.0	314.9	341.9	335.8	332.7	334.1	334.1	349.1

App-Table BFTE-6. Estimated mean weight (kg) at age on January 1 for east Atlantic and Mediterranean bluefin tuna

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1	3.0	3.0	2.9	2.3	2.5	2.5	2.8	2.7	3.6	2.9	3.1	2.8	3.8	3.5	3.7	3.3	3.3	3.4	3.2	4.1	3.1
2	7.5	6.7	7.0	6.7	6.5	6.7	7.1	7.0	6.2	7.3	7.0	7.2	7.8	8.7	7.5	7.7	7.8	7.2	7.7	7.1	7.1
3	16.6	14.1	14.5	14.1	14.7	15.6	14.2	16.0	15.3	13.6	13.9	14.1	15.2	15.7	17.8	15.7	14.9	15.1	14.6	15.5	15.5
4	28.9	27.6	27.0	26.7	25.9	28.3	28.1	25.1	27.6	26.8	25.3	24.4	25.0	26.2	26.1	29.7	27.5	26.4	26.6	26.9	28.0
5	46.9	43.9	44.9	45.7	43.8	43.4	44.6	45.0	42.7	42.6	43.3	42.0	40.5	43.1	41.7	43.8	44.8	42.6	43.5	44.0	48.0
6	62.4	62.4	62.8	64.4	64.1	64.2	63.5	62.7	64.1	62.4	61.2	63.1	63.1	60.7	63.8	62.9	61.8	63.1	63.9	62.6	61.7
7	88.8	86.6	82.4	85.2	84.2	83.7	83.5	85.2	84.3	81.8	81.7	83.2	83.0	86.2	83.3	85.3	84.6	83.2	84.4	87.3	84.0
8	108.2	115.1	108.9	108.1	110.1	108.9	107.0	104.8	107.9	104.5	103.6	103.9	103.1	104.4	109.7	108.2	107.2	107.2	107.6	106.8	115.2
9	135.3	132.2	139.6	129.1	138.0	135.3	137.7	130.4	129.6	130.2	128.1	129.4	128.2	127.5	129.2	132.6	132.8	132.1	131.9	131.2	127.7
10	158.7	158.6	157.8	158.7	158.1	164.1	161.6	162.6	158.1	156.3	154.6	157.1	157.3	156.7	156.3	158.0	160.4	158.8	158.3	158.7	159.3
11	186.6	182.5	184.4	184.2	183.7	184.5	186.6	183.8	183.6	187.3	183.0	186.4	183.8	183.3	184.7	184.4	187.3	186.2	184.9	184.7	189.5
12	213.9	208.9	209.2	209.3	210.5	209.6	208.4	209.9	208.3	209.8	210.3	210.6	210.7	208.3	209.7	211.7	213.4	213.4	213.1	212.3	215.6
13	230.0	236.5	234.6	237.3	236.0	234.5	233.8	234.9	232.4	237.3	236.5	235.4	233.2	233.0	236.4	238.2	239.0	237.6	236.2	239.3	245.1
14	254.9	256.8	259.9	261.2	263.4	261.5	259.4	260.2	258.4	259.4	265.5	262.7	253.6	257.3	262.8	265.6	266.2	263.2	258.5	258.6	266.3
15+	301.9	323.2	320.9	326.5	326.8	324.4	339.3	342.1	334.3	343.1	334.3	339.3	347.0	314.9	341.9	335.8	332.7	334.1	334.1	349.1	349.1

Appendix 6 to Annex 10

DOCUMENTATION OF SWORDFISH ASSESSMENT WORK

1. STOCK ASSESSMENT SESSION

At the 1989 swordfish stock assessment session scientists achieved major stock assessment analyses based on three scenarios on stocks (i.e., Total North, Northeast and Northwest). However, the Standing Committee could not thoroughly review the stock conditions due to time limitations. In 1990, the swordfish stock assessment session met on September 12-19, 1990, to have enough time to complete stock assessments and to give ample time for the Commissioners to study the conclusions reached by the scientists. The participants are listed in Addendum 1 to this Appendix.

2. UPDATE OF CATCH, EFFORT AND CATCH-AT-SIZE/AGE

2.a Catch and effort

The swordfish catch table, including 1989 data, was prepared by the Secretariat and was reviewed by the group. Some changes were introduced. Those are:

Korea - Task I catch reported in the past were found to be significantly less than those reported in Task II catch data (logbook summary), particularly since 1984. For stock assessment purposes, the catches estimated from the logbook summary (raised by the log coverage rate) were used for years since 1984.

Ex-U.S. flag vessels fishing in the Caribbean Sea - The Secretariat received trip receipts from U.S. industries for these vessels. These data were found to be very valuable and the catches for the vessels which are not included in the U.S. catches were estimated to be about 76 MT and 38 MT for 1988 and 1989, respectively. Those figures were included as NEI (not elsewhere included) and were matched with U.S. size data.

Portuguese longline landing at a Spanish port - At least four Portuguese swordfish longliners were confirmed landing at a Spanish port, starting in 1988 but more consistently in 1989. Catches from these vessels were not included in the reported Portuguese landings, which include only landings at Portuguese ports. As these vessels are fishing in the same pattern as Spanish longliners employing the same type of gears, the 1989 catches by these boats were estimated, at least, as 74 MT from the north and 856 MT from the south Atlantic, based on the Spanish catch rate. These are also added as NEI and matched with Spanish size data.

2.b Catch at size

The procedures to match the catch data to size were proposed by the Secretariat. These were reviewed and after some modifications were made (including those changes in the estimated catches as discussed above), the scheme was approved (SCRS/90/9) and the Secretariat has carried out the data substitutions and raising.

North Atlantic - Substitution procedures for catches of various nations which do not provide size samples were similar to those used previously. Most of the update is for the latest years, except for Korea (since 1984). Canadian catches have been sized by Canadian size samples since 1988.

South Atlantic - Since no updating was done at the 1989 SCRS session, a major updating was made for the last few years and the final catch at size included up to 1989.

Mediterranean - In the past, due to the lack of the size data and accurate catch estimates, no attempt was made to create catch at size for the Mediterranean. However, as a result of the Joint GFCM-ICCAT Consultation (Col. Vol. XXXIII), much more size data and more accurate catch estimates have become available. Also, length-weight relations have been established. The Mediterranean swordfish experts discussed in depth and agreed upon data substitution procedures during the Joint Consultation meeting. The Secretariat proposed the data raising and substitutions, based on these agreements, which were studied and approved.

The conclusion of the Consultation was that the data base be made only starting from 1985, until better estimates of Italian catches for earlier years become available. The Italian National Cooperative Research effected in the field in 1985 revealed that the catch had been significantly under-reported until 1983 and possibly for 1984. No size data are available for almost all the countries, with the exception of Spain and Japan until 1985. Therefore, this agreement of the Consultation was ratified and the data base was created only from 1985. Catches for 1989 for many countries were rough estimates. However, size data are available for major catches. Therefore, the data base included 1989 using these preliminary catch figures.

The catch-at-size data provided by the Greek scientists for 1986 and 1987 were kept, even though the total weights estimated based on these data were greater than the reported Task I catch, because it was believed that new size data which were not included previously in the catch were added. The Spanish catch-at-size data for 1988 and 1989 (for the Mediterranean) were re-raised to match the reported Task I catch, since the estimated weight for those data is almost double the Task I catch. In this case, it was believed that the weight of the Task I catch is more accurate. This matter will be investigated further by the Spanish scientists.

3. STOCK STRUCTURE

Stock structure was reviewed from the point of view of whether or not to conduct the assessment of the stock(s) like it was done last year, and with a view towards defining analysis priorities to be carried out on the different proposed hypotheses, based on the information available.

An historical review was carried out on the decisions made previously regarding the structure of the stock(s) and the criteria on which these decisions were based.

Information presented previously was reviewed, as was information contained in this year's papers and that generated by the group itself at this session as regards CPUEs (nominal and standardized) for wide areas and for more restricted fisheries, mark-recapture data (SCRS/90/41) (from the west and from the east), area-time distributions of the size classes, sex ratio by size class, and other biological information available (Table 32).

The group also studied and took into account oceanographic conditions which are considered fundamental to the behavior of this species (SCRS/90/33, 35 and 43)).

In the preliminary analysis of catch, effort and nominal CPUE by 5 x 5 squares of the Spanish fleet in the eastern Atlantic, the recent shift of a part of the effort from the North Atlantic towards the South (around the equatorial areas) is illustrated and continuity of fisheries and CPUE from 40°N to 5°S is also indicated (Figure 68).

Taking into account the previously mentioned information and in order to carry out a comparative analysis with the stock trends obtained for the north, northeast and northwest stock at the 1989 SCRS, the following assessment priorities were established by the group:

1. North Atlantic (latitude > = 05°N).
2. Total Atlantic (North + South).
3. NW - NE (Latitude > = 05°N (separated by the hypothetical 30°W line).

As regards the North Atlantic, the group chose the one-stock hypothesis as more probable, and it was therefore assigned first priority and the analyses were carried out according to this perspective.

The additional information analyzed from mark-recapture data for the western North Atlantic indicated the same pattern of movement described earlier. The increase in fishing effort towards the Caribbean areas resulted in the recovery of some fish.

Spanish tagging of 148 juveniles produced three recoveries. Out of 52 fish tagged off west African waters, two fish were recovered, all in the temperate central North Atlantic and out of 96 fish released, more recently in the central North Atlantic, one fish was recovered in the waters off the Caribbean Sea (SCRS/90/41) APP-Figure STRU-1.

However, the group considered that the tagging rate in general and especially in the East is too low to be able to analyze with relative precision the movements of this species. It was also indicated that the recovery rates can also be influenced, among other factors, by the fishing pattern of the diverse fleets and the restrictiveness of the tagging areas.

The review of the available information on spawning areas, oceanographic conditions and CPUEs indicates the 5°N line used currently for statistical purposes does not indicate separation between the so-called North and South stocks.

It was pointed out that the hypothesis of two stocks (Northeast - Northwest), with an unknown mixing rate, should not be disregarded as an alternative. Due to the lack of evidence to establish an East-West limit based on biological criteria, because of the ICCAT data base system, and in order to be able to make comparisons with assessments carried out last year, the Committee decided to maintain the arbitrary 30°W line for assessment purposes and to carry out comparative analyses as a third priority. However, it was pointed out that this hypothetical line divides the EEZ of the Azores. The Joint GFCM/ ICCAT Consultation was inclined to consider the Mediterranean swordfish separate from the North Atlantic stock(s). However, based on the limited information available, the possibility of mixing between the North Atlantic and the Mediterranean (and also between the South Atlantic with the Indian Ocean) could not be discarded.

The group studied the data available for the Mediterranean. The lack of adequate abundance indices to carry out the VPA was pointed out, and the lack of agreement on a growth curve (or curves) by the ICCAT/GFCM Consultation was noted. Besides, the Committee considered that the historical series of catch at size was relatively short, and therefore making an assessment of the North Atlantic and Mediterranean combined would truncate the historical series of the North Atlantic.

4. DEVELOPMENT OF CPUE INDICES

All standardized indices were derived from "aged" nominal catch rates and using the same general linear model analysis software (SAS). The division of the nominal catch rates into ages or age groups ensures that the ages (sizes) of fish in the CPUE are comparable to the ages to which the CPUE is matched in the VPA. The use of the same General Linear Model (GLM) software introduces a degree of consistency in analytical methods.

4.a U.S. indices

Age-specific indices of swordfish abundance were developed from a catch at size and effort data collected from the US longline fleet. The specific methodology used in standardization of CPUE through GLM is described in Document SCRS/90/31.

4.b Japanese indices

Document SCRS/90/39 describes the analysis of Japanese longline catch and effort statistics. Those analyses included adjustment of the southeast Atlantic catch rates for the effect of deep longlining since 1980. Questions were raised as to whether or not it might be necessary to correct for the effect of deep longlining in other regions of the Atlantic. Four additional analyses were conducted; two for the total Atlantic and two for the eastern North Atlantic for the purpose of deriving indices from fishing in the specific regions for which stock hypotheses were considered. Within each region one analyses covered 1978-1989 and the other 1983-1989 during which period the annual proportion of fishing with deep longlines was thought to have been stable. The trends in catch rates from both sets of analyses for 1983-1989 were very similar, and it was concluded that the lack of adjustment for the change in fishing methods probably had little effect on the catch rate trend, so the indices for the entire time period were selected for possible use in calibrating the VPA.

4.c Spanish indices

The Spanish longline CPUE data were used to develop age-specific (age 1, 2, 3, 4, 5+) indices for the total Atlantic, total North Atlantic, eastern North Atlantic and western North Atlantic stock hypotheses. All four sets of indices were developed via

General Linear Modeling, standardizing for the effects of area, quarter, and years. Analysis was conducted by the Committee at the working meeting. Data from 1983-1989 were used in analysis, except for the western North Atlantic stock hypothesis, where data from 1985-1989 were used. The sized CPUE data were aged using the Gompertz growth equation in the same way that the catch was aged.

Six areas, based on latitudinal and longitudinal ranges were defined for the North Atlantic stock hypothesis. The areas used were similar, but not the same as last year's analysis. These included the Grand Banks (40°N<x<50°N latitude and longitudes >30°W), the Azores (40°N<x<45°N latitude and <30°W longitude), Iberian (40°N>x>35°N latitude), Canary Islands (20°N<x<35°N latitude), Tropical (5°N<x<20°N latitude), and Ireland (55°N>x>45°N latitude and longitude <30°W). Because of sparse coverage in the Ireland area, it was excluded from all analyses. The main effects of area, quarter, and year as well as the quarter*area interaction was included in the model.

The same areas were used for the northeastern Atlantic stock hypothesis, except that areas west of 30°W longitude including the Grand Banks were excluded. For the total Atlantic stock hypothesis, CPUE data from south of 5°N latitude were included in the tropical area for analysis. All other areas included in the North Atlantic stock hypothesis analysis were included in analysis of the total Atlantic hypothesis. The main effects of year, area, and quarter as well as the area*quarter interaction were used in the GLM's for both northeastern Atlantic and total Atlantic analyses.

For the northwestern Atlantic stock hypothesis, only data from west of 30°W longitude were used. The Grand Banks area was further divided into the areas used in the 1989 SCRS analysis. No data prior to 1985 were used in this year's analysis and only the main effects of year, area, and quarter were included in the model.

All the CPUE indices used for the assessment analyses are listed in Table 31.

5. POPULATION PARAMETERS

5.a Growth and Ageing

Documents SCRS/90/29, SCRS/90/36, and SCRS/90/37 further consider the sexually dimorphic growth hypothesis and ageing of swordfish. The Committee also cited two other studies that support the hypothesis of sexually dimorphic growth in swordfish. Sexually dimorphic growth for fish sampled in the Mediterranean Sea was reported by Megalofonou *et al.* (1990) at the GFCM/ICCAT Consultation on large pelagic fishes in the Mediterranean. Sexually dimorphic mercury bioaccumulation rates at size reported in Monteiro and Lopes (1990) from fish caught near the Azores can also be interpreted to support an hypothesis of sexually dimorphic growth in swordfish.

In SCRS/90/29, a fit of a generalized von Bertalanffy growth function to the available data for swordfish in the western north Atlantic resulted in a lower degree of dimorphic growth than did a previously published analysis (Berkeley and Houde 1983). The resulting sex specific growth models and the pooled sex Gompertz growth model used to age the swordfish catch are shown in APP-Figure PARM-1. As apparent from this figure, there is uncertainty about the degree of sexually dimorphic growth.

At the 1989 SCRS meeting, an updated analysis of swordfish growth based on mark-recapture data was presented (Restrepo 1990), incorporating information from an additional 15 fish. The Committee concluded that the new growth curve was not different from that used for ageing the catch, based on the variance associated with the new curve. The Committee agreed that revision of the growth equation with mark-recapture data should only be carried out when substantial data are accumulated, although some recaptures will be made every year. In 1989, an additional 6 marked swordfish with size information potentially useful for mark-recapture growth analysis were recaptured and reported to the US. This year's Committee agreed that the possible addition of 6 data points was not sufficient to warrant additional analysis of the mark-recapture data for growth.

During the 1989 SCRS swordfish workshop, Suzuki and Miyabe (1990) demonstrated potential bias in virtual population analysis (VPA) from ignoring hypothesized dimorphic growth in analysis. Document SCRS/90/26 further considered possible biases in swordfish VPA due to sexually dimorphic growth. This study confirmed through simulation, that overestimation of fishing mortality rates and underestimation of stock sizes can occur if sexually dimorphic growth is ignored in analysis, but also demonstrated that the degree of bias largely depends on the degree of sexually dimorphic growth assumed. This study found that if there is a low degree of dimorphic growth, such as estimated in SCRS/90/29, then there is only a moderate bias in estimates for the last few years. If the degree of divergent growth is as large as described in Berkeley and Houde (1983), then the VPA overestimates of F can be large, almost by a factor of 2.

Although bias resulting from ignoring sexually dimorphic growth hypotheses in analysis can result in overestimates of fishing mortality rate and underestimates of total stock size, SCRS/90/26 also demonstrated that relative measures of stock status are not as greatly affected by these potential biases. Trends in estimated population size and fishing mortality rate were found to be quite similar to the true trends in simulation analysis. Additionally, in the high divergence case, estimates of fishing mortality rates and stock sizes more closely follow the actual values for females. Estimates of current fishing mortality rate relative to reference points commonly used for assessing the current status of the stock (e.g., $F_{0.1}$, F_{max} or some measure of reproductive potential), are also less sensitive to errors in analysis due to dimorphic growth.

5.b Sex ratio

Documents SCRS/90/32, SCRS/90/34, and SCRS/90/42 presented updated information on observations of swordfish sex ratio at size in the Atlantic. Document SCRS/90/44 presented information on swordfish sex ratio at age from samples taken in the Mediterranean. The patterns observed in these data are consistent with those previously observed and indicate trend for a higher proportion of females at large sizes. APP-Figure PARM-2 presents the estimates of percentage females and the associated 95 percent confidence region by 5 cm intervals from swordfish sampled in Atlantic waters between 1978 and 1990, except for some of the most recent Spanish data (SCRS/90/42), which were not available to the Committee for plotting. APP-Figure PARM-2 represents over 3500 observations of sex at size. Differential time-area strata patterns in sex ratio at size hypotheses were presented to the Committee. However, a characteristic of these data, even aggregated over the available time series, is the high variability in the estimated proportions, which makes statistical discrimination of potentially different patterns difficult.

Document SCRS/90/38 demonstrated through simulation that sex ratio at size can be influenced by sexually dimorphic growth rates and differential mortality rates by sex. SCRS/90/26 demonstrated that sexually dimorphic growth was sufficient to explain the observed pattern of sex ratio by size.

The Committee was presented results of preliminary analyses conducted by the US, applying the observed sex ratio data to the North Atlantic stock hypothesis catch at size data used at the 1989 ICCAT swordfish assessment (1978-1988 data). These analyses also incorporated the range of sexually dimorphic growth assumptions described in SCRS/90/-26. The CPUE indices used were those used at the 1989 ICCAT assessment. All indices received equal weight for the simulations. Sex specific CPUE's were not used in this analysis, but the reference ages for tuning were adjusted to approximate the age ranges indexed under the different growth model assumptions. Only in the case of high sexual dimorphism were adjustments to the reference ages required. Under that assumption, age 1 and 2 indices remained assigned to match the age 1 and 2 catches; age 3 indices were adjusted to tune to catch at ages 3 and 4; age 4 indices were adjusted to tune to catch for ages 4, 5, and 6; and the age 5+ indices were adjusted to tune to the catch of ages 6+.

The results of these preliminary analyses showed the same trends as the 1989 ICCAT assessment: 1) the estimated number of recruits has increased, except perhaps in the last year; 2) the estimated population size of age 5+ fish has been decreasing, especially for females; and 3) estimated fishing mortality has increased, especially since 1985.

5.c Natural mortality

The Committee agreed that an instantaneous natural mortality rate assumption of 0.2 would be retained for analyses. Document SCRS/90/46 recommended a range of values for M from 0.1 to 0.25 should be incorporated in analysis to better define the range of uncertainty in VPA results due to uncertainty in M. The Committee agreed to incorporate variability in M, as well as in other input parameters using the methodology described in SCRS/90/28.

5.d Maturity

No new information on maturity of Atlantic swordfish was presented to the Committee. The Committee did review the available information on maturity. The study of Garcia and Mejuto (1988) suggests that the size of first reproduction for female swordfish could be approximately 150 cm LJFL (age 3-4, using the Gompertz growth equation). Nelson *et al.* (1990) estimated a female maturity ogive from data collected off the southeastern U.S. coast by fitting a lognormal distribution to observations aged from LJFL using the Gompertz growth equation as follows: age-3 = 0% mature, age-4 = 29%, age-5 = 71%, age-6 = 89%, age-7 = 96%, age-8 = 99%, and age-9+ = 100% mature. Estimates of female spawning biomass in Nelson *et al.* (1990) using this ogive were made assuming a 1:1 sex ratio at age.

For Mediterranean swordfish, a few data are available relating to first maturity. Megalofonou and De Metrio (1989) reported first maturity at age 1 for males and age 2 for females. A mature female of 82 cm and a mature male of 78 cm were reported by Cavallaro *et al.* (1990); these observations do not necessarily mean that specimens at these sizes are functionally reproductive.

5.e Partial Recruitment

Separable virtual population analysis (SVPA, Pope and Shepherd 1982) was used to estimate the input partial recruitment (PR) for analyses. For this analysis, inputs were chosen to be consistent with recent analysis; they included the catch at age from 1983 to 1989 for ages 1 to 10, a reference age of 5, an M of 0.2, a terminal F of 0.2, and the selectivity on the oldest age (10) set at either 3.0 or 0.3. Results of these analyses are shown in APP-Table PARM-1. As in the 1989 swordfish assessment, the ADAPT VPA methodology accepted by the Committee allowed for the estimation of fishing mortality rates on partially recruited ages in the final year, so that SVPA estimates were only used for ages that were not directly estimated.

The Committee discussed the basis for accepting a flat-topped PR assumption for swordfish older than age 4. Document SCRS/90/27 demonstrates that small errors in ageing can give the impression of a dome-shaped pattern, even when the true pattern is flat-topped. The results of the SVPA analyses (APP-Table PARM-1) also illustrate that although the ascending limb of the PR curve estimated in this fashion is relatively insensitive to changes in input parameters, the appearance of a dome is sensitive to the assumed selectivity at the oldest age. Document SCRS/90/46 recommended addressing the question of a dome-shaped PR from a biological basis. Although several hypotheses were proposed supporting a dome-shaped curve including changing fleet behavior, differential behavior of large fish, and loss of larger fish to longline gear, the Committee had no objective basis for defining a dome shape. For these reasons, the Committee agreed that the null hypothesis of a flat-topped PR should be retained for analysis. An arbitrary dome shape (a linear decrease in selectivity from 1.0 at age-5 to 0.5 at age- 9+) was also used to test sensitivity of results.

6. VPA ESTIMATION METHODS

Several papers were presented to the Committee which addressed the methods used in previous assessments and uncertainties in the estimation that remained (SCRS/90/26, SCRS/90/27, SCRS/90/28 and SCRS/90/38). Conclusions of these papers in regards to VPA estimation procedures were: 1) that treating sexually dimorphic growth with the Gompertz growth curve pooled over sexes could lead to estimates of fishing mortality rates on older fish that were biased high. As the degree of sexual dimorphism increased, then the bias also increased. However, even if sexual dimorphism is large, then VPA results from the pooled growth curve would be similar to the female portion of the stock; 2) the separable VPA (SVPA) methods are not able to resolve whether large fish are equally vulnerable or whether their vulnerability declines or increases with age; errors in ageing (including those introduced due to ageing sexually dimorphic stocks with a pooled sex growth curve) can make large fish which have a flat-topped partial recruitment vector appear to have declining partial recruitment; 3) sexually dimorphic growth is sufficient to cause the observed sex ratio at size; however, sex-specific mortality rates (both natural and fishing) also influence the sex ratio at size; and 4) the precision of VPA estimates can be estimated with Monte Carlo simulation methods in which variation in catch, catch at age, CPUE indices and the SVPA are included in the VPA estimation and in estimation of biological reference points; results indicate that the precision of the VPA's are adequate, especially for relative statistics (for example, relative stock size and fishing mortality rate trends; and $F_{0.1}$ levels relative to 1989 fishing mortality rates). This final point is illustrated in APP-Table EST-1 in which the sensitivity of these relative statistics is examined after incorporation of bias in ageing due to sexually dimorphic growth.

After examination of these results and examination of the data available to be used for this year's assessment, the Committee decided that deterministic VPA's were to be conducted using the same methods as last year. Then results would be interpreted in the context of the known sources of uncertainties and through examination of sensitivity analyses.

6.a Partial Recruitment from Separable VPA

The separable VPA (SVPA) method of Pope and Shepherd (1982) was utilized to estimate the partial recruitment vector of the terminal year (1989). The least squares estimate was derived from the catch at age data from years 1983-89 during which it was the partial recruitment pattern was felt to be relatively constant. As with last year, it was noted that there was sensitivity of the partial recruitment pattern of the older fish (greater than 5 years) to the input selectivity at the oldest age (S_1). The SVPA methodology is not capable of determining whether the large fish PR pattern is flat topped, dome shaped or some other pattern. The SVPA's were run with input parameters M = 0.2, F_t = 0.2, S_1 = 3. Initially, the large fish PR was set to be flat-topped, i.e., all fish equally vulnerable for ages five and older. It should be noted, that in the final VPA runs with all CPUE indices that selectivity is directly estimated for ages 2 and 3. The SVPA pattern is used to estimate those ages not directly estimated and in the preliminary runs in which the VPA was being tuned to one index at a time.

6.b Calibration procedures

The catch-at-age data and the CPUE indices were calibrated using ADAPT VPA tuning methods. This involved several steps which were used last year and are summarized here. First, an SVPA was run on the selected catch at age data to establish a default partial recruitment pattern for the most recent year in the catch at age. Then preliminary VPA runs were made in which an individual index was tuned to the catch at age using the SVPA PR. This was used to obtain a measure of the degree to which this index matched the catch at age data. This measure is the mean squared error of the least squares fit (MSE). Then the VPA was calibrated with all indices simultaneously, but with each index weighted by 1/MSE from the preliminary testing runs.

It must be noted that the weighting procedure is designed to address the matching of the catch at age with the index and not the ability (or reliability) of the index in describing stock at age trends. Reliability questions would have to be addressed with external data, not through the catch at age.

The calibration procedure minimized the weighted least squares deviations between the observed and VPA estimated indices of abundance. When all indices were used simultaneously, there were enough degrees of freedom to estimate stock sizes of ages 3, 4, 5 and 6 in 1990, directly. The initial VPA runs were conducted with the oldest age class in the VPA being fish nine years and older (a "plus" group of 9+). This was done to minimize the effect of aging error in the older fish. The F's of ages 8 and 9+ in years prior to the terminal year were estimated using an average F method (F(8)=F(9+)= avg. F(5,6,7)), when a flat topped PR was used.

The Committee decided that sensitivity analyses should be conducted on the North Atlantic stock option to address effects of simple unweighted least squares versus weighted least squares, of arbitrary dome shaped partial recruitment patterns versus the flat topped pattern, of the effect of removal of specific indices and or data points within those indices and of the effect of grouping at younger ages than 9+ (at 4+ or 5+ or 6+). Note that when an arbitrary dome pattern was tested, the "alpha" method (SCRS/90/27) was used to estimate F's of age 8 and 9+ in years prior to the terminal year (F(8)/F(9+)=PR(8)/PR(9+)=alpha). Changes in catchability not accounted for in the CPUE series were examined by either eliminating the questionable series or by using only a portion of the questionable age-specific indices. The weightings which apply to the CPUE series are found in APP-Table CAL-1.

The VPA calibration methods estimate the variance associated with the degree of fit between the indices and the catch at age. However, it must be remembered that these estimates of standard errors and coefficients of variations (like all variance estimates) are conditional upon the statistical model being correct. In this case, that implies that there are no errors in the catch at age, M and in the indices.

7. VPA RESULTS

7.a ADAPT runs

Results of the ADAPT runs for each of the four assessments (i.e. North Atlantic, Northwest Atlantic, Northeast Atlantic, and Total Atlantic) are discussed fully in the main report. After examining the sensitivity results (see below), the Committee decided to use a pooled age 5+ grouping for the final deterministic VPA runs. This was decided in order to 1) reduce the chance of introducing bias in the VPA results due to ageing errors that could result from hypothesized dimorphic growth or other causes and 2) to reduce the chance of poorly determining the PR for older ages. In the 5+ grouping, the model implies an equal, but average vulnerability for the plus group. Variance of parameter estimates and corresponding weights for the indices are provided in APP-Tables VPA-1, VPA-2, VPA-3, and VPA-4. A fifth run, for the North Atlantic, grouping ages at 9+ is presented in APP-Table VPA-5. All inputs and options as well as the detailed results are documented in these tables. Information on population and fishing mortality trends is presented in the main report.

7.b Sensitivity analyses

Results of these sensitivity analyses are shown in relative terms in APP-Figures VPA-1 and VPA-2. Summary statistics for these runs are presented in APP-Table VPA-6. The Committee concluded from these results that the simulations show quite similar trends. The estimates of full-F in 1989 (fishing mortality rate experienced by adult fish during the 1989 fishing year) were between 2.2 and 4.5 times the level estimated for 1978. Estimates of recruitment of age 1 fish to the stock were between 1.2 and 2.1 times the level estimated in 1978. Incorporation of a dome-shaped PR was observed to lower absolute estimates of F, but also increase the relative change in F over the available time series of data. Removal or truncation of the youngest aged CPUE series resulted in lower estimates of absolute recruitment, but also resulted in higher estimates of full-F. Application of equal weights to the available indices generally resulted in slightly higher estimates of full-F and recruitment than in weighted cases of similar model structure.

7.c Uncertainty in VPA results

Uncertainty in the inputs to the VPAs for the North Atlantic and Northwest Atlantic stock hypotheses was incorporated into the analyses with the method described in Document SCRS/90/28. Input uncertainties were as follows: M uniformly distributed in the interval [0.1,0.25]; annual catch lognormally distributed with coefficients of variation of 0.2 (1978-1982) and 0.1 (1983-1989); catch-at-age proportions multinormally distributed; CPUE indices lognormally distributed with standard errors estimated from the GLM parameter fits. The expected values of the simulated inputs were those defined for the deterministic VPAs run as base cases at the workshop.

In general, the coefficients of variation of the estimates of F at age by year are larger than those for the estimates of abundance (APP-Table VPA-7). Also, uncertainty in the estimates is slightly larger for the Northwest Atlantic stock than for the North Atlantic one. For both stocks, the estimates of abundance indicate clearly increasing trends for age 1 fish (APP-Figures VPA-3 and VPA-4) and decreasing trends for adults (age 5+, APP-Figures VPA-3 and VPA-4). The fishing mortalities estimated in the terminal year are centered around the values obtained with the deterministic VPAs and range from 0.45 to 1.0 for the North Atlantic stock and from 0.5 to 1.15 for the Northwest Atlantic stock (APP-Figures VPA-7 and VPA-8). For both stocks, full F shows increasing trends over the period 1978-1989 (APP-Figures VPA-5 and VPA-6).

A comparison of annual F estimates, relative to the 1978 estimate, was made for each simulation run. For the North Atlantic (APP--Figure VPA-5) the results indicate less than a 5 percent chance that $F_{1989} = F_{1978}$ (i.e., less than 5 percent of the values for the 1989 distribution are 1.0, or less, relative to 1978), and a 50 percent chance that F has more than doubled since 1978 (since the median relative $F_{1989} = 2.04$, 50 percent of the simulations showed increases of more than 2.04). For the northwest Atlantic (APP-Figure VPA-6) the results suggest an increase of at least 1.4 times since 1978 and a 50 percent chance that it has increased by at least 2.5 times (median = 2.52).

8. PRODUCTION MODELS

Document SCRS/90/73 described preliminary experiments to examine the adequacy of fitting stock production models to the 1981-1988 data for the North, Northeast, and Northwest Atlantic swordfish stock assumptions. Estimates of optimal catch (MSY) and effort (F_{MSY}) varied, depending on the model used and the underlying assumptions. Simulation results showed that production model analysis of a short catch and effort time series (relative to the life span of swordfish), may give spurious results and can form a poor basis for management decisions.

9. YIELD PER RECRUIT

Yield per recruit analysis (Y/R) was carried out in two ways. First, deterministic analyses were conducted for all of the stock assumptions analyzed. For the deterministic analyses, the input parameters used were the terminal year F-at-age vector from the deterministic VPAs and weight at age vector estimated from the catch at age for the terminal year (1989). The terminal year weight at age for fishes greater than 14 years old was estimated by averaging the 15+ weights over the available time series, differencing the resulting average from the age 14 average weight in the terminal year and cumulating 1/6th of this difference per year to the age 14 value until age 20. For all deterministic Y/R analyses, a natural mortality rate of 0.2 was assumed. The VPA estimates of 1989 F and estimates of the common reference fishing mortality rates ($F_{0.1}$, F_{max}) are shown in APP-Table YPR-1.

Estimates of $F_{0.1}$ and F_{max} resulting from the sensitivity analyses, expressed as proportions of the current (1989) F resulting from the sensitivity analyses are shown in APP-Table VPA-6 and APP-Figure YPR-1. The $F_{0.1}$ reference rate ranges from 13-28 percent of the estimated current F while the F_{max} reference rate ranges from 28-57 percent of estimated 1989 F from the sensitivity runs.

Yield-per-recruit analyses were also carried out within the simulations used to quantify uncertainty about the VPA results for North Atlantic and Northwest Atlantic stock hypotheses. These results demonstrated that the F values required to reach $F_{0.1}$, expressed as a fraction of the 1989 F, have a narrower distribution than do those required to reach F_{max}. For both stock hypotheses evaluated, F reductions required to reach $F_{0.1}$ are on the order of 70-90 percent (APP-Figures YPR-2 and YPR-3).

10. OTHER FISHERY INDICATORS

The Committee discussed the availability of alternative indicators of the status of swordfish stocks. The group decided to examine trends in mean weight calculated from the catch-at-size data for several areas in the Atlantic and to examine the catch-at-age data from the Mediterranean from 1985 through 1989. Members of the group were particularly concerned about potential bias resulting from fleet movements and differences in sample coverage rate by nation during the time period from 1978 through 1989.

Average weights (kg round) are plotted in Figure 71 for the three ICCAT swordfish reporting areas in the North Atlantic and for two reporting areas in the South Atlantic.

For the North Atlantic the trends were very similar with the northeast and north-central trends parallel to the northwest trend but consisting of larger fish. Greater variability was noted for the early years of the time series particularly prior to 1982. This variability was thought to result from lower sampling levels that may not have provided coverage proportional to landings in all areas. After 1982 the sampling of the major fleets improved and the trends are less variable. Concern remains about the influence of increased fishing effort in tropical areas which has been noted in recent years.

In the South Atlantic there appeared to be differences in the patterns between the southwest and southeast regions with particularly high variability in the early years for the southeast. It was also noted that the sizes for the last two years for the southwest reflect data substitutions for Brasil, Argentina, and Uruguay. Sampling coverage was also a problem in the southeast Atlantic area especially in the early years when effort and landings were low. The group did not draw any strong conclusions from these plots other than noting that all of the trends are declining. Additional studies were recommended to examine temporal-spatial influences on size with particular emphasis on environmental conditions including oceanographic currents and bottom topography.

In the Mediterranean recent improvements in landings data as well as size composition samples allowed the group to develop catch at size estimates from 1985 through 1989. The group transformed the catch at size into catch at age by using the growth equation developed for the North Atlantic. The group recommended that growth information from the Mediterranean be compared to the Atlantic to evaluate potential bias. The catch at age indicates very few large fish in the Mediterranean and a predominance of age 1 and 2 fish which account for 61 percent of the total number harvested in recent years. This was particularly troublesome because of reported undersampling of age 0.

11. PROJECTIONS FOR MANAGEMENT OPTIONS

Two year forward projections were simulated to compute catches (in weight) in 1991, relative to the current year (APP-Figures YPR-2 and YPR-3). For the North Atlantic stock hypothesis, 1991 catches resulting from 1989 F levels (FSQ) could range from 80-120 percent of current catches. Fishing at $F_{0.1}$ levels in 1991 could result in catches between 10 and 50 percent of the 1989 catches (APP-Figure YPR-2). For the Northwest Atlantic stock hypothesis, the catches could be similar to 1989, ranging from 60-130 percent when fishing at FSQ and from 10-40 percent at $F_{0.1}$ levels (APP-Figure YPR-3).

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App-Table SWO-PARM-1. Results of separable virtual population analysis

Separable VPA Results

88 estimates based upon 83-88 catch at age
89 estimates based upon 83-89 catch at age

Terminal F=0.2 M=0.2
Ages 1 to 10 used
Reference age is age 5
Selectivity at age 10 (Sn) was varied

	North Atlantic			Northwest Atlantic			Northeast Atlantic			Tot. Atl.
	Sn=3.0		Sn=0.3	Sn=3.0		Sn=0.3	Sn=3.0		Sn=0.3	Sn=3.0
AGE	88	89	89	88	89	89	88	89	89	83-89
1	.117	.109	.179	.140	.125	.224	.100	.092	.132	.086
2	.338	.334	.503	.392	.384	.619	.316	.277	.376	.271
3	.602	.602	.825	.673	.688	.958	.576	.523	.664	.514
4	.902	.896	1.079	.928	.920	1.132	.884	.852	.986	.797
5	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
6	--	.975	.762	--	1.022	.783	--	.942	.764	1.106
7	--	1.054	.602	--	1.105	.611	--	1.038	.637	1.189
8	--	1.112	.435	--	1.198	.447	--	1.049	.448	1.305
9	--	1.614	.380	--	1.670	.374	--	1.598	.408	1.844

APP-Table SWO-CAL-1. Results of tests of individual abundance indices

Northwest Atlantic

US 1	.3389	.155	.0233	.2391
US 2	.3378	.1926	.0286	.1948
US 3	.5191	.820	.1745	.0319
US 4	.5507	.8864	.1207	.0462
US 5+	.8663	2.6421	.2578	.0216
Spain 1	.1328	.7901	.1219	.0457
Spain 2	.1891	.2772	.0314	.1775
Spain 3	.3087	.3426	.0456	.1222
Spain 4	.4567	.8862	.1479	.0378
Spain 5+	.5495	.8874	.1089	.0512
Japan 5+	.4353	1.1051	.1740	.0320

North Atlantic

US 1	.2745	.1603	.0277	.0885
US 2	.2609	.1644	.0238	.1033
US 3	.4036	.7202	.15923	.0155
US 4	.4202	.7369	.1075	.0229
US 5+	.7269	2.5487	.2585	.0095
Spain 1	.2080	.3309	.0815	.0302
Spain 2	.2100	.1605	.01989	.1236
Spain 3	.3112	.1363	.0079	.3113
Spain 4	.3698	.3665	.0323	.0761
Spain 5+	.3271	.2252	.0123	.1999
Japan 5+	.2360	.5824	.1279	.0192

Northeast Atlantic

Spain 1	.1572	.375	.1095	.0359
Spain 2	.1435	.149	.0184	.2138
Spain 3	.2212	.145	.0101	.3894
Spain 4	.2681	.254	.0198	.1986
Spain 5+	.2640	.343	.0273	.1440
Japan 5+	.1914	.776	.2168	.0181

Total Atlantic

US 1	.2421	.142	.0210	.0916
US 2	.2376	.151	.0194	.0992
US 3	.4374	.770	.1613	.0119
US 4	.4659	.854	.1276	.0151
US 5+	.7784	3.056	.2984	.0065
Spain 1	.1827	.342	.0753	.0256
Spain 2	.1890	.123	.0105	.1833
Spain 3	.3345	.117	.0053	.363
Spain 4	.4087	.351	.0299	.0644
Spain 5+	.3561	.284	.0160	.1203
Japan 5+	.227	.485	.0998	.0193

APP-Table EST-1. Required reductions in the terminal year F to reach $F_{0.1}$ and F_{max}, expressed as a multiplier. Two cases are presented for growth: as estimated by Berkeley and Houde, or as estimated by Ehrhardt. "VPA" indicates the apparent reductions that would be suggested from a VPA estimate where data for both sexes were pooled and assigned ages with the Gompertz formulation.
(Source: SCRS/90/26)

	Proportion of Present F Required to Reach:	
	$F_{0.1}$	F_{max}
CASE I: Growth follows Ehrhardt's estimates		
Females	0.27	0.53
Males	0.29	0.63
VPA	0.25	0.48
CASE II: Growth follows Berkeley-Houde's estimates		
Females	0.25	0.48
Males	0.35	0.87
VPA	0.18	0.34

APP-Table VPA-1. North Atlantic Swordfish

Final Run - Ages Grouped at 5+
DATE: 09-17-1990
TIME: 10:52:26

Age	Input Partial Recruitment
1	0.10900
2	0.33400
3	0.60200
4	0.89600
5+	1.00000

Indices were scaled to the mean after any transformations were taken.
No tri-cubic weighting used in the least squares
Final year selectivity was entered as an input
The reference age for computing terminal year selection was 2
Bottom row F's Estimated by F Ratio method

Weighting Given to Indices in Sum of Squares

	78	79	80	81	82	83
US Age 1	0.000000	0.000000	0.000000	0.088500	0.088500	0.088500
US Age 2	0.000000	0.000000	0.000000	0.103300	0.103300	0.103300
US Age 3	0.000000	0.000000	0.000000	0.015500	0.015500	0.015500
US AGE 4	0.000000	0.000000	0.000000	0.022900	0.022900	0.022900
US Age 5+	0.000000	0.000000	0.000000	0.009500	0.009500	0.009500
ES 4AB 1	0.000000	0.000000	0.000000	0.000000	0.000000	0.030200
ES 4AB 2	0.000000	0.000000	0.000000	0.000000	0.000000	0.123600
ES 4AB 3	0.000000	0.000000	0.000000	0.000000	0.000000	0.311300
ES 4AB 4	0.000000	0.000000	0.000000	0.000000	0.000000	0.076100
ES 4AB 5+	0.000000	0.000000	0.000000	0.000000	0.000000	0.199900
JLL NAT 5+	0.019200	0.019200	0.019200	0.019200	0.019200	0.019200

	84	85	86	87	88	89
US Age 1	0.088500	0.088500	0.088500	0.088500	0.088500	0.088500
US Age 2	0.103300	0.103300	0.103300	0.103300	0.103300	0.103300
US Age 3	0.015500	0.015500	0.015500	0.015500	0.015500	0.015500
US AGE 4	0.022900	0.022900	0.022900	0.022900	0.022900	0.022900
US Age 5+	0.009500	0.009500	0.009500	0.009500	0.009500	0.009500
ES 4AB 1	0.030200	0.030200	0.030200	0.030200	0.030200	0.030200
ES 4AB 2	0.123600	0.123600	0.123600	0.123600	0.123600	0.123600
ES 4AB 3	0.311300	0.311300	0.311300	0.311300	0.311300	0.311300
ES 4AB 4	0.076100	0.076100	0.076100	0.076100	0.076100	0.076100
ES 4AB 5+	0.199900	0.199900	0.199900	0.199900	0.199900	0.199900
JLL NAT 5+	0.019200	0.019200	0.019200	0.019200	0.019200	0.019200

Numbers at Age at End of Terminal Year

	Estimate	Std Error	Coeff of Var
Number at Age 2	631596	78529	0.12433
Number at Age 3	317361	22483	0.07084
Number at Age 4	128982	10161	0.07878
Number at Age 5+	90598	8121	0.08964

Numbers at End of Terminal Year by Age Category

	Estimate	Std Error	Coeff of Var
Ages 1 to 1	0	0	0.00000
Ages 2 to 4	1077939	89933	0.08343
Ages 5 to 5+	90598	8121	0.08964

Fishing Mortality Rate at Age During Terminal Year

	F Estimate	Std Error	Approx. 95% CI
F at Age 1	0.098	0.012	0.077 <=F<= 0.123
F at Age 2	0.277	0.017	0.245 <=F<= 0.312
F at Age 3	0.499	0.031	0.441 <=F<= 0.561
F at Age 4	0.742	0.046	0.657 <=F<= 0.836
F at Age 5+	0.828	0.051	0.733 <=F<= 0.933

APP-Table VPA-2. Northeast Atlantic Swordfish

Final Run - Ages Grouped at 5+
DATE: 09-17-1990
TIME: 11:43:53

Age	Input Partial Recruitment
1	0.09200
2	0.27700
3	0.52300
4	0.85200
5+	1.00000

Indices were scaled to the mean after any transformations were taken.
No tri-cubic weighting used in the least squares
Final year selectivity was entered as an input
The reference age for computing terminal year selection was 2
Bottom row F's Estimated by F Ratio method

Weighting Given to Indices in Sum of Squares

	78	79	80	81	82	83
ES 4B 1	0.000000	0.000000	0.000000	0.000000	0.000000	0.035900
ES 4B 2	0.000000	0.000000	0.000000	0.000000	0.000000	0.213800
ES 4B 3	0.000000	0.000000	0.000000	0.000000	0.000000	0.389400
ES 4B 4	0.000000	0.000000	0.000000	0.000000	0.000000	0.198600
ES 4B 5+	0.000000	0.000000	0.000000	0.000000	0.000000	0.144000
JLL NE 5+	0.018100	0.018100	0.018100	0.018100	0.018100	0.018100

	84	85	86	87	88	89
ES 4B 1	0.035900	0.035900	0.035900	0.035900	0.035900	0.035900
ES 4B 2	0.213800	0.213800	0.213800	0.213800	0.213800	0.213800
ES 4B 3	0.389400	0.389400	0.389400	0.389400	0.389400	0.389400
ES 4B 4	0.198600	0.198600	0.198600	0.198600	0.198600	0.198600
ES 4B 5+	0.144000	0.144000	0.144000	0.144000	0.144000	0.144000
JLL NE 5+	0.018100	0.018100	0.018100	0.018100	0.018100	0.018100

Numbers at Age at End of Terminal Year

	Estimate	Std Error	Coeff of Var
Number at Age 2	240863	80736	0.33519
Number at Age 3	135564	12402	0.09149
Number at Age 4	60263	6008	0.09970
Number at Age 5+	45017	5114	0.11360

Numbers at End of Terminal Year by Age Category

	Estimate	Std Error	Coeff of Var
Ages 1 to 1	0	0	0.00000
Ages 2 to 4	436690	84509	0.19352
Ages 5 to 5+	45017	5114	0.11360

Fishing Mortality Rate at Age During Terminal Year

	F Estimate	Std Error	Approx. 95% CI
F at Age 1	0.081	0.026	0.042 <=F<= 0.143
F at Age 2	0.198	0.016	0.168 <=F<= 0.232
F at Age 3	0.374	0.031	0.317 <=F<= 0.438
F at Age 4	0.609	0.050	0.517 <=F<= 0.714
F at Age 5+	0.715	0.059	0.606 <=F<= 0.838

APP-Table VPA-3. Northwest Atlantic Swordfish
Final Run - Ages Grouped at 5+
DATE: 09-17-1990
TIME: 11:32:58

Age	Input Partial Recruitment
1	0.12500
2	0.38400
3	0.66800
4	0.92000
5+	1.00000

Indices were scaled to the mean after any transformations were taken.
No tri-cubic weighting used in the least squares
Final year selectivity was entered as an input
The reference age for computing terminal year selection was 2
Bottom row F's Estimated by F Ratio method

Weighting Given to Indices in Sum of Squares

	78	79	80	81	82	83
US Age 1	0.000000	0.000000	0.000000	0.239100	0.239100	0.239100
US Age 2	0.000000	0.000000	0.000000	0.194800	0.194800	0.194800
US Age 3	0.000000	0.000000	0.000000	0.031900	0.031900	0.031900
US AGE 4	0.000000	0.000000	0.000000	0.046200	0.046200	0.046200
US Age 5+	0.000000	0.000000	0.000000	0.021600	0.021600	0.021600
ES 4A 1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
ES 4A 2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
ES 4A 3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
ES 4A 4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
ES 4A 5+	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
JLL NW 5+	0.032000	0.032000	0.032000	0.032000	0.032000	0.032000

	84	85	86	87	88	89
US Age 1	0.239100	0.239100	0.239100	0.239100	0.239100	0.239100
US Age 2	0.194800	0.194800	0.194800	0.194800	0.194800	0.194800
US Age 3	0.031900	0.031900	0.031900	0.031900	0.031900	0.031900
US AGE 4	0.046200	0.046200	0.046200	0.046200	0.046200	0.046200
US Age 5+	0.021600	0.021600	0.021600	0.021600	0.021600	0.021600
ES 4A 1	0.000000	0.045700	0.045700	0.045700	0.045700	0.045700
ES 4A 2	0.000000	0.177500	0.177500	0.177500	0.177500	0.177500
ES 4A 3	0.000000	0.122200	0.122200	0.122200	0.122200	0.122200
ES 4A 4	0.000000	0.037800	0.037800	0.037800	0.037800	0.037800
ES 4A 5+	0.000000	0.051200	0.051200	0.051200	0.051200	0.051200
JLL NW 5+	0.032000	0.032000	0.032000	0.032000	0.032000	0.032000

Numbers at Age at End of Terminal Year

	Estimate	Std Error	Coeff of Var
Number at Age 2	383325	48040	0.12532
Number at Age 3	194225	21280	0.10957
Number at Age 4	77393	9466	0.12231
Number at Age 5+	55610	7574	0.13621

Numbers at End of Terminal Year by Age Category

	Estimate	Std Error	Coeff of Var
Ages 1 to 1	0	0	0.00000
Ages 2 to 4	654943	63789	0.09740
Ages 5 to 5+	55610	7574	0.13621

Fishing Mortality Rate at Age During Terminal Year

	F Estimate	Std Error	Approx. 95% CI
F at Age 1	0.111	0.013	0.087 <=F<= 0.138
F at Age 2	0.313	0.029	0.260 <=F<= 0.374
F at Age 3	0.545	0.051	0.452 <=F<= 0.651
F at Age 4	0.750	0.070	0.622 <=F<= 0.897
F at Age 5+	0.816	0.076	0.676 <=F<= 0.975

APP-Table VPA-4. Total Atlantic Swordfish

Final Run - Ages Grouped at 5+
DATE: 09-17-1990
TIME: 12:27:25

Age	Input Partial Recruitment
1	0.08600
2	0.27100
3	0.51400
4	0.79700
5+	1.00000

Indices were scaled to the mean after any transformations were taken.
No tri-cubic weighting used in the least squares
Final year selectivity was entered as an input
The reference age for computing terminal year selection was 2
Bottom row F's Estimated by F Ratio method

Weighting Given to Indices in Sum of Squares

	78	79	80	81	82	83
US Age 1	0.000000	0.000000	0.000000	0.091600	0.091600	0.091600
US Age 2	0.000000	0.000000	0.000000	0.099200	0.099200	0.099200
US Age 3	0.000000	0.000000	0.000000	0.011900	0.011900	0.011900
US AGE 4	0.000000	0.000000	0.000000	0.015100	0.015100	0.015100
US Age 5+	0.000000	0.000000	0.000000	0.006500	0.006500	0.006500
ES 4ABS1	0.000000	0.000000	0.000000	0.000000	0.000000	0.025600
ES 4ABS2	0.000000	0.000000	0.000000	0.000000	0.000000	0.183300
ES 4ABS3	0.000000	0.000000	0.000000	0.000000	0.000000	0.363000
ES 4ABS4	0.000000	0.000000	0.000000	0.000000	0.000000	0.064400
ES 4ABS5+	0.000000	0.000000	0.000000	0.000000	0.000000	0.120300
JLL Atl 5+	0.019300	0.019300	0.019300	0.019300	0.019300	0.019300

	84	85	86	87	88	89
US Age 1	0.091600	0.091600	0.091600	0.091600	0.091600	0.091600
US Age 2	0.099200	0.099200	0.099200	0.099200	0.099200	0.099200
US Age 3	0.011900	0.011900	0.011900	0.011900	0.011900	0.011900
US AGE 4	0.015100	0.015100	0.015100	0.015100	0.015100	0.015100
US Age 5+	0.006500	0.006500	0.006500	0.006500	0.006500	0.006500
ES 4ABS1	0.025600	0.025600	0.025600	0.025600	0.025600	0.025600
ES 4ABS2	0.183300	0.183300	0.183300	0.183300	0.183300	0.183300
ES 4ABS3	0.363000	0.363000	0.363000	0.363000	0.363000	0.363000
ES 4ABS4	0.064400	0.064400	0.064400	0.064400	0.064400	0.064400
ES 4ABS5+	0.120300	0.120300	0.120300	0.120300	0.120300	0.120300
JLL Atl 5+	0.019300	0.019300	0.019300	0.019300	0.019300	0.019300

Numbers at Age at End of Terminal Year

	Estimate	Std Error	Coeff of Var
Number at Age 2	933977	112976	0.12096
Number at Age 3	450709	30594	0.06788
Number at Age 4	214896	16359	0.07612
Number at Age 5+	161072	14471	0.08984

Numbers at End of Terminal Year by Age Category

	Estimate	Std Error	Coeff of Var
Ages 1 to 1	0	0	0.00000
Ages 2 to 4	1599582	129656	0.08106
Ages 5 to 5+	161072	14471	0.08984

Fishing Mortality Rate at Age During Terminal Year

	F Estimate	Std Error	Approx. 95% CI
F at Age 1	0.089	0.010	0.070 <=F<= 0.110
F at Age 2	0.267	0.016	0.238 <=F<= 0.300
F at Age 3	0.507	0.030	0.450 <=F<= 0.568
F at Age 4	0.786	0.047	0.699 <=F<= 0.881
F at Age 5+	0.986	0.058	0.876 <=F<= 1.105

APP-Table VPA-5. North Atlantic Swordfish

11 indices - Ages Grouped at 9+
DATE: 09-14-1990
TIME: 20:02:48

Age	Input Partial Recruitment
1	0.10900
2	0.33400
3	0.60200
4	0.89600
5	1.00000
6	1.00000
7	1.00000
8	1.00000
9+	1.00000

Indices were scaled to the mean after any transformations were taken.
No tri-cubic weighting used in the least squares
Final year selectivity was entered as an input
The reference age for computing terminal year selection was 5
Bottom row F's Estimated by Pooled F method for ages 5 to 7

Weighting Given to Indices in Sum of Squares

	78	79	80	81	82	83
US Age 1	0.000000	0.000000	0.000000	0.102295	0.102295	0.102295
US Age 2	0.000000	0.000000	0.000000	0.109030	0.109030	0.109030
US Age 3	0.000000	0.000000	0.000000	0.018147	0.018147	0.018147
US AGE 4	0.000000	0.000000	0.000000	0.024971	0.024971	0.024971
US Age 5+	0.000000	0.000000	0.000000	0.008451	0.008451	0.008451
ES 4AB 1	0.000000	0.000000	0.000000	0.000000	0.000000	0.033985
ES 4AB 2	0.000000	0.000000	0.000000	0.000000	0.000000	0.146378
ES 4AB 3	0.000000	0.000000	0.000000	0.000000	0.000000	0.344083
ES 4AB 4	0.000000	0.000000	0.000000	0.000000	0.000000	0.086021
ES 4AB 5+	0.000000	0.000000	0.000000	0.000000	0.000000	0.109935
JLL NAT 5+	0.016705	0.016705	0.016705	0.016705	0.016705	0.016705

	84	85	86	87	88	89
US Age 1	0.102295	0.102295	0.102295	0.102295	0.102295	0.102295
US Age 2	0.109030	0.109030	0.109030	0.109030	0.109030	0.109030
US Age 3	0.018147	0.018147	0.018147	0.018147	0.018147	0.018147
US AGE 4	0.024971	0.024971	0.024971	0.024971	0.024971	0.024971
US Age 5+	0.008451	0.008451	0.008451	0.008451	0.008451	0.008451
ES 4AB 1	0.033985	0.033985	0.033985	0.033985	0.033985	0.033985
ES 4AB 2	0.146378	0.146378	0.146378	0.146378	0.146378	0.146378
ES 4AB 3	0.344083	0.344083	0.344083	0.344083	0.344083	0.344083
ES 4AB 4	0.086021	0.086021	0.086021	0.086021	0.086021	0.086021
ES 4AB 5+	0.109935	0.109935	0.109935	0.109935	0.109935	0.109935
JLL NAT 5+	0.016705	0.016705	0.016705	0.016705	0.016705	0.016705

Numbers at Age at End of Terminal Year

	Estimate	Std Error	Coeff of Var
Number at Age 2	561804	63912	0.11376
Number at Age 3	320854	30190	0.09409
Number at Age 4	128460	13530	0.10532
Number at Age 5	50424	8745	0.17342
Number at Age 6	14445	2489	0.17233
Number at Age 7	6796	1171	0.17233
Number at Age 8	3700	638	0.17234
Number at Age 9+	5998	1034	0.17234

Numbers at End of Terminal Year by Age Category

	Estimate	Std Error	Coeff of Var
Ages 1 to 1	0	0	0.00000
Ages 2 to 4	1011117	79833	0.07896
Ages 5 to 9+	81364	11068	0.13603

Fishing Mortality Rate at Age During Terminal Year

	F Estimate	Std Error	Approx. 95% CI
F at Age 1	0.110	0.012	0.088 <=F<= 0.135
F at Age 2	0.274	0.022	0.233 <=F<= 0.321
F at Age 3	0.500	0.041	0.424 <=F<= 0.586
F at Age 4	0.725	0.089	0.567 <=F<= 0.914
F at Age 5	1.007	0.108	0.811 <=F<= 1.235
F at Age 6	1.007	0.108	0.811 <=F<= 1.235
F at Age 7	1.007	0.108	0.811 <=F<= 1.235
F at Age 8	1.007	0.108	0.811 <=F<= 1.235
F at Age 9+	1.007	0.108	0.811 <=F<= 1.235

APP-Table VPA-6. Sensitivity analyses for the North Atlantic stock hypothesis

Scenario 1: Flat Topped Partial Recruitment
11 Indices Weighted

Age :	1	2	3	4	5	6	7	8	9+
Input PR :	.109	.334	.602	.896	1.000	1.000	1.000	1.000	1.000
F's in 89:	.110	.274	.500	.725	1.007	1.007	1.007	1.007	1.007

Year :	78	79	80	81	82	83	84	85	86	87	88	89
F 5-9+:	.38	.38	.45	.39	.47	.54	.46	.48	.60	.74	.76	1.01
Recr :	3.7	4.0	4.1	4.1	4.8	5.1	5.3	5.7	6.1	6.4	7.2	--

F 5-9+ in 1989/F 5-9+ in 1978:	2.65
Recr in 1988/Recr in 1978:	1.94
F0.1/F in 1989:	0.21
FMAX/F in 1989:	0.44

Scenario 2: Flat Topped Partial Recruitment
11 Indices Unweighted

Age :	1	2	3	4	5	6	7	8	9+
Input PR :	.109	.334	.602	.896	1.000	1.000	1.000	1.000	1.000
F's in 89:	.120	.266	.475	.785	1.100	1.100	1.100	1.100	1.100

Year :	78	79	80	81	82	83	84	85	86	87	88	89
F 5-9+:	.38	.38	.45	.39	.47	.55	.46	.48	.60	.75	.79	1.10
Recr :	3.7	4.0	4.0	4.1	4.8	5.1	5.3	5.6	5.9	6.6	7.4	--

F 5-9+ in 1989/F 5-9+ in 1978:	2.89
Recr in 1988/Recr in 1978:	2.00
F0.1/F in 1989:	0.19
FMAX/F in 1989:	0.35

Scenario 3: Dome Shaped Partial Recruitment
11 Indices Unweighted

Age:	5	6	7	8	9+
Sel:	1.0	0.8	0.7	0.6	0.5

Age :	1	2	3	4	5	6	7	8	9+
Input PR :	.109	.334	.602	.896	1.000	.800	.700	.600	.500
F's in 89:	.114	.259	.457	.732	1.045	.836	.732	.627	.523

Year :	78	79	80	81	82	83	84	85	86	87	88	89
F 5-9+ :	.22	.24	.27	.24	.30	.34	.30	.34	.46	.57	.59	.81
Recr :	4.1	4.2	4.2	4.3	4.9	5.2	5.4	5.7	6.0	6.7	7.5	--

F 5-9+ in 1989/F 5-9+ in 1978:	3.68
Recr in 1988/Recr in 1978:	1.83
F0.1/F in 1989:	0.20
FMAX/F in 1989:	0.44

Scenario 4: Flat Topped Partial Recruitment
7 Indices Unweighted
(US Age 1, US Age 2, ES Age 1 and ES Age 2 excluded)

Age :	1	2	3	4	5	6	7	8	9+
Input PR :	.109	.334	.602	.896	1.000	1.000	1.000	1.000	1.000
F's in 89:	.174	.534	.621	.917	1.600	1.600	1.600	1.600	1.600

Year :	78	79	80	81	82	83	84	85	86	87	88	89
F 5-9+ :	.38	.38	.45	.39	.47	.55	.47	.49	.62	.80	.89	1.60
Recr :	3.7	4.0	4.0	4.0	4.7	5.0	5.2	5.5	5.7	5.8	4.6	--

F 5-9+ in 1989/F 5-9+ in 1978: 4.21
Recr in 1988/Recr in 1978: 1.24
F0.1/F in 1989: 0.13
FMAX/F in 1989: 0.28

Scenario 5: Flat Topped Partial Recruitment
11 Indices Unweighted;
all age 1 and 2 indices use data from 1986-89, only

Age :	1	2	3	4	5	6	7	8	9+
Input PR :	.109	.334	.602	.896	1.000	1.000	1.000	1.000	1.000
F's in 89:	.143	.328	.576	.922	1.314	1.314	1.314	1.314	1.314

Year :	78	79	80	81	82	83	84	85	86	87	88	89
F 5-9+:	.38	.38	.45	.39	.47	.55	.46	.49	.61	.77	.84	1.31
Recr :	3.7	4.0	4.0	4.1	4.7	5.1	5.2	5.5	5.7	6.0	6.3	--

F 5-9+ in 1989/F 5-9+ in 1978: 3.44
Recr in 1988/Recr in 1978: 1.70
F0.1/F in 1989: 0.16
FMAX/F in 1989: 0.35

Scenario 6: Dome Shaped Partial Recruitment
11 Indices Unweighted;
all age 1 and 2 indices use data from 1986-89, only

Age :	1	2	3	4	5	6	7	8	9+
Input PR :	.109	.334	.602	.896	1.000	.800	.700	.600	.500
F's in 89:	.138	.322	.560	.873	1.264	1.011	.885	.758	.632

Year:	78	79	80	81	82	83	84	85	86	87	88	89
F 5-9+:	.22	.24	.28	.24	.31	.35	.31	.35	.48	.61	.65	.98
Recr :	4.0	4.2	4.2	4.2	4.8	5.2	5.3	5.6	5.8	6.1	6.4	--

F 5-9+ in 1989/F 5-9+ in 1978: 4.45
Recr in 1988/Recr in 1978: 1.60
F0.1/F in 1989: 0.17
FMAX/F in 1989: 0.36

Scenario 7: Dome Shaped Partial Recruitment
11 Indices Unweighted; All Age 5+ indices assume:

Age	1	2	3	4	5	6	7	8	9+
Input PR	.109	.334	.602	.896	1.000	.800	.700	.600	.500
F's in 89	.115	.260	.458	.734	1.056	.845	.739	.634	.528

Year:	78	79	80	81	82	83	84	85	86	87	88	89
F 5-9+:	.22	.24	.27	.24	.30	.34	.30	.34	.46	.57	.59	.82
Recr :	4.1	4.2	4.2	4.3	4.9	5.2	5.4	5.7	6.0	6.7	7.5	--

F 5-9+ in 1989/F 5-9+ in 1978: 3.73
Recr in 1988/Recr in 1978: 1.83
F0.1/F in 1989: 0.20
FMAX/F in 1989: 0.43

Scenario 8: Flat Topped Partial Recruitment
11 Indices Unweighted; Oldest age class in VPA is 6+

Age	1	2	3	4	5	6+
Input PR	.109	.334	.602	.896	1.000	1.000
F's in 89	.100	.258	.550	.818	.913	.913

Year :	78	79	80	81	82	83	84	85	86	87	88	89
F 5-6+:	.31	.35	.39	.34	.44	.48	.40	.42	.56	.69	.68	.91
Recr :	3.8	4.1	4.3	4.3	4.9	5.3	5.5	5.8	5.9	6.2	7.6	---

F 5-9+ in 1989/F 5-9+ in 1978: 2.93
Recr in 1988/Recr in 1978: 2.00
F0.1/F in 1989: 0.22
FMAX/F in 1989: 0.46

Scenario 9: Dome Shaped Partial Recruitment
11 Indices Unweighted; Oldest age class in VPA is 6+

Age	1	2	3	4	5	6+
Input PR	.109	.334	.602	.896	1.000	.700
F's in 89	.100	.259	.552	.821	.917	.642

Year :	78	79	80	81	82	83	84	85	86	87	88	89
F 5-6+:	.23	.25	.28	.25	.33	.36	.30	.33	.46	.57	.57	.74
Recr :	3.9	4.3	4.4	4.3	4.9	5.2	5.5	5.7	5.9	6.1	7.6	---

F 5-6+ in 1989/F 5-6+ in 1978: 3.22
Recr in 1988/Recr in 1978: 1.95
F0.1/F in 1989: 0.22
FMAX/F in 1989: 0.46

Scenario 10: 11 Indices Unweighted; Oldest age class in VPA is 5+

Age:	1	2	3	4	5+
Input PR:	.109	.334	.602	.896	1.000
F's in 89:	.095	.291	.524	.780	.871

Year: 78 79 80 81 82 83 84 85 86 87 88 89
F 5+ :.32 .34 .39 .34 .43 .50 .43 .46 .60 .74 .74 .87 Recr :3.9
3.9 4.1 4.2 4.9 5.2 5.5 6.0 5.9 6.3 6.9 --- F 5-9+ in 1989/F 5-9+
in 1978: 2.72
Recr in 1988/Recr in 1978: 1.76
F0.1/F in 1989: 0.23
FMAX/F in 1989: 0.47

Scenario 11: 11 Indices Unweighted; Oldest age class in VPA is 5+
Age 3 indices applied to ages 3 and 4
Age 4 indices applied to ages 4+

Age :	1	2	3	4	5+
Input PR :	.109	.334	.602	.896	1.000
F's in 89:	.092	.281	.506	.753	.841

Year :	78	79	80	81	82	83	84	85	86	87	88	89
F 5+ :	.32	.34	.39	.34	.42	.50	.43	.46	.60	.74	.73	.84
Recr :	3.9	3.9	4.1	4.2	4.9	5.2	5.5	6.0	6.0	6.4	7.1	---

F 5+ in 1989/F 5+ in 1978:	2.62
Recr in 1988/Recr in 1978:	1.82
F0.1/F in 1989:	0.24
FMAX/F in 1989:	0.49

Scenario 12: 4 Indices Unweighted; Oldest age class in VPA is 5+
Only Age 3 and 4 indices used

Age :	1	2	3	4	5+
Input PR :	.109	.334	.602	.896	1.000
F's in 89:	.121	.371	.669	.996	1.111

Year :	78	79	80	81	82	83	84	85	86	87	88	89
F 5+ :	.32	.34	.39	.34	.43	.50	.44	.47	.62	.77	.82	1.11
Recr :	3.9	3.9	4.1	4.2	4.9	5.2	5.4	5.8	5.6	5.7	5.8	--

F 5+ in 1989/F 5+ in 1978:	3.46
Recr in 1988/Recr in 1978:	1.49
F0.1/F in 1989:	0.18
FMAX/F in 1989:	0.37

Scenario 13: 4 Indices Unweighted; Oldest age class in VPA is 5+
Only Age 1 and 2 indices used

Age	1	2	3	4	5+
Input PR	.109	.334	.602	.896	1.000
F's in 89	.079	.241	.435	.647	.722

Year	78	79	80	81	82	83	84	85	86	87	88	89
F 5+	.32	.34	.39	.34	.42	.50	.43	.45	.59	.70	.68	.72
Recr	3.9	3.9	4.2	4.2	4.9	5.3	5.6	6.2	6.2	6.9	8.0	--

F 5+ in 1989/F 5+ in 1978: 2.25
Recr in 1988/Recr in 1978: 2.05
F0.1/F in 1989: 0.28
FMAX/F in 1989: 0.57

Scenario 14: 11 Indices Unweighted; Oldest age class in VPA is 4+
Age 4 and 5+ indices applied to ages 4+

Age	1	2	3	4+
Input PR	.109	.334	.602	.896
F's in 89	.098	.302	.544	.809

Year	78	79	80	81	82	83	84	85	86	87	88	89
F 4+	.30	.31	.37	.31	.37	.45	.41	.45	.60	.76	.76	.81
Recr	4.1	4.2	4.0	4.0	4.7	5.1	5.3	5.9	6.2	6.2	6.7	--

F 4+ in 1989/F 4+ in 1978: 2.70
Recr in 1988/Recr in 1978: 1.63
F0.1/F in 1989: 0.24
FMAX/F in 1989: 0.49

App-Table VPA-7A. Coefficients of variation of estimated fishing mortality at rates at age

NORTH ATLANTIC

	YEAR											
AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.27	0.30	0.25	0.27	0.25	0.17	0.17	0.17	0.16	0.13	0.14	0.18
2	0.25	0.27	0.23	0.25	0.23	0.15	0.14	0.15	0.14	0.11	0.10	0.11
3	0.21	0.26	0.22	0.23	0.22	0.14	0.13	0.13	0.13	0.10	0.09	0.19
4	0.20	0.23	0.21	0.23	0.19	0.12	0.13	0.12	0.12	0.09	0.09	0.19
5	0.20	0.23	0.21	0.22	0.19	0.12	0.13	0.13	0.12	0.09	0.09	0.19

NORTHWEST ATLANTIC

	YEAR											
AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.27	0.25	0.22	0.23	0.21	0.19	0.18	0.17	0.17	0.15	0.15	0.17
2	0.24	0.24	0.18	0.18	0.21	0.17	0.15	0.15	0.14	0.12	0.11	0.18
3	0.19	0.22	0.17	0.18	0.17	0.18	0.14	0.14	0.12	0.12	0.10	0.17
4	0.19	0.18	0.16	0.18	0.16	0.14	0.14	0.12	0.12	0.11	0.10	0.17
5	0.20	0.18	0.17	0.18	0.16	0.14	0.14	0.12	0.12	0.11	0.10	0.16

APP-Table VPA-7B. Coefficients of variation of estimated abundance at age

NORTH ATLANTIC

	YEAR											
AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.17	0.16	0.16	0.17	0.15	0.15	0.15	0.14	0.13	0.13	0.12	0.12
2	0.15	0.14	0.13	0.13	0.13	0.12	0.12	0.12	0.11	0.10	0.11	0.10
3	0.14	0.13	0.12	0.11	0.12	0.11	0.10	0.10	0.10	0.10	0.10	0.10
4	0.13	0.13	0.12	0.11	0.11	0.11	0.11	0.09	0.09	0.10	0.10	0.09
5	0.14	0.12	0.12	0.10	0.11	0.09	0.10	0.10	0.09	0.10	0.10	0.09

NORTHWEST ATLANTIC

	YEAR											
AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.20	0.18	0.17	0.18	0.16	0.15	0.15	0.14	0.14	0.14	0.16	0.15
2	0.18	0.17	0.14	0.14	0.15	0.13	0.12	0.12	0.11	0.11	0.11	0.14
3	0.15	0.15	0.15	0.14	0.12	0.13	0.12	0.10	0.10	0.10	0.11	0.11
4	0.15	0.14	0.14	0.15	0.13	0.12	0.13	0.10	0.10	0.11	0.10	0.11
5	0.14	0.14	0.13	0.13	0.12	0.11	0.11	0.11	0.09	0.10	0.10	0.10

App-Table SWO-YPR-1. Results of yield-per-recruit calculation

North Atlantic Swordfish - age 5+

Age	F At Age	Mid Year Wt At Age	M At Age	SSB At Age
1	0.098	14.500	0.200	0.000
2	0.277	25.000	0.200	0.000
3	0.499	41.200	0.200	0.000
4	0.742	60.600	0.200	17.574
5	0.828	78.900	0.200	56.019
6	0.828	97.830	0.200	87.069
7	0.828	115.300	0.200	110.688
8	0.828	128.200	0.200	128.200
9	0.828	141.500	0.200	141.500
10	0.828	148.700	0.200	148.700
11	0.828	155.300	0.200	155.300
12	0.828	160.700	0.200	160.700
13	0.828	166.500	0.200	166.500
14	0.828	167.600	0.200	167.600
15	0.828	174.600	0.200	174.600
16	0.828	181.600	0.200	181.600
17	0.828	188.600	0.200	188.600
18	0.828	195.500	0.200	195.500
19	0.828	202.500	0.200	202.500
20	0.828	209.500	0.200	209.500

Full-F	Yield/Rec	SSB/Rec	(%)	Stock/Rec	Biomass/Rec	
0.000	0.00000	267.74765	100	5.41562	360.03882	
0.100	18.67185	138.72092	52	4.35809	222.17635	
0.200	24.54956	80.68719	30	3.77715	156.78094	
0.200	24.54957	80.68710	30	3.77715	156.78084	<---- F 0.1
0.300	26.41828	50.89153	19	3.41084	120.78165	
0.400	26.83734	33.99483	13	3.15609	98.60218	
0.410	26.83960	32.73299	12	3.13471	96.85545	<---- Fmax
0.500	26.68250	23.68684	9	2.96630	83.75209	
0.600	26.29502	17.04607	6	2.81774	73.17155	
0.700	25.82035	12.58476	5	2.69711	65.26525	
0.800	25.32372	9.48634	4	2.59639	59.13232	
0.828	25.18040	8.76945	3	2.57013	57.60246	<---- F Initial
0.900	24.83491	7.27546	3	2.51045	54.23046	
1.000	24.36708	5.66198	2	2.43583	50.21594	
1.100	23.92543	4.46185	2	2.37012	46.86141	
1.200	23.51128	3.55447	1	2.31157	44.01091	
1.300	23.12403	2.85863	1	2.25889	41.55418	
1.400	22.76226	2.31834	1	2.21111	39.41113	
1.500	22.42419	1.89420	1	2.16746	37.52226	
1.600	22.10795	1.55796	1	2.12734	35.84239	
1.700	21.81175	1.28906	0	2.09027	34.33669	
1.800	21.53388	1.07232	0	2.05585	32.97775	
1.900	21.27279	0.89637	0	2.02378	31.74381	

Northwest Atlantic Swordfish

Age	F At Age	Mid Year Wt At Age	M At Age	SSB At Age
1	0.111	14.500	0.200	0.000
2	0.313	25.000	0.200	0.000
3	0.545	41.200	0.200	0.000
4	0.750	60.600	0.200	17.574
5	0.816	78.900	0.200	56.019
6	0.816	97.830	0.200	87.069
7	0.816	115.300	0.200	110.688
8	0.816	128.200	0.200	128.200
9	0.816	141.500	0.200	141.500
10	0.816	148.700	0.200	148.700
11	0.816	155.300	0.200	155.300
12	0.816	160.700	0.200	160.700
13	0.816	166.500	0.200	166.500
14	0.816	167.600	0.200	167.600
15	0.816	174.600	0.200	174.600
16	0.816	181.600	0.200	181.600
17	0.816	188.600	0.200	188.600
18	0.816	195.500	0.200	195.500
19	0.816	202.500	0.200	202.500 &1
20	0.816	209.500	0.200	209.500

Full-F	Yield/Rec	SSB/Rec	(%)	Stock/Rec	Biomass/Rec	
0.000	0.00000	267.74765	100	5.41562	360.03882	
0.100	18.72579	136.58511	51	4.32409	219.30191	
0.196	24.34352	79.85076	30	3.74504	154.95523	<---- F 0.1
0.200	24.46809	78.22713	29	3.72644	153.04272	
0.300	26.20008	48.58770	18	3.35060	116.80560	
0.391	26.51095	33.12863	12	3.11015	96.24207	<---- Fmax
0.400	26.50871	31.96421	12	3.08992	94.61263	
0.500	26.26915	21.93689	8	2.89624	79.83640	
0.600	25.81769	15.55102	6	2.74507	69.36383	
0.700	25.29498	11.31092	4	2.62269	61.57712	
0.800	24.76247	8.40085	3	2.52081	55.56522	
0.816	24.67847	8.02416	3	2.50603	54.72846	<---- F Initial
0.900	24.24703	6.34907	2	2.43413	50.78131	
1.000	23.75973	4.86964	2	2.35909	46.87970	
1.100	23.30415	3.78245	1	2.29319	43.63222	
1.200	22.88043	2.97040	1	2.23463	40.88283	
1.300	22.48704	2.35520	1	2.18209	38.52139	
1.400	22.12186	1.88332	1	2.13454	36.46811	
1.500	21.78256	1.51738	1	2.09121	34.66383	
1.600	21.46685	1.23080	0	2.05148	33.06373	
1.700	21.17258	1.00440	0	2.01484	31.63331	
1.800	20.89777	0.82412	0	1.98091	30.34550	
1.900	20.64065	0.67955	0	1.94934	29.17882	

Northeast Atlantic Swordfish

Age	F At Age	Mid Year Wt At Age	M At Age	SSB At Age
1	0.081	14.500	0.200	0.000
2	0.198	25.900	0.200	0.000
3	0.374	43.300	0.200	0.000
4	0.609	63.300	0.200	18.357
5	0.715	81.200	0.200	57.652
6	0.715	101.700	0.200	90.513
7	0.715	121.000	0.200	116.160
8	0.715	135.600	0.200	135.600
9	0.715	149.700	0.200	149.700
10	0.715	159.800	0.200	159.800
11	0.715	165.300	0.200	165.300
12	0.715	173.400	0.200	173.400
13	0.715	176.700	0.200	176.700
14	0.715	180.600	0.200	180.600
15	0.715	187.000	0.200	187.000
16	0.715	193.500	0.200	193.500
17	0.715	199.900	0.200	199.900
18	0.715	206.400	0.200	206.400
19	0.715	212.800	0.200	212.800
20	0.715	219.200	0.200	219.200

Full-F	Yield/Rec	SSB/Rec	(%)	Stock/Rec	Biomass/Rec	
0.000	0.00000	282.89694	100	5.41562	378.56110	
0.100	19.51148	148.81169	53	4.39620	236.11243	
0.200	25.75094	87.87668	31	3.83344	168.12640	
0.204	25.88520	86.20647	30	3.81617	166.19740	<---- F 0.1
0.300	27.79901	56.28948	20	3.47708	130.52998	
0.400	28.31916	38.20071	14	3.22818	107.26846	
0.424	28.33396	35.04367	12	3.17887	102.97623	<---- Fmax
0.500	28.22598	27.05063	10	3.04191	91.62492	
0.600	27.87704	19.78789	7	2.89543	80.42625	
0.700	27.42567	14.85180	5	2.77593	72.01653	
0.715	27.34929	14.21453	5	2.75876	70.86127	<---- F Initial
0.800	26.94146	11.38189	4	2.67570	65.45982	
0.900	26.45685	8.87473	3	2.58979	60.19245	
1.000	25.98685	7.02135	2	2.51486	55.85686	
1.100	25.53798	5.62457	2	2.44859	52.21628	
1.200	25.11256	4.55435	2	2.38930	49.10814	
1.300	24.71079	3.72250	1	2.33575	46.41730	
1.400	24.33189	3.06776	1	2.28699	44.06007	
1.500	23.97460	2.54671	1	2.24229	41.97408	
1.600	23.63749	2.12794	1	2.20106	40.11195	
1.700	23.31912	1.78842	1	2.16285	38.43700	
1.800	23.01809	1.51096	1	2.12726	36.92038	
1.900	22.73310	1.28261	0	2.09400	35.53907	

Total Atlantic Swordfish

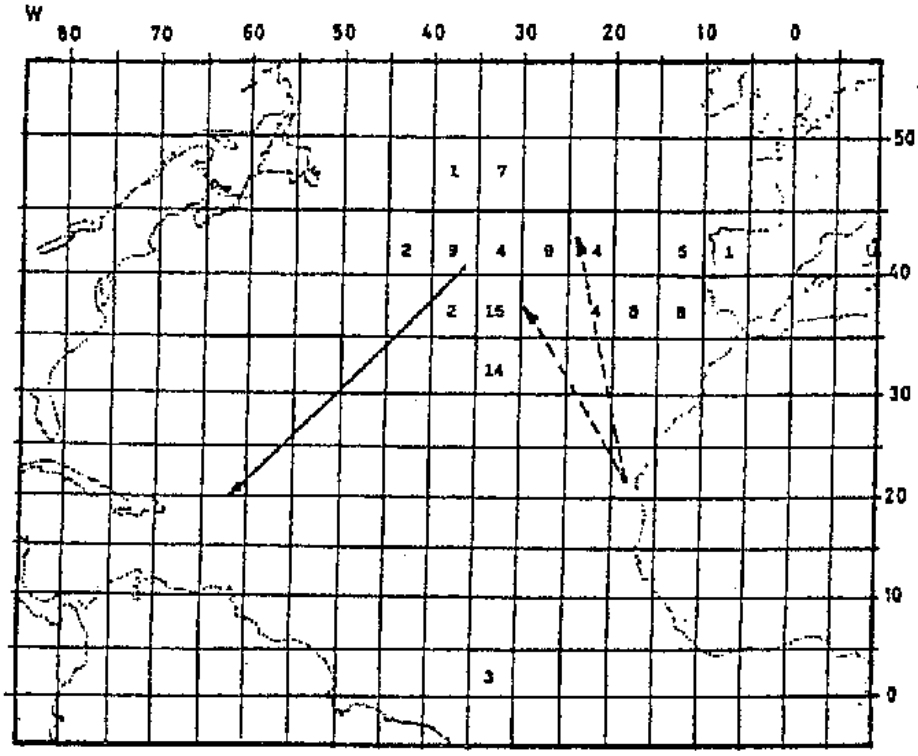
Age	F At Age	Mid Year Wt At Age	M At Age	SSB At Age
1	0.089	14.700	0.200	0.000
2	0.267	25.400	0.200	0.000
3	0.507	41.200	0.200	0.000
4	0.786	60.700	0.200	17.603
5	0.986	78.700	0.200	55.877
6	0.986	98.100	0.200	87.309
7	0.986	115.000	0.200	110.400
8	0.986	128.900	0.200	128.900
9	0.986	142.700	0.200	142.700
10	0.986	149.400	0.200	149.400
11	0.986	155.900	0.200	155.900
12	0.986	161.600	0.200	161.600
13	0.986	168.300	0.200	168.300
14	0.986	168.600	0.200	168.600
15	0.986	175.800	0.200	175.800
16	0.986	182.900	0.200	182.900
17	0.986	190.100	0.200	190.100
18	0.986	197.200	0.200	197.200
19	0.986	204.400	0.200	204.400
20	0.986	211.500	0.200	211.500

Full-F	Yield/Rec	SSB/Rec	(%)	Stock/Rec	Biomass/Rec	
0.000	0.00000	268.88519	100	5.41562	361.67279	
0.100	18.58204	143.07561	53	4.41550	228.18707	
0.200	24.67161	85.46256	32	3.86251	164.07138	
0.209	24.96514	81.94867	30	3.82472	160.02119	<---- F 0.1
0.300	26.76111	55.34749	21	3.51202	128.38998	
0.400	27.36467	37.95287	14	3.26710	106.18472	
0.445	27.40927	32.48997	12	3.17865	98.76538	<---- Fmax
0.500	27.35691	27.13848	10	3.08378	91.17631	
0.600	27.08554	20.03520	7	2.93962	80.38736	
0.700	26.70261	15.16812	6	2.82205	72.25776	
0.800	26.27884	11.71975	4	2.72347	65.90237	
0.900	25.84816	9.20919	3	2.63902	60.78596	
0.986	25.48085	7.55408	3	2.57447	57.07454	<---- F Initial
1.000	25.42691	7.33966	3	2.56542	56.56778	
1.100	25.02271	5.92073	2	2.50038	53.02142	
1.200	24.63869	4.82610	2	2.44224	49.99095	
1.300	24.27566	3.96968	1	2.38978	47.36562	
1.400	23.93329	3.29134	1	2.34205	45.06467	
1.500	23.61065	2.74819	1	2.29833	43.02782	
1.600	23.30657	2.30910	1	2.25806	41.20917	
1.700	23.01978	1.95107	1	2.22075	39.57311	
1.800	22.74904	1.65689	1	2.18605	38.09158	
1.900	22.49314	1.41349	1	2.15363	36.74216	

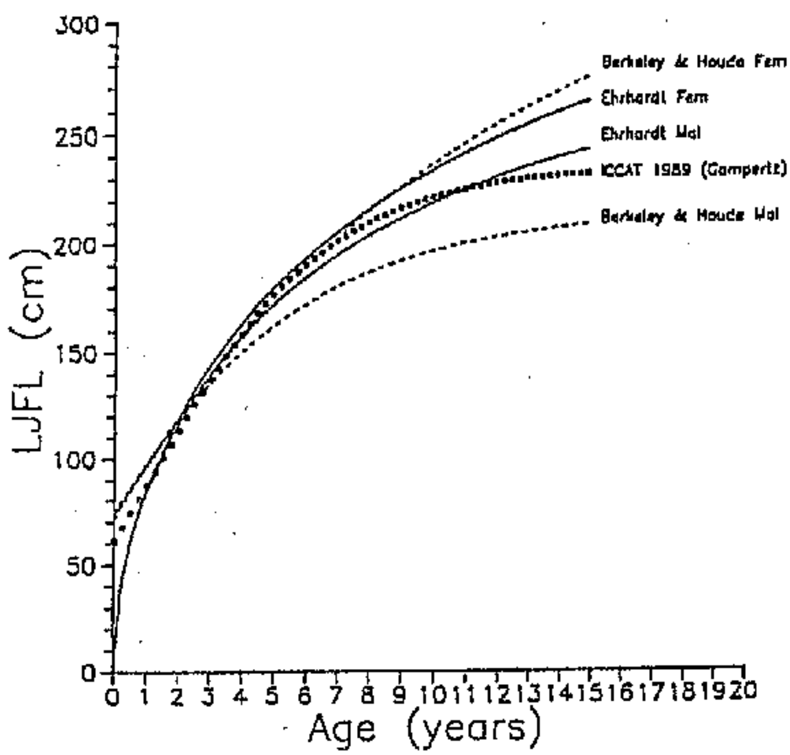
North Atlantic Swordfish - age 9+

Age	F At Age	Mid Year Wt At Age	M At Age	SSB At Age
1	0.110	14.500	0.200	0.000
2	0.274	25.000	0.200	0.000
3	0.500	41.200	0.200	0.000
4	0.725	60.600	0.200	17.574
5	1.007	78.900	0.200	56.019
6	1.007	97.830	0.200	87.069
7	1.007	115.300	0.200	110.688
8	1.007	128.200	0.200	128.200
9	1.007	141.500	0.200	141.500
10	1.007	148.700	0.200	148.700
11	1.007	155.300	0.200	155.300
12	1.007	160.700	0.200	160.700
13	1.007	166.500	0.200	166.500
14	1.007	167.600	0.200	167.600
15	1.007	174.600	0.200	174.600
16	1.007	181.600	0.200	181.600
17	1.007	188.600	0.200	188.600
18	1.007	195.500	0.200	195.500
19	1.007	202.500	0.200	202.500
20	1.007	209.500	0.200	209.500

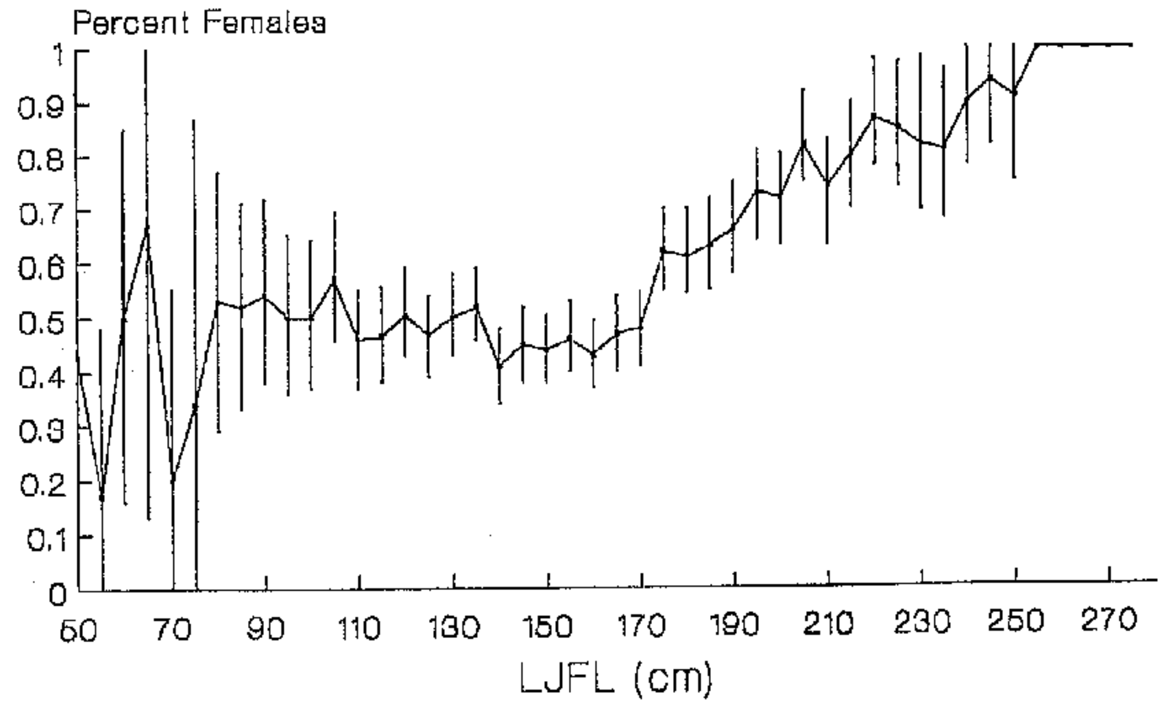
Full-F	Yield/Rec	SSB/Rec	(%)	Stock/Rec	Biomass/Rec	
0.000	0.00000	267.74765	100	5.41562	360.03882	
0.100	18.41963	143.64610	54	4.42324	228.33736	
0.200	24.49862	86.47571	32	3.87105	164.69312	
0.210	24.82373	82.59988	31	3.82906	160.22275	<---- F 0.1
0.300	26.59550	56.41705	21	3.51879	129.06487	
0.400	27.20061	38.95433	15	3.27106	106.76684	
0.443	27.24322	33.66814	13	3.18495	99.59344	<---- Fmax
0.500	27.18618	28.03522	10	3.08449	91.61510	
0.600	26.90166	20.82245	8	2.93696	80.66941	
0.700	26.50124	15.85286	6	2.81603	72.38513	
0.800	26.05728	12.31274	5	2.71419	65.88345	
0.900	25.60500	9.72180	4	2.62661	60.63161	
1.000	25.16160	7.78260	3	2.55003	56.28940	
1.007	25.12684	7.64951	3	2.54432	55.97431	<---- F Initial
1.100	24.73529	6.30360	2	2.48218	52.63014	
1.200	24.32956	5.15730	2	2.42138	49.49726	
1.300	23.94548	4.25647	2	2.36642	46.77923	
1.400	23.58287	3.53994	1	2.31635	44.39442	
1.500	23.24088	2.96394	1	2.27044	42.28176	
1.600	22.91836	2.49655	1	2.22809	40.39455	
1.700	22.61408	2.11413	1	2.18885	38.69653	
1.800	22.32676	1.79889	1	2.15233	37.15896	
1.900	22.05518	1.53729	1	2.11821	35.75886	



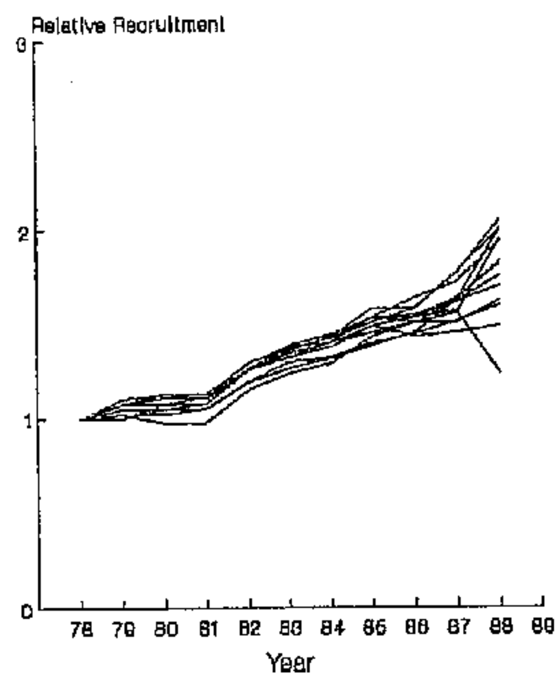
App-Fig. STRU 1. Number of swordfish released by the commercial fleet (Spain) from 1984 to 1990, by 5^0x5^0 squares and rectilinear diagram of hypothetical movement of a single recapture (solid line), and movements reported previously in the east Atlantic (dotted line) (SCRS/90/41).



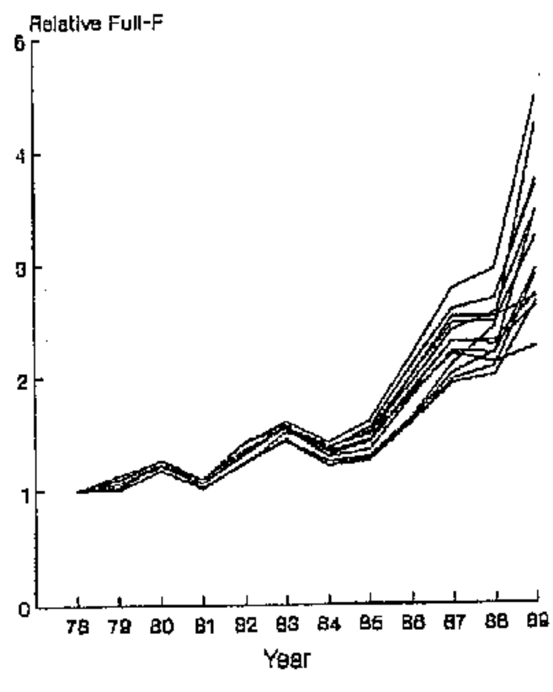
APP-Fig. PARM 1. Length-age relationships derived from Berkeley and Houde models (sex-specific), from Ehrhardt models (sex-specific) and from the Gompertz model (sexes pooled). The Ehrhardt and Berkeley-Houde models were derived from the same data set of anal fin spine sections; whereas, the Gompertz model was derived from mark-recapture data (SCRS/90/26).



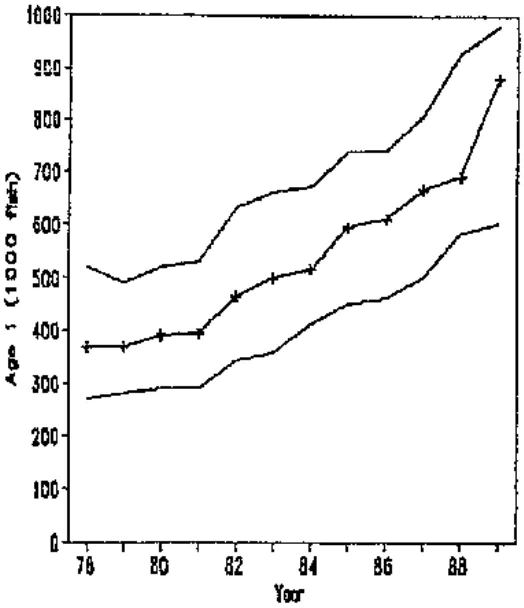
APP-Fig. PARM 2. Estimated percent females by 5 cm intervals based on 3877 sex-at- size observations collected in the North Atlantic between 1978 and 1990. Vertical bars represent approximate 95% confidence limits.



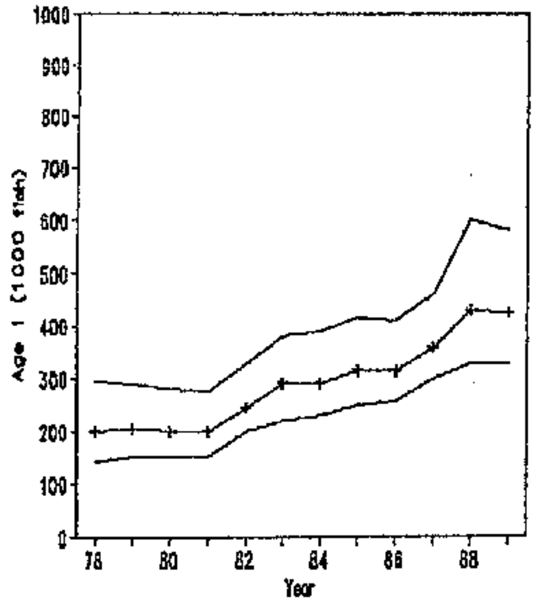
APP-Fig. VPA 1. VPA sensitivity analysis results for North Atlantic stock hypothesis. Recruitment trends expressed relative to 1978.



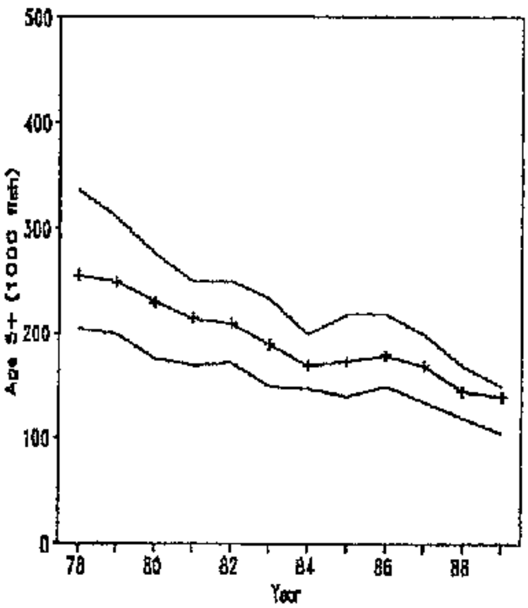
APP-Fig. VPA 2. VPA sensitivity analysis results for the North Atlantic stock hypothesis. Full-F (ages 5+) trends expressed relative to 1978.



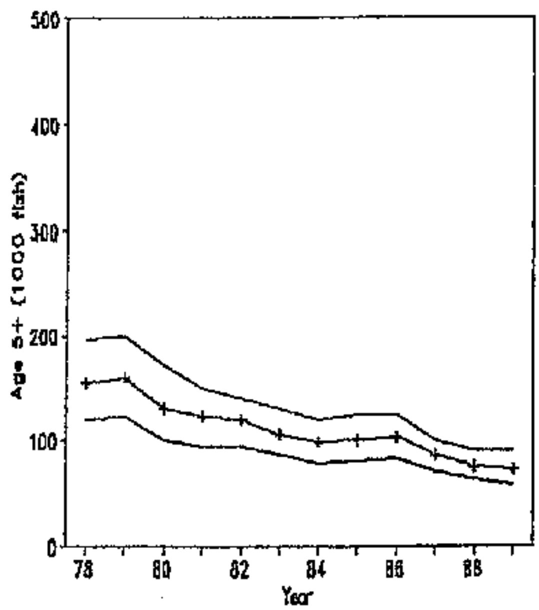
APP-Fig. VPA 3-A. Recruitment estimates from the simulations. Shown are the median (central) and the approximate 95% confidence region for the North Atlantic stock hypothesis.



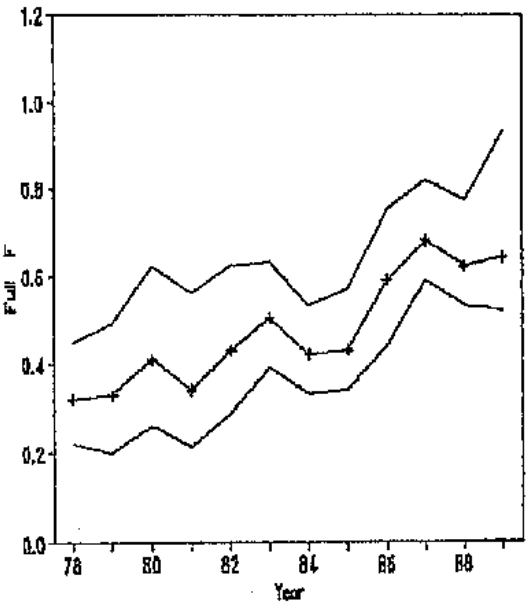
APP-Fig. VPA 4-A. Recruitment estimates from the simulations. Shown are the median (central) and the approximate 95% confidence region for the Northwest Atlantic stock hypothesis.



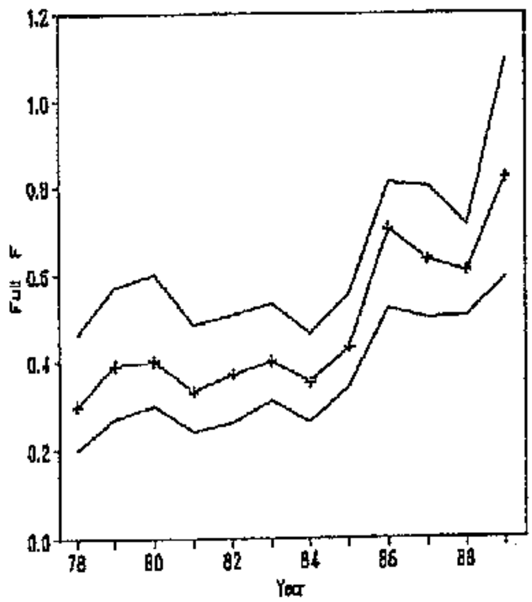
APP-Fig. VPA 3-B. Age 5+ stock estimates from the simulations. Shown are the median (central) and the approximate 95% confidence region for the North Atlantic stock hypothesis.



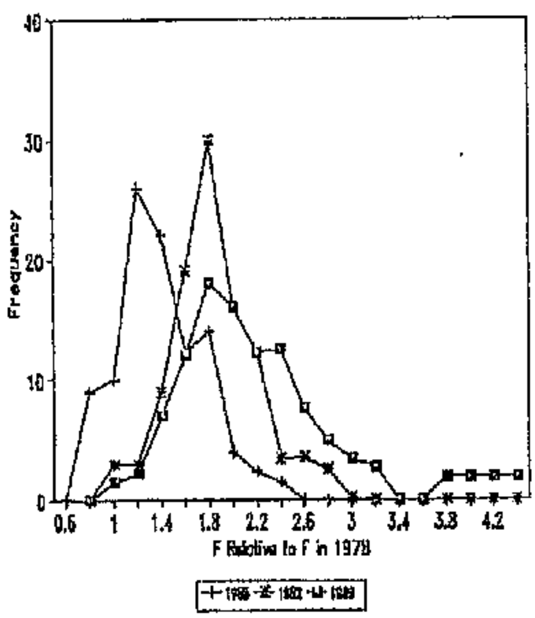
APP-Fig. VPA 4-B. Age 5+ stock estimates from the simulations. Shown are the median (central) and the approximate 95% confidence region for the Northwest Atlantic stock hypothesis.



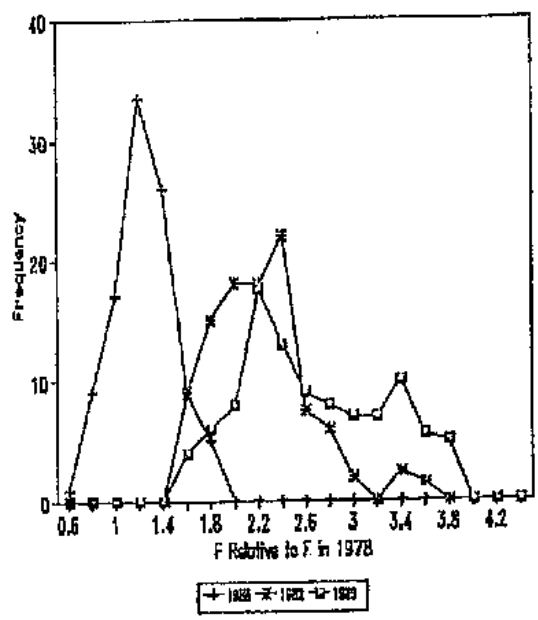
APP-Fig. VPA 5-A. Estimates of full-F from simulations. Shown are the median and approximate 95% confidence region for the North Atlantic hypothesis.



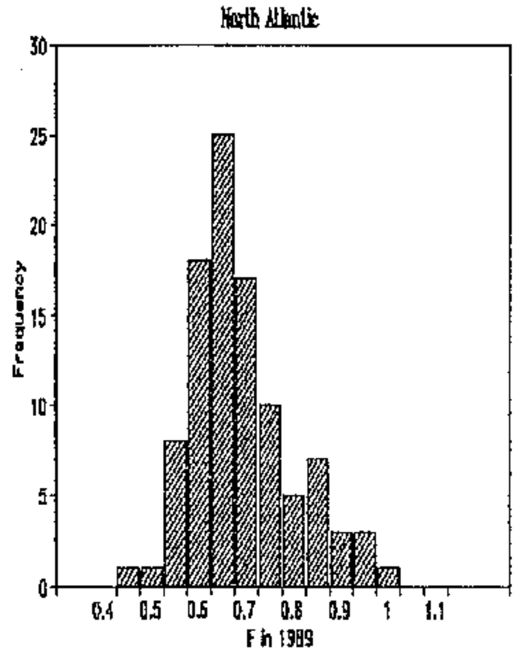
APP-Fig. VPA 6-A. Estimates of full-F from simulations. Shown are the median and approximate 95% confidence region for the Northwest Atlantic hypothesis.



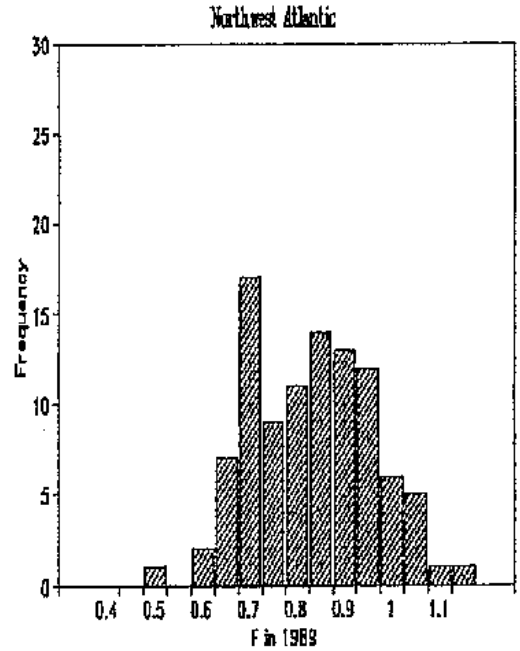
APP-Fig. VPA 5-B. Distribution of estimates of full-relative to F in 1978 from simulations for the North Atlantic stock hypothesis.



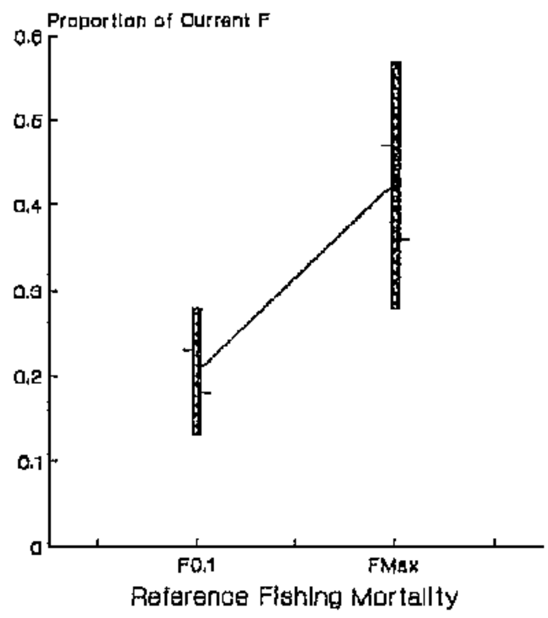
APP-Fig. VPA 6-B. Distribution of estimates of full-relative to F in 1978 from simulations for the Northwest Atlantic stock hypothesis.



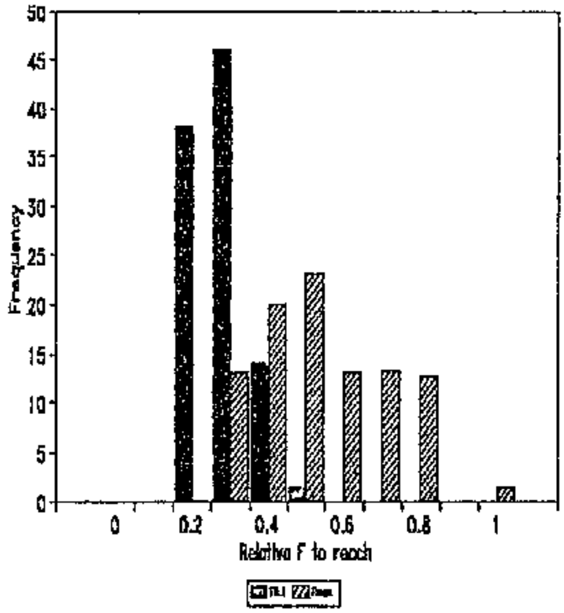
APP-Fig. VPA 7. Distribution of estimates of fully recruited F (ages 5+) from simulations for the North Atlantic stock hypothesis.



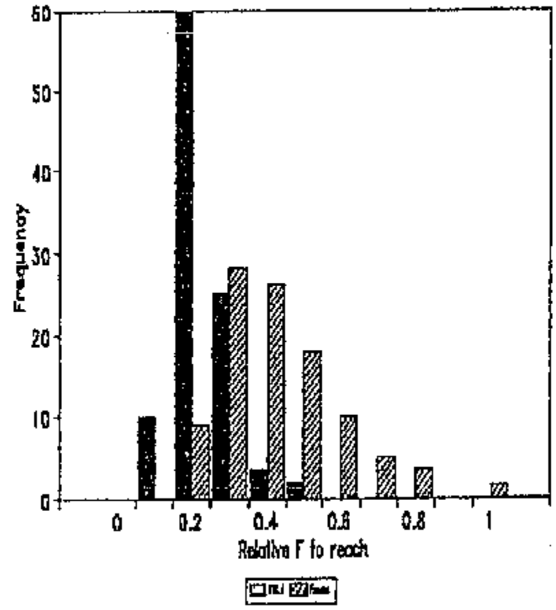
APP-Fig. VPA 8. Distribution of estimates of fully recruited F (ages 5+) from simulations for the Northwest Atlantic stock hypothesis.



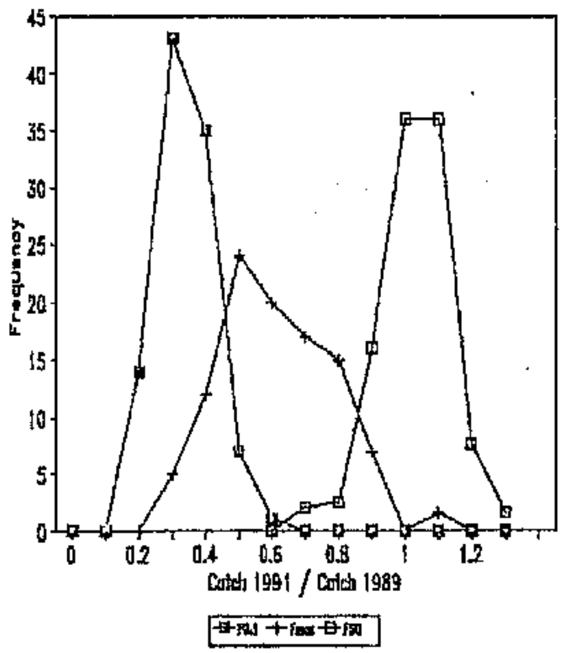
APP-Fig. YPR 1. Ratios of $F_{0.1}$ and F_{max} relative to full-F estimated from the North Atlantic stock hypothesis sensitivity analyses. The range (max, min), 25th and 75th percentiles, and mean values are shown.



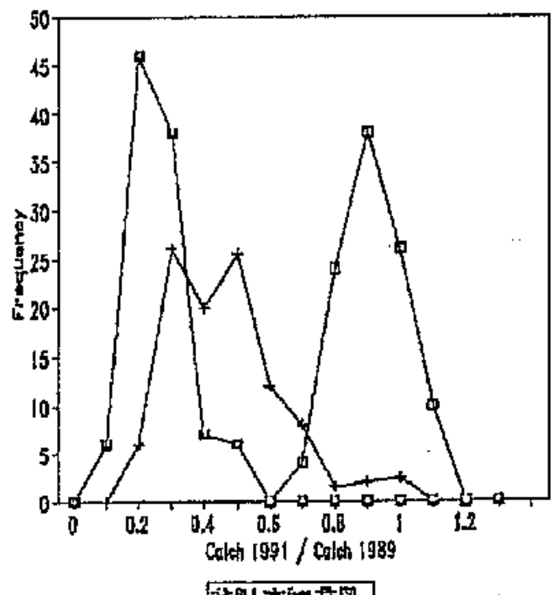
APP-Fig. YPR 2-A.
Distribution of $F_{0.1}$ and F_{max} expressed relative to the 1989 estimates of full-F from simulations for the North Atlantic stock hypothesis.



APP-Fig. YPR 3-A.
Distribution of $F_{0.1}$ and F_{max} expressed relative to the 1989 estimates of full-F from simulations for the Northwest Atlantic stock hypothesis.



APP-Fig. YPR 2-B.
Distribution of expected catches relative to catch in 1989 from simulations under three F-strategies implemented in 1991. F_{sq} is the status quo strategy. Catches expected under the F_{max} and $F_{0.1}$ strategies are also shown for the North Atlantic stock hypothesis.



APP-Fig. YPR 3-B.
Distribution of expected catches relative to catch in 1989 from simulations under three F-strategies implemented in 1991. F_{sq} is the status quo strategy. Catches expected under the F_{max} and $F_{0.1}$ strategies are also shown for the Northwest Atlantic stock hypothesis.

Addendum 1 to Appendix 6 to Annex 10

List of Participants at the Swordfish Stock Assessment Session

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AN OPEN LETTER[1]

FROM: Dr. A. Fonteneau, French Tuna Scientist, Orstom
TO: The SCRS Chairman and the Rapporteur of the Swordfish Assessment Session

Dear Chairmen:

After reading the Report of the Swordfish Assessment Session released by ICCAT, I have some serious uncertainties about most of its conclusions, which I would like to transmit to you in this letter.

Among other serious problems, I can see the following:

1) No use of a production model: This model is clearly a good tool for swordfish, at least to help to understand the relative trend of catch and efforts in conjunction with the analytical model. The swordfish fishery provides 40 years of fishery data, in a wide range of fishing efforts and with a dominance of a single gear, longline, which can be perfectly analyzed by a production model, as most of the catches in weight are from a limited number of ages (see my Table 1) which will correspond to a k factor of only 5 to 6 in the estimation of equilibrium. (Catches between 3 and 8 years correspond to an average of 80 percent of the 1978-89 catches.)

2) Sex ratio and VPA: an unsolved serious problem.

3) Trend of increased recruitment: This conclusion is only the working group hypothesis that the CPUE of juveniles = abundance.

   The alternative hypothesis, which is much more realistic for me is that this increased CPUE is only due to an increased catchability of small fishes (which can be explained by several reasons ...).

   This realistic hypothesis should have been completely analyzed by the Working Group.

4) Partial recruitment and F/age: The fishing pattern and 1989 exploitation rate accepted for the most recent year, is an hypothesis which is dubious for me. This very high exploitation rate is for me a completely unrealistic hypothesis for swordfish, taking into account the large fishing area, the cryptic ecology of swordfish, its ocean wide and depth dispersion, and the relatively low efficiency of the longline gear. The working group fishing pattern could be valid for cod and trawl fishery, not for North Atlantic swordfish!

[1] Submitted in English by A. Fonteneau.

It is for me an unrealistic hypothesis to accept that 63 percent of the Atlantic swordfish population older than 5 years is presently caught each year by the longline fisheries. These high exploitation rates may probably be observed locally in some areas, but not in the entire North Atlantic.

5) "Pseudo" confidence intervals or so-called sensitivity analysis given for VPA results:

Many results from the VPA are given with so-called confidence intervals or based on so-called sensitivity analysis. Those intervals are for me completely misleading as they are based on a set of dubious hypotheses and do not correspond to the real uncertainties in the stock assessment. For instance, the confidence intervals calculated on the recruitment trends would indicate that there is no doubt on the increasing trend of the recruitment. This conclusion is valid only in the dubious (for me) hypothesis of constant catchability of juveniles. The same doubts apply for all the confidence intervals given in the report: The true value of the estimated parameters of their trends may be completely outside the so-called "confidence interval" (that I will subsequently call pseudo confidence intervals).

As a consequence of those problems which may drive all the analyses to erroneous or dubious conclusions, I propose for your consideration another type of VPA results based on a more realistic hypothesis:

An example of coherent production model (Figure 1)

This figure is based on Japanese longline CPUE until 1987, with an average of Spanish (age 4+ only) + Japanese CPUE since 1982. A k = 5 and k = 8 were used with an M = 1.0 (exponential model).

Based on this figure, the production model provides for me a good understanding of the recent trends of the fisheries and of its present situation. The fishery has clearly been in relative equilibrium until the early 1980's. Effort has been growing very rapidly since 1985. The present caches would be in excess of the equilibrium catches, the present effort being slightly greater than F_{opt}.

An alternate example of a more coherent VPA analysis (Figure 2)

Data: Catch-at-age table North Atlantic swordfish

Hypotheses:

- M = 2
- Recruitment: stable between 1970 and 1989, at the level estimated by the working group for the most recent year (760,000 individuals estimated for 1989).
- Catch-at-age table from 1966 to 1977, similar to the catch at age observed during the average period 1978-1980.

- No hypothesis done on partial recruitment or on constant catchability of any age (no tuning done.)

This very simple, but for me, more robust hypothesis gives the following results:

Table 2: Fishing mortalities
Table 3: Underlying populations in numbers
Table 4: Underlying populations in weight

My present results have only one common feature with the working group estimates: the decreasing trend in the adult stock which is estimated to be in my VPA, for ages 5 to 9 a biomass decreasing from 88,000 tons in 1978 to 27,000 tons in 1989. This trend is in good agreement with adult CPUEs. However, the adult population size estimated in my analysis is much greater than the working group estimates.

Other results are completely divergent:

My fishing mortalities are dome-shaped, with during 1989 a maximum level of F between 3 and 7 years: average F = .53 (Figure 3).

My fishing pattern of the fisheries has been permanently changed, with a spectacular increase of fishing mortalities on the young ages: the average F ages 2 to 4 is estimated to be at .10 in 1980 and .35 in 1989. Those dramatic changes in fishing patterns and of age-specific catchabilities are for me a major characteristic of most tuna fisheries. Unfortunately, the tuned VPA has some difficulties to handle this variability ...

My increase of fishing mortalities is spectacular during recent years: average F = .13 in 1985, and reaching .28 in 1989.

This present set of results is perfectly consistent with the fishery data, is based on a single but probably robust hypothesis of recruitment stability. My present results are preliminary (other recruitment levels should be compared), but, at least for me and possibly for other scientists, they may be more realistic than the working group hypothesis and subsequent results.

A more realistic yield-per-recruit analysis (Figure 4)

A subsequent yield-per-recruit analysis has also been conducted on my VPA results for the years 1985 and 1989. The results of this model are given in Figure 4:

This figure indicates that:

1) The fishery was during 1985 near the F 0.1 level. During this year no yield per recruit gain could be expected from a size limit.

2) The 1989 fishery would be 10 percent above the F max. Significant gain of Y/R, 10 percent, would result from avoiding to catch swordfish less than 4 years (increasing also the spawning biomass).

On the contrary, the 1989 Y/R estimated by the working group seems to me ridiculous (Figure 5).

I cannot, comparing the production model results and the working group Y/R analysis, understand how the swordfish fishery was already fully exploited in 1978 and how it can presently be at a level three times the F Max!

Projections

The working group projections done for the future of the swordfish fisheries are really dramatic, even if the recruitment stays at a high level! I am not personally very frightened by those projections. The projections done under my 1989 stock sizes estimate and F per age are in fact much less dramatic and leave some hope for reasonable catches to a limited fishery.

Conclusion

This present analysis provides estimates of the swordfish stock status which seems (at least to me) much more realistic and which are completely different from the working group results. I think subsequently that the working group report should be considered, (as previous similar SCRS analysis on swordfish) to be extremely dubious.

I subsequently recommend to you to be extremely careful before giving any formal approval of the SCRS to this swordfish report.

However, thinking of the management of the resource, all the data set indicates that the recent dramatic increase of fishing efforts and the spectacular increase of juvenile catches may be dangerous in the short and average terms for a long living and slow growing species such as swordfish.

In that sense, the SCRS and ICCAT should probably take an hoc measures to control this fishery and avoid the overfishing of this stock. An important point to remember for this species is that, in the case of a fast increase of juvenile catches, the equilibrium consequences in the spawning stock and fishery yields, will necessarily take several years before being visible. This is easily demonstrated by simulation models, and this conclusion is a fundamental fact, which is relatively independent of any VPA biases; this present disequilibrium of the stock should be better explored by SCRS in its recommendations to the Commission.

I hope that this letter will be helpful to your committee.

Friendly yours,

A. Fonteneau

Table 1. Catches at age in weight for North Atlantic swordfish and average of 1987-1989

AGES (YEARS)	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	AVERAGE 78-89
1	8	17	48	43	54	60	75	72	194	285	310	110	60
2	160	260	647	369	509	731	713	816	1146	1831	2129	1807	559
3	794	1128	1896	1435	1279	2233	2120	2390	3757	4803	5420	4634	1671
4	2193	2023	3009	2450	2617	3349	3315	3976	5192	6494	6196	5640	2584
5	2794	2526	3091	2744	3155	3823	3430	4078	5201	5755	5078	4743	2688
6	2545	2231	2525	2053	2630	2987	2470	2650	3420	3704	3089	2762	2033
7	1571	1648	1708	1298	1525	1773	1422	1479	1863	2095	1522	1528	1251
8	1109	1151	1194	932	991	1071	810	924	1030	1014	977	926	815
9	602	662	662	584	701	567	446	501	593	554	509	480	459
10	490	521	481	362	437	387	296	336	426	329	304	327	329
11	318	319	299	241	260	214	171	181	248	264	171	171	203
12	173	237	185	149	195	141	119	108	162	172	125	121	132
13	136	137	117	103	103	87	68	72	107	100	76	80	84
14	120	143	83	86	80	62	52	48	70	62	58	62	70
15	89	114	70	66	55	62	50	40	56	57	41	29	55
16+	993	1137	971	904	1177	724	541	538	794	755	489	618	680
TOTAL	14095	14253	16987	13818	15767	18270	16097	18208	24259	28275	26493	24038	

Table 2. Population size of North Atlantic swordfish, estimated under the hypothesis of M=.2 and with constant recruitment at 760,000 individuals

AGES (YEARS)	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	694029	693717	692675	692835	692478	692262	691757	691847	687767	684725	683885	690595
2	564610	562933	554869	558554	556101	551137	551124	548251	541888	521270	510105	515234
3	449153	446201	433892	426381	435923	420025	413625	410618	389539	365439	329063	325407
4	344037	343263	329301	316213	313248	316503	294286	284519	268811	226382	199345	168901
5	261256	250874	247763	231966	222317	214401	214806	192545	172585	147948	109886	91897
6	199738	188043	179406	176414	162267	150416	143319	144662	119147	95872	76717	50722
7	156393	145749	137216	130717	129234	114207	104608	100653	99331	74385	56962	43697
8	123003	117957	108806	102623	98533	96202	84047	76987	73137	70776	49754	37668
9	98135	94801	90535	83180	78552	75481	73738	64441	57976	54621	52899	35928

Table 3. Fishing mortalities under the same hypothesis

AGES (YEARS)	78	79	80	81	82	83	84	85	86	87	88	89
1	0.001	0.002	0.005	0.004	0.005	0.006	0.007	0.007	0.019	0.029	0.031	0.011
2	0.011	0.018	0.047	0.026	0.037	0.053	0.052	0.060	0.085	0.141	0.167	0.140
3	0.043	0.061	0.106	0.082	0.071	0.129	0.124	0.141	0.234	0.319	0.400	0.346
4	0.105	0.097	0.151	0.128	0.138	0.175	0.186	0.231	0.319	0.473	0.513	0.551
5	0.136	0.128	0.158	0.150	0.180	0.226	0.202	0.268	0.382	0.493	0.586	0.654
6	0.130	0.121	0.144	0.119	0.166	0.203	0.176	0.187	0.294	0.395	0.412	0.557
7	0.087	0.098	0.108	0.086	0.103	0.135	0.118	0.128	0.163	0.245	0.232	0.304
8	0.070	0.076	0.086	0.071	0.079	0.087	0.075	0.094	0.110	0.112	0.153	0.192
9	0.044	0.050	0.052	0.050	0.063	0.053	0.043	0.055	0.072	0.072	0.068	0.095

Table 4. Biomasses by age calculated under the same hypothesis

	YEARS											
AGES	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	10063	10059	10044	10046	10041	10038	10030	10032	9973	9929	9916	10014
2	14115	14073	13872	13964	13903	13778	13778	13706	13547	13032	12753	12881
3	18505	18383	17876	17567	17960	17305	17041	16917	16049	15056	13557	13407
4	20849	20802	19956	19163	18983	19180	17834	17242	16290	13719	12080	10235
5	20613	19794	19549	18302	17541	16916	16948	15192	13617	11673	8670	7251
6	19534	18391	17546	17253	15870	14711	14017	14148	11653	9376	7503	4961
7	17985	16761	15780	15032	14862	13134	12030	11575	11423	8554	6551	5025
8	15744	15098	13927	13136	12612	12314	10758	9854	9362	9059	6369	4822
9	13837	13367	12765	11728	11076	10643	10397	9086	8175	7702	7459	5066
1-4	63532	63317	61748	60739	60886	60301	58684	57897	55859	51735	48307	46537
5-9	87714	83411	79567	75452	71961	67717	64150	59855	54229	46365	36551	27124
TOTAL	151247	146729	141314	136191	132847	128019	122833	117753	110088	98100	84858	73660

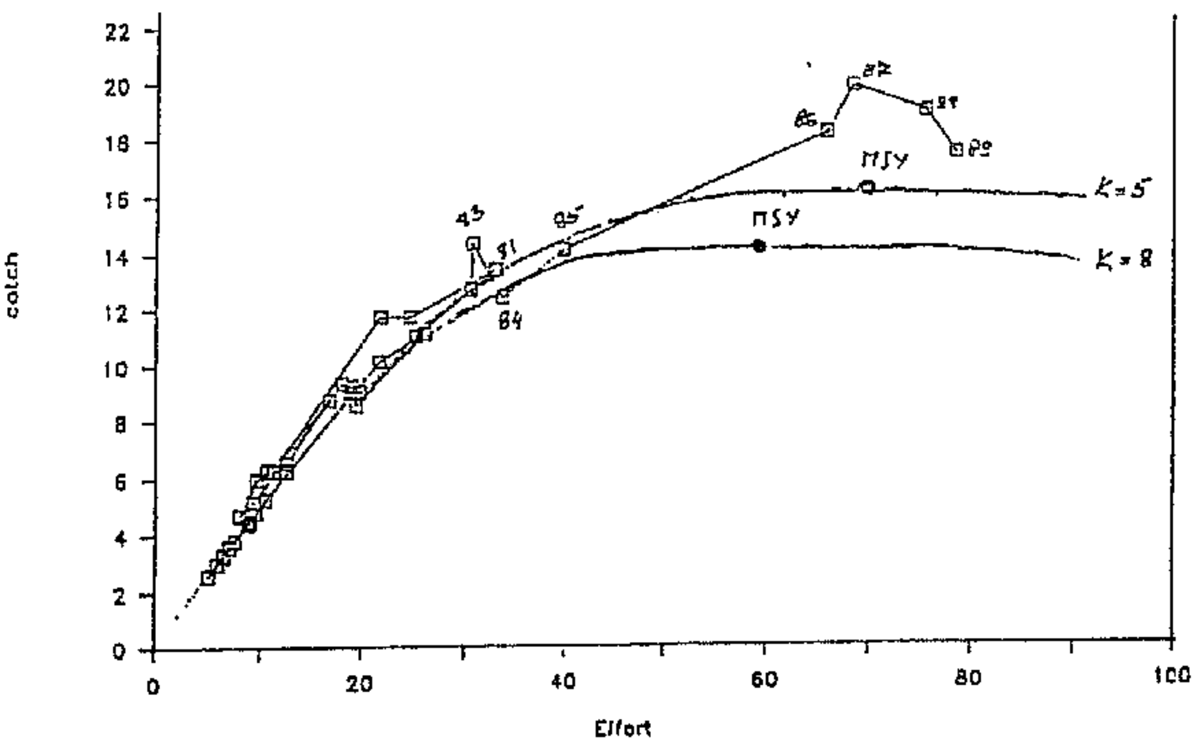

Figure 1.

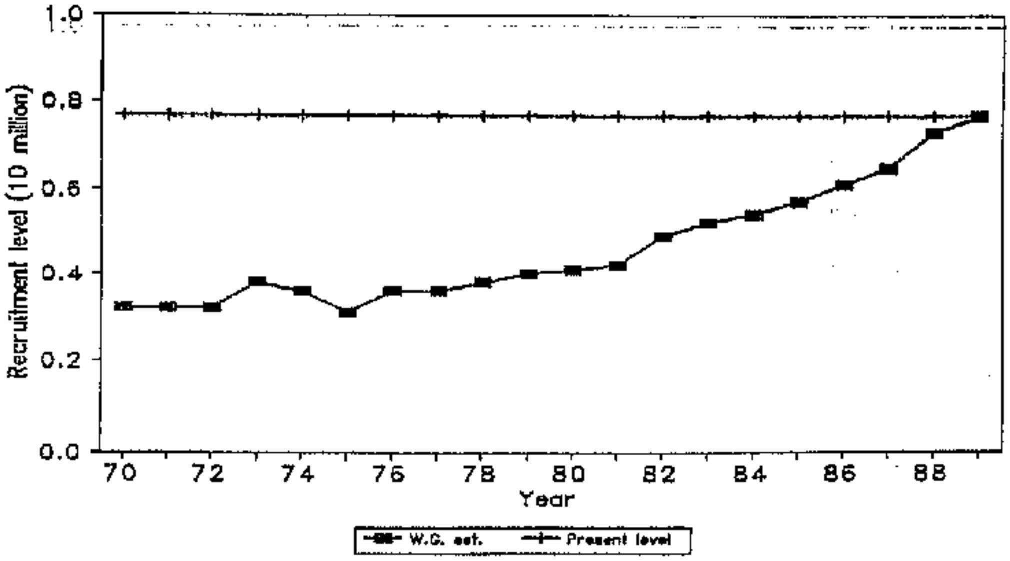

Figure 2.

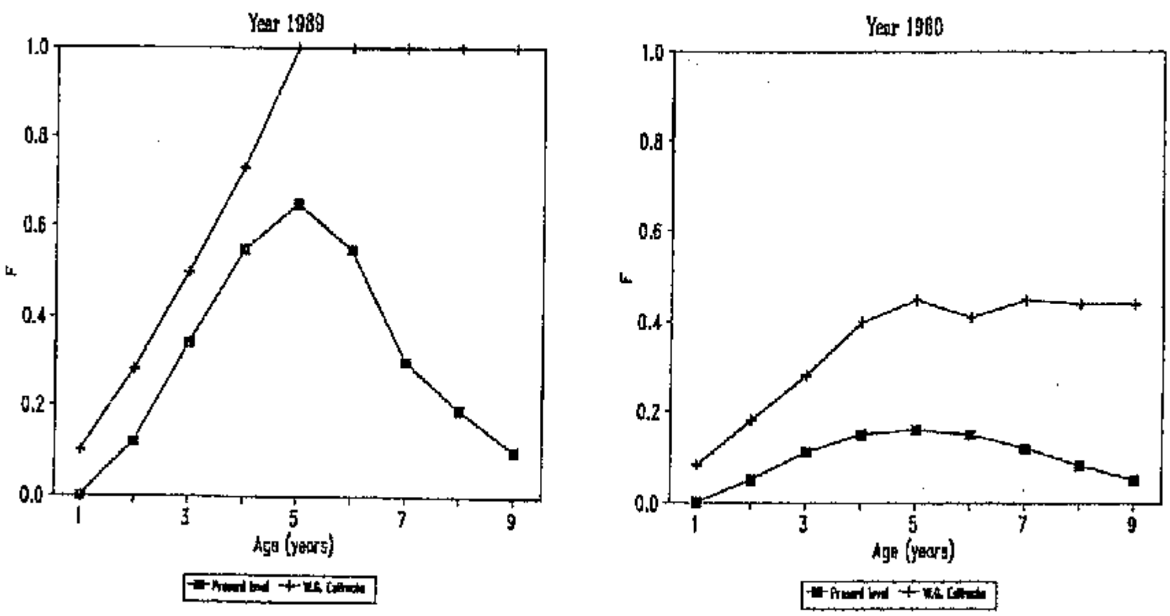

Figure 3.

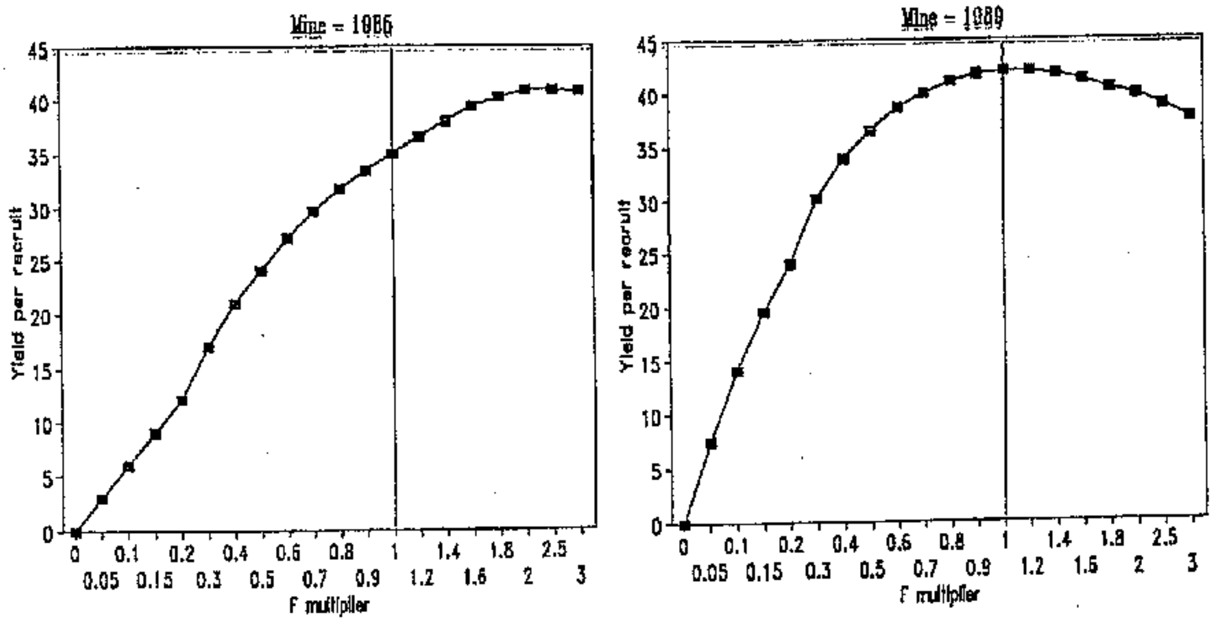

Figure 4.

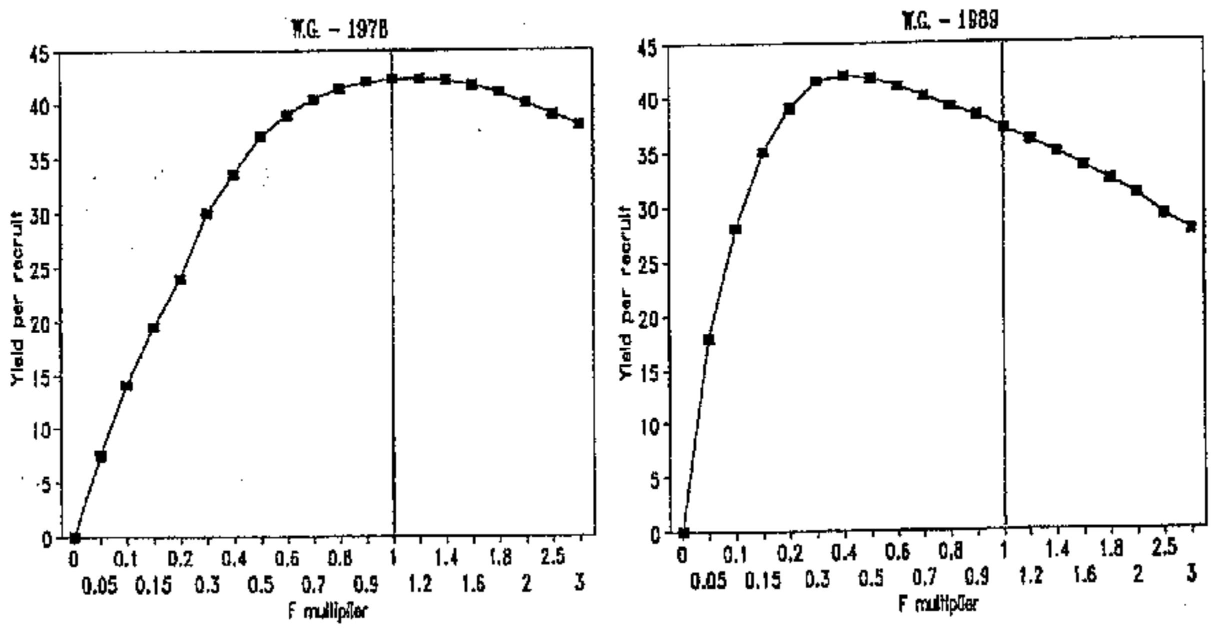

Figure 5.

REPORT OF THE SUB-COMMITTEE ON STATISTICS

1. OPENING OF THE MEETING

The meeting of the Sub-Committee on Statistics was held in Madrid, Spain, at the Hotel Pintor on November 7, 1990. Dr. S. Turner (U.S.A.), Convener of the Sub-Committee, who chaired the entire session, 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 this Report. Dr. P. M. Miyake (Secretariat) served as rapporteur.

3. REVIEW OF THE STATISTICAL PROGRESS MADE BY NATIONAL OFFICES

3.a National data collection systems

The Secretariat Report on Statistics and Coordination of Research (SCRS/90/10) was reviewed as to the progress made by the national offices in the collection of data. Table 1 shows the updated status on the availability of 1989 data at the time of this meeting.

There have been remarkable improvements in the Mediterranean statistics (catch, catch and effort and size) particularly for Greece and Italy, thanks to the joint GFCM/ICCAT meeting. While congratulating the scientists involved and the Secretariat for this achievement, the Sub-Committee considered it important to continue to collaborate with the GFCM scientists (see Section 5.b).

3.b Data processing by national offices

It was reported that most countries are now reporting data which has been processed, so the Secretariat has to process less raw data than in the past. However, the concern was expressed on the availability of catch and effort data for Ghanaian baitboats and the Venezuelan fleet. In the past the Secretariat processed logbook information from those countries.

The Ghanaian scientists stated that the data have been all entered into the computer but not yet processed. They will be processed very soon in 1°x1° areas and be sent to the Secretariat before the end of 1990. The Venezuelan data are also entered and have been processed, but there has been some delay in extrapolating the data to the total catch. It is anticipated that the extrapolation problem will be solved soon and the data will be sent to the Secretariat before the end of 1990.

The Sub-Committee expressed its satisfaction on this progress, particularly as the Committee is holding the West Atlantic Tropical tuna stock assessment meeting in early 1991.

3.c Reporting to ICCAT

The Sub-Committee noted that in general the Task I catch was reported earlier than usual this year, except for the Mediterranean countries, many of which had not reported 1989 catches by the start of the SCRS meeting. This was in part due to a special effort by the Secretariat to remind the countries to provide the data before the various intersessional meetings. As a result, the Secretariat was able to distribute catch tables by species to the rapporteurs almost a month before the SCRS species groups met.

The Sub-Committee commended all the national offices and the Secretariat for such achievements, while recommending that this effort be continued in future, particularly with the Mediterranean non-member countries.

Task II catch and effort and biological data for 1989 are still missing from some important fisheries, namely FIS, Ghana (catch and effort) and Japan (longline). French scientists expressed their surprise that the Secretariat did not have the 1989 FIS data and noted that the problem appeared to be one of communication rather than the availability of data. As a result, the data were resubmitted during the session.

The SCRS requested that all the major fishing countries create and submit the catch at size before any stock assessment sessions (this year, swordfish, albacore and bluefin). The Secretariat announced that this criterion has not been observed, and despite various reminders, most countries submitted the catch-at-size data just before or during the meeting. In addition, other countries have not submitted raised catch at size so that much work has to be carried out during the meeting by the Secretariat to create the total catch-at-size data base. Having to complete these tasks during the meeting delays the analyses by the SCRS.

The Sub-Committee reiterated the previous recommendation and urged in the strongest possible manner that it be observed by the respective countries.

3.d Improvements to be made

The Secretariat reported that there are many minor problems, associated with the data submitted. They are given in the Secretariat Report on the Coordination of Research and Statistics (See Chapter I of the Biennial Report).

The Sub-Committee noted that most of the problems are due to omission of specific details about the submitted data and can be avoided by the national offices making an effort to report these details when submitting data to the Secretariat.

4. EXAMINATION OF PROGRESS MADE BY THE SECRETARIAT

4.a Data processing carried out in 1990

The Sub-Committee noted that the Secretariat has gradually reduced its backlog of data management tasks accumulated over the last few years and completed the reorganization of the size files. Also the reorganization of tagging data has been started, and the Secretariat requested the collaboration of national scientists in providing historical tag-recapture data to complete the file. The Sub-Committee noted that this progress was made while at the same time the Secretariat handled increased data processing work such as providing catch at size for all the intersessional meetings during 1990.

The Sub-Committee was pleased that the size samples collected by IATTC at Cumaná, Venezuela, have continued to be provided to and processed by the Secretariat.

4.b Port sampling program

The Sub-Committee noted that the port sampling activities at the transshipment ports were minimal in 1990. The major reason for this is fewer longline operations as well as the increase in the transshipment of catches at sea from fishing vessels to transshippers. At the same time, the samplers were not well supervised due to lack of visits to sampling sites by the Secretariat staff.

The Secretariat offered three alternatives for the Committee: 1) maintain the system at the present low level; 2) strengthen the sampling program by spending considerable amounts of money; and 3) abolish the total system.

The Sub-Committee felt that the first alternative would be the best choice under the present circumstances, considering that the fishery is very mobile and transshipment strategy changes very often and that once the sampling system is abolished, it would be very difficult to re-establish the system. Maintenance of the present level of sampling provides ICCAT with a system for the rapid resumption of sampling if landings in these ports increase in the future.

The Sub-Committee appreciated the sampling currently conducted by South Africa from the Asian longliners transshipping at Cape Town. The data have been of high quality and used very effectively for checking the albacore size data measured by fishermen at sea.

The Abidjan port-sampling from the Ghanaian baitboats unloading at that port has been carried out for several years by CRO through a contract with ICCAT. The Sub-Committee was informed that this fleet stopped landing the catch at Abidjan in October, 1989, and consequently all the sampling from this fleet is now being carried out by the Ghanaian scientists in Tema.

The Ghanaian scientists expressed their appreciation for the collaboration by the CRO (Abidjan, Cote d'Ivoire) scientists in the past few years in supplementing their sampling in Abidjan and assisting the Ghanaian scientists in the development of sampling and data processing systems. The Sub-Committee also commended both the CRO and Ghanaian scientists for this achievement.

4.c Secretariat data management policy

The Secretariat noted that the data-base software available for the Micro-VAX has been studied and that it concluded that it is more economical to manage the data files with the present system (i.e., in flat files and with the FORTRAN programs developed by the Secretariat). The Sub-Committee agreed with continuing the general priorities of data management policies, instead of obtaining a new elaborate and costly data-base system.

4.d Data dissemination and publication

The Sub-Committee was pleased to learn that the backlog of data requests from the national scientists has almost been eliminated and that the scientists working directly on ICCAT stock assessment work may now receive the data they request with a very short time lag.

The Statistical Bulletin and Data Records have been presented by the Secretariat. The latest Data Record published in March, 1990 summarized all the data submitted by the end of 1989. The promptness of making the data available to the scientists were appreciated by the Sub-Committee.

4.e Biostatistical assignments

The Sub-Committee noted that there was no outside contract or assistance for biostatistical work this year. On the other hand, many of the statistical activities by the Secretariat is really biostatistical work, such as improvement of the Mediterranean statistics, examination of catch-at-size data presented by the national scientists, developing various computer programs to process catch, effort and size data, etc. Also the Secretariat's active participation in various meetings (including SCRS) also involves biostatistical tasks.

The Secretariat specially noted that a new program for the VAX and for PCs was written to substitute and raise size data to catch in one step; this work can now be done much faster. Also the recommendations of SCRS (1989) to develop graphs of various data sets for the SCRS was fulfilled. The scientists made extensive use of the facilities provided by the Secretariat in this aspect during the present session.

The Sub-Committee noted with thanks that the Spanish scientists assisted Morocco in developing a new sampling program along the coast for their tuna fisheries. The report is presented in SCRS/90/24.

The Sub-Committee also noted with pleasure, that the 3rd Edition of the Field Manual has been published in English and is expected to be published in the other two official languages very soon.

4.f Other Matters

No other matters were discussed.

5. REVIEW OF PROGRESS MADE ON RECOMMENDATIONS FOR STATISTICS AS CONTAINED IN THE 1989 SCRS REPORT

The Convener noted that the species sections of the SCRS Report show the results of appraisals of recommendations made previously and any new recommendations made on statistics for each species.

5.a Expansion of computer facilities

The Sub-Committee recognized that the only new acquisition of computer facilities was a PC with a laser printer purchased towards the end of 1990. This PC, besides adding computer facilities to the Secretariat, has been very useful during the various inter-sessional meetings as well as the SCRS, particularly having two diskette drives of different sizes. Also the combination of this PC with a laser printer added printing quality to the graphics and tables prepared by the Secretariat during these scientific meetings. The Field Manual is also prepared by this equipment and shows good quality printing.

Recognizing the absence of cartographic software at the Secretariat, which is very convenient for drawing map-type graphics, French scientists offered a versatile software to be installed in the ICCAT PCs, free of charge. The Sub-Committee appreciated the offer and requested that a manual and documentation be sent to the Secretariat at a later time. The software is assumed to function with matrix and/or laser printer but in case it does not work with the printers presently available at the ICCAT Secretariat, the Sub-Committee recommended that the Secretariat use a part of the fund budgeted for the computer facilities in 1990 which has not been used up to the present, to the purchase of simple model of X-Y plotter (approximately U.S. $2,000).

While no other needs for major computer facilities were identified, the Secretariat reported verbally that components of the current word processing system are failing and cannot be replaced. It reported that a gradual change to a more modern, efficient system was being considered.

The Secretariat requested advice from the Sub-Committee on how best to replace the existing system, recognizing that the expertise of members of the Sub-Committee with computers even though this subject is not a direct concern of the Sub-Committee. It was agreed that a small group of experts would meet to study the options and give some advice to the Secretariat. The Group later reported that three alternatives were studied:

1) Use of the present VAX as the host to which the terminals are connected. This idea was immediately discarded, as the VAX is already saturated with scientific use and the cost for additional ports and license is quite high.

2) Set up a network of PCs. This idea is excellent for the scientific work, but the cost of the network is not warranted for the Secretariat work. Most of the work is carried out independently and file transfer could be made easily by diskette.

3) Individual PCs with hard disks and diskette drives. This is considered to be most economical and suitable solution for the Secretariat situation.

The Group recommended that the Secretariat shift to the modern system after careful comparative studies among various PCs available within the range of funds available. It also recommended that if funds permit, to add a simple laser printer to each language department for efficient and faster work.

5.b Results of the Joint GFCM/ICCAT Stock Assessment Meeting

As already reported in various sections of the SCRS Report, the Joint meeting was held very successfully and the quality and quantity of the Mediterranean tuna data have increased to a great extent. At the Joint Meeting, it was recommended that scientists from both organizations participate in assessments conducted by either GFCM or ICCAT. Indeed many GFCM members who are not ICCAT members have attended this year's ICCAT stock assessment sessions. The Joint Meeting also recommended to hold a second joint session.

The Sub-Committee recommended that ICCAT be represented at the next session of the GFCM to continue such collaboration in the future.

It was brought up that size data for large bluefin handled by processors are accumulated in Yugoslavia. With a small amount of funds (approximately $500), these data can be extracted and used. The Sub-Committee recommended that the Secretariat contact Yugoslavian scientists and, if feasible, obtain the data.

5.c Improvement of Mediterranean Statistics

See Section 5.b.

5.d Data from Albacore Research Program

As of this time, the Secretariat has not received any data from this program. Most of the data from this program will be processed at the national level.

The problem which SCRS experienced with albacore catch-at-size data used during the recent Albacore Workshop was discussed. The number of large fish in the catch at age was seriously underestimated. It was recommended that for each species the total weight of the catch be estimated from the catch at size and compared to the reported catch weight to avoid such omission in the future.

The Secretariat mentioned that this procedure has been adopted as routine with all the catch-at-size files made by the Secretariat in the past and many errors have been detected and corrected (e.g., Japanese albacore, swordfish data, U.S. bluefin data, Canadian bluefin and swordfish data, Taiwanese albacore data for earlier and later years, etc.). This unfortunate incident (1990 albacore) occurred in part because the raised catch at size was presented during the meeting rather than two weeks before. The Sub-Committee recommended again, that the data be submitted well in advance to allow verification by the Secretariat.

5.e Data base for the Working Group on Western Atlantic Tropical Tunas

Since the meeting has been postponed until early 1991, the only preparations by the Secretariat on this subject, were the development of the data catalogue. The Secretariat has requested that scientists engaged in the Yellowfin Year Program provide the catch-at-size files, which that group has created, by country, gear, time and area strata. However, such files have not yet been received.

Since the Secretariat has all the basic data, the Sub-Committee recommended that the Secretariat make as much progress as possible in creating the catch-at-size base for the west Atlantic for yellowfin (with priority) and skipjack, documenting all the substitutions and raising procedures. It requested the collaboration of the scientists working on the western Atlantic tropical tunas.

The Yellowfin Year Program Coordinator stated that the catch-at-size file in detailed gear-country-area-time strata for eastern yellowfin will be provided, as such information may be useful for the Workshop. This offer was welcomed.

The boundary of east and west was questioned. It was recommended that catch and effort, size, catch at size data files should be prepared in the finest time-area strata as possible. However, if it is difficult, since all the nominal catches are reported by a line at 30°W, it was agreed that this border line could be used.

5.f Computer network communication

The Secretariat reported that it is now connected to the IRIS network (SCRS/90/19) through which electronic mail can be sent and received. The Sub-Committee commended this achievement with relatively low cost and recognized again the usefulness of the electronic network.

The Sub-Committee determined which countries might have access to electronic mail. Canada, France, Taiwan and U.S.A. scientists have an access to the network and scientists of Cote d'Ivoire, France, Senegal also have access through the French ORSTOM network. IATTC, FAO and possibly the EC also have mailboxes in the international network. Portugal and Japan informed the Sub-Committee that they will be joining a network in 1991. Spanish and South African scientists are exploring the possibility.

The Sub-Committee requested that all the institutes participating in any international network to fill out the questionnaire attached to this document and return it to the Secretariat. It also recommended that the Secretariat prepare and periodically revise a directory of those addresses.

6. FUTURE PLANS TO IMPROVE STATISTICS, AND RECOMMENDATIONS TO THE SCRS

6.a Collaboration with other agencies

The Sub-Committee reviewed the relationship which ICCAT has maintained with other organizations regarding statistics.

FAO

The collaboration with FAO continued as the GFCM/ICCAT joint meeting was organized and the exchange of statistical data base was carried out.

Coordinating Working Party on Atlantic Fishery Statistics (CWP)

The Assistant Executive Secretary reported on the CWP meeting held in Paris, February, 1990. The main point of the meeting was to keep the statistics of various agencies as consistent as possible. Mr. Cross of EUROSTAT reported on the subsequent work conducted by EUROSTAT, FAO and ICES.

ICCAT was invited to these inter-agency data comparative meetings but due to the lack of traveling funds, it did not participate in the subsequent sessions. The ICCAT Secretariat received a request to provide ICCAT tuna data by ICES sub-areas. However, after studying the ICES sub-areas, it was found that the task involves a major study of data base and data processing.

The observer from EC/EUROSTAT, the co-Secretary of CWP commented that it was agreed among the ICES, FAO and EUROSTAT that they will accept the ICCAT tuna statistics, even though not broken down by ICES sub-areas, in strata where there are discrepancies between ICCAT and their statistics. The Sub-Committee recommended that the Secretariat contact ICES and provide the tuna data to them, without stratification by ICES areas. It was confirmed that the EUROSTAT and ICES will check the consistency and if the ICCAT file lacks any report of tuna catches from their member countries, they will provide ICCAT with these data. The ICCAT welcomed such an offer.

Other scientific meetings

The Sub-Committee noted that there have been many scientific meetings held in 1990 as in the past years, which concerned on tuna statistics and research (e.g., Stock Assessment meeting of Indian Ocean Fisheries Commission, annual meeting of the Inter-American Tropical Tuna Commission) and it was concerned that the ICCAT was not formally represented in these meetings, even though many scientists working on Atlantic tuna participated.

The Sub-Committee recommended that in the future, for such scientific sessions, one of the ICCAT scientist be appointed to represent the Commission, unless a Secretariat staff is attending the same, so that he will formally report to the SCRS and/or the Sub-Committee a summary of the scientific findings of the meetings.

The Sub-Committee noted with a special interest the recommendation made in the bigeye section of Agenda Item 10 of the SCRS, Statistics ii), i.e., that the efficiency and the statistical validity of multi-species sampling methods and extrapolation procedures used in for the Atlantic be compared with those developed in other areas, such as the Indian Ocean. The Sub-Committee believed that it is an important subject and supported the recommendation.

7. OTHER MATTERS

No other matters were discussed.

8. ADOPTION OF REPORT

The Sub-Committee adopted the Report and endorsed the recommendations made by the Working Group.

9. ADJOURNMENT

The meeting was adjourned.

Table 1. Progress in the collection of 1989 statistics (as of November 7, 1990) Revised

SPECIES, GEAR & COUNTRY	TASK I DATE REC'D 1989	TASK I DATE REC'D 1990	BOATS	TASK II CATCH & EFFORT DATE REC'D 1989	TASK II CATCH & EFFORT DATE REC'D 1990	BIOLOGICAL (SIZE) DATE REC'D 1989	BIOLOGICAL (SIZE) DATE REC'D 1990	REMARKS
YFT, BET, SKJ - Surface Fleet								
BAITBOAT								
Angola	May 23	Jun 7	X	Aug 29				Preliminary Task I
Brazil	Oct 10	Jul 4		Oct 10		Oct 10		Preliminary Task I
Brazil-Japan	Oct 10	Jul 4		Oct 10		Oct 10		
Cape Verde								
Cuba	Sep 7	Aug 17	X					
FIS		Jul 10	X	Jun 1	Nov 7	Jul 20	Nov 7	Raised size
Ghana	Oct 30	Nov 5		Oct 30		Oct 30	Nov 5	
						Jan 30	Mar 9	Abidjan landings 1989
						Mar 15		
						Aug 30		
Portugal (Azores)	Aug 3	Jun 18		Aug 3	Jun 18	Aug 3	Jun 18	
(Madeira)	Mar 3	Mar 30	X	Mar 3	Mar 30	Jul 14	Aug 6	
(Mainland)	Sep 15			Sep 15				
South Africa	Aug 16	Sep 14		Aug 16	Sep 14			
Spain (Canary Islands)	May 10	May 9	X	May 10	May 9	May 10	May 9	
					Oct 4			
(Peninsula)	Jul 17			Jun 1		Jul 12		
(Tropical)		May 25	X		May 25		May 25	
Venezuela	Jun 3	Mar 8				**	**	
VEN-FOR						**		
PURSE SEINE								
Benin	Jul 6							
Cuba	Sep 7	Aug 17	X					
FIS		Jul 10	X	Jun 1	Nov 7	Jul 20	Nov 7	Raised size
Japan	Apr 28	Apr 24		Apr 28			Jul 24	Size for 1988
Morocco								
Norway	Apr 17							
Portugal (Mainland)	Sep 15	Jul 4		Sep 15	Jul 4			
Spain (Tropical)	Jul 5	Sep 25		Jun 1	Oct 4	Jul 12		Preliminary C/E
U.S.A.	Oct 16	Aug 16		Aug 9	Aug 24	Aug 9	Aug 24	
		Oct 24						Revised YFT Task I 1988-89
U.S.S.R.	Jul 13	Jun 12	X	Sep 15		Sep 29	Aug 17	
Venezuela	Jun 3	Mar 8				**	**	
VEN-FOR						**		
NEI	Sep 19	Jun 19						
UNCL & OTHERS								
Angola	May 23	Jun 7						Preliminary Task I
Argentina	Aug 7							
Benin	Jul 6	Aug 27						
Bermuda		Jul 20						
Brazil	Oct 10	Oct 2						Revised Task I for 1988
Brazil-Japan								
Bulgaria						May 24		
Cuba		Aug 17						
Cape Verde								
Ghana								
Morocco	Jun 19	May 30						
Portugal (Madeira)	Mar 3		X			Mar 3		
(Mainland)	Sep 15	Jul 4		Sep 15	Jul 4			
St. Helena	Apr 18	Jul 3	X	Apr 18	Jul 3			
St. Lucia	Jul 24							
Sao Tomé & Principe								

** Field reports periodically.

Table 1. Continued.

SPECIES, GEAR & COUNTRY	TASK I DATE REC'D 1989	TASK I DATE REC'D 1990	BOATS	TASK II CATCH & EFFORT DATE REC'D 1989	TASK II CATCH & EFFORT DATE REC'D 1990	BIOLOGICAL (SIZE) DATE REC'D 1989	BIOLOGICAL (SIZE) DATE REC'D 1990	REMARKS
South Africa	Aug 16	Sep 14			Sep 14			
Spain (Peninsula)								
U.S.A.	Oct 16	Aug 16		Aug 9	Aug 24	Aug 9	Aug 24	
		Oct 24						Revised YFT Task I 1988-89
U.S.S.R.				Sep 15	Nov 2		Aug 17	
Venezuela						**		
VEN-FOR						**		

3

Albacore - Surface Fleet

BAITBOAT

Angola								
Brazil	Oct 10	Jul 4						Preliminary Task I
Brazil-Japan	Oct 10	Jul 4		Oct 10				
France		Jul 5	X					
Portugal (Azores)	Aug 3	Jun 18		Aug 3	Jun 18	Aug 3	Jun 18	
(Madeira)	Mar 3	Mar 30	X	Mar 3	Mar 30	Jun 9	Aug 6	
South Africa	Aug 16	Sep 14		Aug 16	Sep 14			
Spain (Canary Islands)	May 10	May 9	X	May 10	May 9	May 10	May 9	Partially raised size data
(Peninsula)	Jul 17	Feb 27		Jul 10		Aug 16		Revision to 1975 Task I
		Aug 14			Aug 14		Aug 14	Raised size data
Venezuela								
VEN-FOR								

PURSE SEINE

FIS								
France	Oct 23					Oct 16		
Italy								
Portugal (Mainland)								
South Africa								
Spain	Jul 17							
Venezuela		Mar 8						
NEI	Mar 30							

TROL

France	Sep 19	Jul 5	X	Sep 19	Jul 5	Sep 19	Jul 31	Size and catch by size
Greece					Jun 21			Data for 1986
Portugal (Azores)								
Spain (Peninsula)	Jul 17			Jul 10	Mar 30	Aug 16	Mar 30	C/E & Size data for 1988
		Aug 14			Aug 14		Aug 14	Raised size data

UNCL & OTHERS

Argentina	Aug 7							
Bermuda		Jul 20						
Brazil	Oct 10	Oct 2						Revised Task I for 1988
France	Sep 19	Jul 5	X	Sep 19	Jul 5	Sep 19	Jul 31	Size and catch by size
Greece		Jun 21					Jun 21	Size data for 1986-7, 89
Italy							Jun 21	Data for 1985-89
Portugal (Azores)								
(Madeira)						Jun 9	Aug 6	
(Mainland)	Sep 15	Jul 4		Sep 15	Jul 4			
St. Lucia	Jul 24							
South Africa	Aug 16	Sep 14			Sep 14	Aug 28		
Spain (Peninsula)	Jul 17			Jul 31		Aug 16		
U.S.A.	Jun 17	Aug 16		Aug 9	Aug 24	Aug 9	Aug 24	
Venezuela								
VEN-FOR								

** Field reports periodically.

Table 1. Continued.

SPECIES, GEAR & COUNTRY	TASK I DATE REC'D 1989	TASK I DATE REC'D 1990	BOATS	TASK II CATCH & EFFORT DATE REC'D 1989	TASK II CATCH & EFFORT DATE REC'D 1990	BIOLOGICAL (SIZE) DATE REC'D 1989	BIOLOGICAL (SIZE) DATE REC'D 1990	REMARKS
Bluefin - Surface Fleet								
BAITBOAT								
France (Bay of Biscay)	Oct 23	Oct 29						
Portugal (Azores)								
(Madeira)	Mar 3	Mar 30	X	Jul 29	Mar 30		Jun 4	
(Mainland)	Sep 15			Sep 15				
South Africa		Sep 14						
Spain (Canary Islands)	May 10	May 9	X	May 10	May 9	May 10	May 9	Raised size data
(Bay of Biscay)	Apr 10	Feb 23			Mar 15	Apr 10	Feb 23	C/E - 1988. Raised size data
PURSE SEINE								
France (Mediterranean)	Oct 23	Aug 27	X				Aug 27	Size and catch by size
Italy	Mar 6	May 22	X			Mar 6	Jun 21	Size 1984-85
Morocco						Aug 2		
Norway	Aug 2							
Portugal (Azores)								
(Mainland)								
Spain								
Turkey	Jul 26					Jul 26		
U.S.A.	Jun 17	Aug 22		Aug 9	Aug 24	Aug 9	Aug 24	
							Oct 22	Catch at size
Yugoslavia		Jun 21					Jun 21	Size data for 1978-79, 81-88
TRAP								
Canada	Sep 5	Oct 24				Sep 5		
Morocco	Jun 19	May 30						
Spain (Mediterranean)	Jul 17	Sep 25		Jul 31	Oct 18	Jul 31	Oct 4	Raised size data
					Oct 25			Revised C/E
(Peninsula)	Jul 17	Oct 4		Jul 31	Oct 18	Jul 31	Oct 4	Raised size data
UNCL & OTHERS								
Algeria	Jul 10							
Argentina	Aug 7							
Canada	Sep 5	Oct 24				Sep 5	Oct 26	
France (Mediterranean)	Oct 23							
(Bay of Biscay)		Oct 29						
Greece	Jun 15				Jun 21	Jun 15	Jun 21	Data for 1986-87
Italy	Aug 1	Jun 21				Aug 2	Jun 21	Size data for 1985-89
Malta	Jun 22							
Portugal (Azores)								
(Madeira)	Mar 3	Mar 30	X	Mar 3		Mar 3		
(Mainland)	Sep 15	Jul 4		Sep 15	Jul 4			
St. Lucia	Jul 24							
Spain (Mediterranean)		Mar 22						Task I for 1988
		Sep 24		Jul 31	Sep 24	Jul 31	Sep 24	Raised size data
(Peninsula)		Mar 22		Jul 31				Task I for 1988
U.S.A.	Jun 17	Aug 22		Aug 9	Aug 24	Aug 9	Aug 24	
							Oct 22	Catch at size
Billfish (including SWO) - Surface Fleet								
Argentina	Aug 7							
Benin	Jul 6	Aug 27						
Bermuda		Jul 20						
Brazil		Oct 31						Revised Task I for 1988

Table 1. Continued.

	TASK I			TASK II CATCH & EFFORT		BIOLOGICAL (SIZE)		
SPECIES, GEAR & COUNTRY	DATE REC'D 1989	1990	BOATS	DATE REC'D 1989	1990	DATE REC'D 1989	1990	REMARKS
Canada	Oct 11	Jul 16	X	Oct 11	Jul 16	Oct 11	Jul 16	SWO catch by size
							Jul 24	SWO size data
Ghana								
Italy	Mar 6						Jun 21	Size data for 1985-89
Malta	Jun 22							
Morocco	Jun 19	May 30						
Portugal (Madeira)	Mar 3	Mar 30	X	Mar 3	Mar 30	Jun 9	Aug 6	
(Mainland)	Sep 15	Jul 4		Sep 15	Jul 4			
Senegal							Apr 24	Size - diskette
							Jun 4	Size - diskette
South Africa	Aug 16	Sep 14						
Spain (Canary Islands)	May 10	May 9	X	May 10	May 9		Aug 20	SWO catch by size
(Mediterranean)	Jul 17	Sep 11		Jul 31	Sep 11		Sep 11	SWO raised size data
(Peninsula)	Jul 17	Aug 20		Jul 31	Aug 20	Jul 31	Aug 20	SWO catch by size
Turkey	Jul 26							
U.S.A.	Jun 17	Aug 3		Aug 9	Aug 24	Aug 9	Jul 17	SWO size and catch by size
					Aug 27		Aug 24	
U.S.S.R.	Jul 13			Sep 15	Nov 2			
Small Tunas - Surface Fleet								
Angola	May 23	Jun 7						Preliminary Task I
Argentina	Aug 7							
Benin	Jul 6	Aug 27						
Bermuda		Jul 20						
Brazil	Oct 10	Jul 4		Oct 10				
Cape Verde								
Cuba	Sep 7	Aug 17				Jun 14		
FIS		Jul 10	X					
Ghana	Oct 30	Jul 16		Oct 30				Preliminary Task I
Greece		Jun 21						
Morocco	Jun 19	May 30						
Portugal (Azores)	Aug 3	Jun 18		Aug 3	Jun 18	Aug 3		
(Madeira)	Mar 3	Mar 30	X	Mar 3	Mar 30			
(Mainland)	Sep 15	Jul 4		Sep 15	Jul 4			
Senegal								
St. Lucia	Jul 24							
Spain (Canary Islands)	May 10	May 9	X	May 10	May 9		May 9	
(Mediterranean)	Jul 17	Sep 25		Jul 31				
(Peninsula)	Jul 17	Sep 25			Jul 31			
		Oct 4						
(Tropical)		Sep 25						
Turkey	Jul 26					Jul 26		
U.S.A.	Jun 17	Aug 16		Aug 9	Aug 24	Aug 9	Aug 24	
U.S.S.R.	Jul 14	Jun 12	X	Sep 15	Nov 2	Sep 29	Aug 17	
Venezuela	Jun 3							
Yugoslavia		Jun 21						
HEI	Sep 19	Jun 18						
All Species - Longline Fleet								
Brazil	May 17	Jul 4						Preliminary Task I
Brazil-Japan	Oct 10	Jul 4		Oct 10				
		Oct 2						Task I for 1986
Canada	Oct 11	Jul 16	X	Oct 11	Jul 16	Oct 11	Jul 16	SWO Task I and catch by size
							Jul 24	Size data for SWO
		Oct 24					Oct 26	
China (Taiwan)	Oct 23	May 10		Nov 1	Oct 3		Oct 3	Except ALB
Cuba	Sep 7	Aug 17	X	Sep 7	Aug 31			
Cyprus	Jul 12	May 3	X	Jul 12	May 3		May 3	
Greece		Jun 21			Jun 21	Jun 15	Jun 21	C/E - 1986-87. Size - 1988
Italy					Jun 21		Jun 21	C/E - 1984-88. Size - 1985-86

Table 1. Continued.

SPECIES, GEAR & COUNTRY	TASK I DATE REC'D 1989	TASK I DATE REC'D 1990	BOATS	TASK II CATCH & EFFORT DATE REC'D 1989	TASK II CATCH & EFFORT DATE REC'D 1990	BIOLOGICAL (SIZE) DATE REC'D 1989	BIOLOGICAL (SIZE) DATE REC'D 1990	REMARKS
Japan	Jul 17	May 7		Jul 17	Jun 15	Oct 19		Task I and II '88 (BFT prel.)
							Jul 24	Size for 1988
							Aug 7	SWO catch by size - 1988 - rev. 1989 - prel.
							Oct 2	ALB raised size data 1987-88
							Oct 3	BFT catch at size East/Medi - 1988, West - 1989
Japan-Canada-Observer								Reported by Canada
Japan-S.Helena-Observer	Apr 18	Jul 3	X	Apr 18	Jul 3			Reported by S. Helena. Prel.
Japan-U.S.-Observer						May 24		Reported by the U.S.
Korea	Aug 18	Aug 27	X	Aug 18	Aug 27	Aug 18	Aug 27	
Mexico	Sep 5	May 31						Task I for 1980 - 89
Morocco	Jun 19	May 30						
Panama								
Portugal (Azores)	Aug 3	Jun 18		Aug 3	Jun 18	Aug 3		
(Madeira)						Jun 9	Aug 6	
(Mainland)	Sep 15	Jul 4			Jul 4			
South Africa	Aug 16	Sep 14		Aug 16				
Spain (Mediterranean)	Jul 17	Sep 11		Jul 31	Sep 11	Jul 31	Sep 11	SWO data. Raised size data
		Sep 24			Sep 24		Sep 24	BFT data. Raised size data
(Peninsula)	Jul 17	Aug 20		Jul 31	Aug 20	Jul 31	Aug 20	SWO catch by size
		Sep 24		Oct 11		Oct 11		
Uruguay	Aug 9	Mar 15	X			Aug 31		
U.S.A.	Jun 17						Jul 17	SWO size and catch by size for 1986 - 89
		Aug 3		Aug 9		Aug 9		Task I for 1989 and revised Task I for 1986 - 88
		Aug 16						Task I for 1989 (except BFT)
		Aug 22						Task I for 1989 (BFT)
					Aug 24		Aug 24	C/E & Size, including revised BFT size data for 1984 - 88
							Oct 22	BFT catch at size, including revised data for 1984 - 88
		Oct 24						Revised YFT Task I 1988-89
U.S.S.R.	Jul 13	Jun 12	X	Sep 15	Nov 2	Sep 29		
Venezuela	Jun 3	Mar 8				**	**	
VEN-FOR						**	**	
NEI		Jul 24			Jul 24		Jul 24	WTRO data reported by U.S. industry
Various:								
FAO	Sep 19	May 23						
		Sep 17						
		Oct 10						
		Oct 26						

** Field reports periodically.

Addendum 1 to Appendix 8 to Annex 10

Agenda
Sub-Committee on Statistics

1. Opening of the meeting
2. Adoption of Agenda and arrangements for the meeting
3. Review of statistical progress made by national offices
   - 3.a National data collection systems
   - 3.b Data processing by national offices
   - 3.c Reporting to ICCAT
   - 3.d Improvements to be made
4. Examination of progress made by the Secretariat
   - 4.a Data processing carried out in 1990
   - 4.b Port sampling program
   - 4.c Secretariat data management policy
   - 4.d Data dissemination and publication
   - 4.e Biostatistical assignments
   - 4.f Other matters
5. Review of progress made on recommendations for statistics as contained in the 1989 SCRS Report
   - 5.a Expansion of computer facilities
   - 5.b Results of the Joint GFCM/ICCAT Stock Assessment Meeting
   - 5.c Improvement of Mediterranean Statistics
   - 5.d Data from Albacore Research Program
   - 5.e Data base for the Working Group on West Atlantic Yellowfin
   - 5.f Computer network communication
6. Future plans to improve statistics, and recommendations to the SCRS
7. Other matters
8. Adoption of Report
9. Adjournment

Appendix 9 to Annex 10

REPORT OF THE WORKING GROUP ON THE ENVIRONMENT

1. BACKGROUND

In November, 1989, the SCRS recommended creating a Sub-Committee on the Environment within the framework of the SCRS. However, the Committee felt that first it was necessary to establish the function of the Sub-Committee as well as its exact structure. The SCRS Chairman named J. Pereira as chairman of the Working Group. This Group worked through correspondence to establish the terms of reference of the Sub-Committee.

2. MEETING OF THE WORKING GROUP

During the Plenary Session of the SCRS, J. Pereira presented a synthesis of the work done by the Working Group (Document SCRS/90/22).

After the presentation of this report, and before discussing it in more detail, the participants briefly summarized the state of research conducted on tuna and the environment in ICCAT member countries.

From this summary, it was noted that while some countries have a long history of research on the environment of tunas, others in contrast collect traditional oceanographic data without relating them to tuna catches. There was unanimous agreement for cooperation and for providing scientists with the data that they may need.

Before discussing the report of the Working Group on the Environment, discussion centered on whether or not the studies of tuna fishing associated with marine mammals or aggregating devices should fall within the competence of the Sub-Committee on the Environment. Without disregarding the importance of fishing with aggregating devices or the sensitivity of the public to the subject of tuna fishing associated with marine mammals, it was suggested that these two items should not be made part of the terms of reference of the Sub-Committee on the Environment. On the other hand, if they are needed, they could be included in special items of the agenda of the SCRS Plenary Sessions.

2.a Data base

The environmental data of tuna fisheries are numerous and voluminous. It would not be realistic for the ICCAT Secretariat to assume the collection and management of this type of data; however, the ICCAT Secretariat could centralize the information on the data bases existing around the world which could be used by ICCAT scientists.

These data bases should allow detailed studies to be made on fluctuations of the environment and to understand their impact on the stocks, because the traditional models used in population dynamics do not permit this.

The Secretariat library should be equipped with pertinent information on the environment and tunas, and a list should be provided to the concerned scientists. This type of documents could be collections of temperature maps, etc.

2.b Documents

During the discussion, it was suggested that there not be definite subjects for documents which would be presented during the first meeting of the Sub-Committee in 1991. However, it is possible that in the future preference could be given to some subjects over others.

2.c Sub-Committee meeting

The Working Group proposed that the Sub-Committee meeting be in the form of an annual one-day symposium during the SCRS meeting. Each author would present his document for 15 minutes; this presentation would be followed by discussion. A synthesis of these discussions could be presented to the SCRS. As for the format of the documents, the criteria set by ICCAT for all documents presented to the SCRS could be applied to the Tuna/Environment Symposium.

This Working Group wants the symposium to be open to scientists working in other oceans and/or on subjects not normally taken up in SCRS documents.

Because of the particular nature of the meeting of the Sub-Committee on the Environment, the Secretariat was asked to distribute a "call for papers" at the beginning of 1991.

2.d Other problems discussed

Some scientists suggested that the Sub-Committee on the Environment study the long-term trends of the environment which could have fundamental repercussions on the fisheries by modifying the productivity of the stock and the MSY of the fisheries.

From the consultation carried out by J. Pereira, it was indicated that scientists concerned with problems of the environment would like an experimental duration of three years to test the viability of the Sub-Committee on the Environment.

All the delegations present at the SCRS Plenary Session agreed with the creation of a Sub-Committee on the Environment.

PLAN OF THE WORKING GROUP ON WESTERN ATLANTIC TROPICAL TUNAS

A Meeting of Working Group on Western Atlantic Tropical Tunas will be held in Miami, Florida (USA) from April 17 to 24, 1991. Dr. B. E. Brown will act as Convener. Information on hotel accommodations will be sent out on a later date.

The Working Group's Tentative Agenda is attached herewith. Data relative to the Agenda items must be provided to the Secretariat by December 31, 1990 to ensure adequate data processing time prior to the meeting. The Secretariat will provide a catch-at-size table and a mark/recapture data base. In creating the catch-at-size table, the Group agreed to use the length-weight equation presented at the YYP Meeting by Davis (SCRS/89/30) for larger fish and the equation presented by Gaertner and Pagavino (SCRS/89/67) for small fish, pending further studies expected during the Working Group meeting.

The deadline to submit titles of working papers will be March 17. Twenty-five copies of the papers must be provided at the meeting. Papers are particularly needed on standardized CPUE. Scientists are also encouraged to bring raw data for the calculation of standardized CPUEs.

In order for the meeting to be successful, participation of scientists from countries such as Cuba, Japan, Korea, United States and Venezuela, which have, or have had, significant fisheries is essential. The Working Group will be enhanced by the participation of those member countries which have fisheries at the boundaries of yellowfin distribution, i.e. Brazil and Canada. Participation by non-member countries that have an interest in yellowfin tuna and information on this species, such as Mexico and certain Caribbean island countries, is also encouraged.

The Secretariat will be required to provide statistical and computer support at the Group's meeting in Miami. The Micro-VAX at the Southeast Fisheries Center will be made available to the Secretariat for data processing. The U.S. will provide administrative support.

Addendum 1 to Appendix 10 to Annex 10

Tentative Agenda for
Working Group on Western Atlantic Tropical Tunas

1. Opening of meeting
2. Adoption of Agenda
3. Selection of rapporteurs and organization of meeting
4. Review of working papers
5. Review of various national fisheries on tropical tunas in the western Atlantic
6. Review of data base
   a) Total annual catches (Task I)
   b) Catch and effort data (Task II)
   c) Size data (Task II)
   d) Tag release and recapture file
7. Creation of catch-at-length data base
   a) Data substitution
   b) Raising size data to the total catch
8. Review of various biological parameters
9. Aging of catch at length
10. Review of CPUE indices
11. Interaction between fisheries
12. Status of stocks
    a) Review of stock structure hypothesis for stock assessment purposes
    b) Discussion of natural mortality rates
    c) Abundance index series
    d) Yield per recruit
    e) Production model analyses
    f) VPA
13. Recommendations
14. Adoption of Report
15. Adjournment

PROGRAM PLAN FOR THE ICCAT ENHANCED RESEARCH PROGRAM FOR BILLFISH - 1991

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 (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 formulated with the intention of developing the data necessary to assess the status of the billfish stocks. The report of progress made during 1990 is attached as Addendum 1 to this plan.

It was confirmed that Drs. Brad Brown and Eric Prince (U.S.A) will continue to function as the general coordinator and western Atlantic coordinator, respectively. Mr. Martin Mensah (Ghana) and Mr. Taib Diouf (Senegal) will be co-coordinators for the eastern Atlantic Ocean. Research results, as well as a financial summary for 1990 are presented to the 1990 SCRS and Commission meetings (SCRS/90/14, 20, 106). The summary of the 1991 proposed budget is attached as Table 1.

Quarterly highlight reports of research activities will continue to be provided to interested parties. 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. Each year, financial reports of the previous year's work are available in the Annual Program Progress Report and the ICCAT Financial Report. Projected funds for future research activities will be available in subsequent annual program plans.

All institutes 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 cooperatives in this program will be required to submit data (either to area coordinators or directly to the ICCAT Secretariat) collected in 1991 and in previous years, prior to the 1992 SCRS meeting.

A special meeting (workshop) will be planned in 1992 to summarize the research, revise billfish data bases, and prepare for an analysis of the available data on the status of the billfish resources.

1. SPECIES IDENTIFICATION KITS

As reported in SCRS/90/87, the study to develop field species identification kits for istiophoridae has taken a new approach. This new approach is based on acquiring monoclonal antisera using mice immunized with billfish albumin, instead of immunizing rabbits with billfish albumin to obtain polyclonal antisera. The research team has concluded that polyclonal antisera obtained from rabbits was inconsistent in producing antisera that had low cross reactivity. Further, the opinion of the research team was that monoclonal antisera using mice would provide the antisera needed to develop accurate kits. The monoclonal approach has just been completed for sailfish and was highly successful--the monoclonal antisera produced had very little cross reactivity, if any at all. The research team anticipates that some form of field kits (which will include tests for sailfish, white marlin and blue marlin) will be available for initial testing of accuracy during the summer of 1991. Since the research team has been successful in obtaining some additional funding outside of ICCAT, only a minimal amount of ICCAT funds ($1,200) will be necessary for this final phase of the research in 1991.

2. SHORE-BASED SAMPLING

Cumaná, 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 1991. Since part of this sampling can occur on weekends and after normal working hours, funding for 1991 will be $500.00. A few multi- purpose trips will be conducted by the western Atlantic coordinator to observe the sampling.

Caracas, Venezuela. Shore-based sampling and detailed analysis of the recreational fishery (centered in La Guaira, Venezuela) will be continued in 1991. Since the new Venezuelan laws prohibit landings, except by special permits, size frequency and sex data will be very limited. However, continuation of the very long data (1961-1989) set on CPUE (as described in SCRS/90/65) will still be possible. Staff of FONAIAP and the Department of Fisheries and Aquaculture (DGSPA), as well as Dr. D. Gaertner (ORSTOM), will continue to direct this research in which sampling occurs mainly on weekends. Funding for 1991 will be $1,500. In addition to recreational work in La Guaira, shore-based sampling of an artisanal gillnet fishery, which targets sharks but catches substantial amounts of billfish, will be initiated in 1991. This sampling will be coordinated by Mr. Louis Marcano of the Department of Fisheries and Aquaculture (DGSPA) and FONAIAP, and will provide data on size frequency and sex of the landings. Gillnet landings also often occur on weekends and after normal working hours. There is also a possibility that some limited amount of at-sea sampling can be accomplished (see section on at-sea sampling). Funding for 1991 will be $800.

Grenada. Shore-based sampling of size frequency and total landings from the artisanal and recreational fishery for billfish will be conducted by Ministry of Agriculture, Lands, Forestry, and Fisheries (Mr. Crofton Isaac and Mr. Paul Phillip) in 1991. A limited amount of at-sea sampling may also be possible (see section on at-sea sampling) Funding for 1991 will be $1,000.

Barbados. Shore-based sampling of size frequency and total landings from artisanal, small industrial, and recreational fisheries will be conducted by personal from the Bellaires Research Institute in 1991. Some limited amount of at-sea sampling may also be possible in 1991 (see section on at-sea sampling). Funding for 1991 will be $1,000.

Jamaica. Shore-based sampling of the size frequency, and total landings from the artisanal fishery and catch and effort and size frequency from the recreational fishery will be conducted by Dr. Guy Harvey, and also with personnel from the University of West Indies, if possible. Funding for 1991 will be $1,000.

Dominican Republic. Shore-based sampling of size frequency, sex determination, and catch and effort from the recreational fishery will be conducted by personnel from MAM-MA (Mr. Mario Delgado) for 1991. Historical data from billfish tournaments, acquisition of biological samples, and age and growth samples will also be obtained. Funding for 1991 will be $1,150.

St. Maarten, Netherlands Antilles. Shore-based sampling of size frequency data for off-loaded billfish carcasses from China-Taiwan, Korean, and Panamanian longline vessels will continue in 1991 through the Nichirei Carib Corporation. Funding for 1991 will be reduced to $1,000 (from $1,500 in 1990) since many of the vessels are now off-loading in other Caribbean ports. One trip to the contractee will be required by the western Atlantic coordinator.

Port of Spain, Trinidad. Shore based sampling of size frequency data for off-loaded billfish carcasses from China-Taiwan longline vessels will be initiated in 1991. This work will be supervised by the National Fisheries Company Limited (Mr. Edward Raghunan). Funding for 1991 will be $1,000. Some volunteer data on the annual recreational billfish tournament will be supplied by the Trinidad Game Fish Association and some limited at-sea sampling may be possible (see section on at-sea sampling).

Las Palmas, Canary Islands. The Assistant ICCAT Secretary may visit the port to investigate shore-based sampling for billfish in this location, although a small amount of data was acquired in 1990. Funding for 1991 will be $500.

U.S. and British Virgin Islands. Shore-based sampling of the recreational fisheries will be initiated in 1991. Mr. Alan Friedlander of the Division of Fish and Wildlife, St. Thomas (see SCRS/90/85), will supervise this work which will emphasize catch and effort data, although some biological samples may be obtained. Funding for 1991 will be $1,000. Some at-sea sampling will be conducted (see section on at-sea sampling).

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 Dakar, Senegal, by Mr. Taïb Diouf, co-eastern Atlantic coordinator in 1991. The western Atlantic coordinator will travel to Senegal in order to train samplers in taking data on sex determination and filling out data forms. Funding will be $1,500 in 1991.

Cote d'Ivoire. Abidjan shore-based sampling of the artisanal and recreational billfish fisheries will be continued and directed by ORSTOM staff in 1991. The western Atlantic coordinator will travel to Cote d'Ivoire to train samplers in taking data on sex determination and filling out data forms. Funding in 1991 will be $1,000.

Ghana. Shore-based sampling of size frequency and sex determination, and catch/effort of the artisanal gillnet fisheries for billfish will be continued in 1991 by the co-eastern Atlantic coordinator, Mr. Martin Mensah. The western Atlantic coordinator will travel to Ghana to train samplers in taking data on sex determination and filling out data forms. Funding will be $1,000.

Benin. Shore-based sampling artisanal fisheries for blue marlin and sailfish for size frequency and sex determination data at one port in Benin will be continued in 1991. Mr. Taib Diouf will supervise this research activity. Funding will be $500 in 1991.

Sao Tomé et Principe. Shore-based sampling of the artisanal fisheries for billfish for size frequency, sex determination, and total landings will be initiated in 1991. The program will be supervised by J. Castel David of the Ministry of Agriculture and Fisheries. Funding for 1991 will be $500.

Cape Town, South Africa. Investigate the possibility of initiating shore-based sampling of Taiwanese longline vessels that use Cape Town to transship catches. No funding is required in 1991.

Other West African countries. If proposals can be developed for specific locations, sampling can be initiated. Funding for 1991 will be $1,500.

3. AT-SEA SAMPLING

3.a Istiophoridae

Venezuela. Six observer trips are planned aboard industrial longline vessels targeting yellowfin tuna out of Cumana harbor for 1991. These trips average from 14-21 days at sea. More trips will be made if the opportunity arises, particularly on larger longline vessels (100-200 MT) fishing out of Carupano and Port de la Cruz. Recent information indicates that some of these boats are making short trips of only two weeks, thus at-sea sampling maybe possible. Also, some limited observer trips maybe possible on small gillnet vessels targeting sharks off La Guaira. Funding for 1991 will be $3,000.

Port of Spain, Trinidad. Several observer trips will be initiated on Trinidad longline vessels targeting swordfish out of Port of Spain. Captain Michael James, working in conjunction with National Fisheries Corporation Limited, will initiate the first observer trip. If successful, more trips will be attempted. Funding for 1991 will be $500.

Barbados. The western Atlantic coordinator has been invited to go out on a 4 day trip on several of the larger Barbados longline vessels targeting swordfish. If these initial trips prove worthwhile, additional short duration observer trips will be made by the staff of the Bellaires Research Institute, under the guidance of Dr. Hazel Oxenford. Funding for 1991 will be $500.

U.S. and British Virgin Islands. Four observer trips are planned on U.S. longline vessels targeting swordfish out of St. Croix (U.S.V.I.) and Tortola (B.V.I.). This work will be supervised by Mr. William Tobias of the Division of Fish and Wildlife in St.

Croix (see SCRS/90/83). The number of trips will depend on the extent of longline fishing activity in this area. Funding for 1991 will be $1,000.

Grenada. Several Grenadian industrial longline vessels may be initiating fishing activity for tuna sometime in 1991. If these vessels do start fishing during the 1991 sampling season, at-sampling will also be initiated. No additional funding for this is activity is planned at this time.

Senegal. Although numerous observer trips, using Senegalese observers, were made on Spanish longline vessels fishing for swordfish in the Senegal EEZ during 1990, observers did not complete ICCAT billfish forms and data on size and sex of billfish was not obtained. During the 1991 sampling season, several observer trips on the Spanish boats will again be attempted, depending on fishing activities, but these will be done during the billfish season (June through October) to maximize information on billfish. ICCAT billfish observer forms on these trips will be completed and if successful, this activity will be revaluated and possibly expanded. No additional funds are necessary for 1991.

3.b Xiphidae

An observer program on Venezuelan industrialized longline vessels targeting swordfish will be initiated. Billfish (Istiophoridae) by-catch data will be gathered. Expansion of the Venezuelan fishery for swordfish has provided the opportunity for this research activity, which will emphasize collecting data on sex at size, and biological sampling of gonads for determination of sexual maturity, and sampling anal spines and otoliths for age and growth determination for swordfish, as well as the basic billfish data. Dr. Daniel Novoa, Director General of the Department of Fisheries and Aquaculture (DGSPA) has agreed to establish this research activity through the ICCAT Enhanced Research Program for Billfish. The ICCAT billfish at-sea sampling forms C and D will be maintained by all observers and half the sampling will be conducted by FONAIAP/Department of Fisheries and Aquaculture (DGSPA) and the other half by the University of Oriente (Dr. Walter Gonzalez) on Margarita Island. These two groups will work together to accomplish about 20 trips during 1991. Funding for this activity for 1991 will be $10,000.

4. BILLFISH TAGGING PROGRAM

Most of the items comprising the tagging kit have already been purchased and inventory of these items is sufficient for the 1991 sampling season. In order to further encourage the return of tagged billfish, the two types of tagging posters will be printed in Japanese and Chinese. he funds needed for 1991 will involve the lottery and rewards for tagged and recaptured fish, printing costs for posters, and costs of purchasing printed T-shirts for the east Atlantic. Funds for 1991 will be $3,500.

5. AGE AND GROWTH

Funds for biological samples from juvenile and very large billfish, as well as for tag-recaptured billfish, will be $500 for 1991.

6. COORDINATION

6.a Travel/Coordination

Experience in the western Atlantic (SCRS/90/20) indicates that it will be necessary to make a series of trips in specific Caribbean island locations to maintain quality control of on-going research. The purpose for this travel will be to train samplers in data collection, pick up data, assist in data analysis, hand-carry frozen samples back to Miami, monitor the rapidly changing pelagic fisheries, and maintain contacts with project cooperatives. In addition, travel will also be necessary from Miami, Florida, to west Africa to assist the eastern Atlantic coordinators in resolving sex identification and in refining sampling problems (SCRS/90/23 and SCRS/90/106). Coordinators Mensah and Diouf in the eastern Atlantic will also require trips to various west African locations for the same reasons. Funding for 1991 will be $14,000. Travel will include the following areas:

--Cumaná, Margarita Island, and Caracas, Venezuela
--Grenada
--Barbados
--Dominican Republic
--St. Maarten, Netherlands Antilles
--Port of Spain, Trinidad
--Ghana
--Dakar, Senegal
--Côte d'Ivoire
--Other west African countries

6.b Miscellaneous/Mailing

Eastern Atlantic miscellaneous and mailing. Funding for 1991 is $500.

Similar needs for the western Atlantic Coordinator are covered by the U.S. domestic budget.

6.c Secretariat

Funding for mailing and shipment of materials, data management and samples ($1,300) and for miscellaneous expenses and contingencies ($1,000) for 1991 is included. Travel by the ICCAT assistant Secretariat may be required to establish shore-based sampling of billfish in various transshipment ports and for resolving problems associated with the international billfish data sets presently being compiled and evaluated by the western Atlantic coordinator. Funding for 1991 will be $2,700.

Because of unforeseen 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 made in consultation with the ICCAT Secretariat and area coordinators.

Table 1. Proposed Budget for the Program of Enhanced Research for Billfish, 1991

	SUB-TOTAL	TOTAL
A. SPECIES IDENTIFICATION KITS	1,200.00	1,200.00
B. AGE AND GROWTH	500.00	500.00
Purchase of hard parts		
C. TAGGING		4,000.00
Tag rewards	500.00	
Lottery rewards	500.00	
Hard part rewards	500.00	
Printing posters in Japanese/Chinese	2,000.00	
Printing of T-shirts	500.00	
D. STATISTICS AND SAMPLING ENHANCEMENT	30,950.00	
West Atlantic Research		
Cumaná, Venezuela	500.00	
Caracas, Venezuela	2,300.00	
Grenada	1,000.00	
Barbados	1,000.00	
Jamaica	1,000.00	
Dominican Republic	1,150.00	
Trinidad port-sampling	1,000.00	
U.S. & British Virgin Islands	1,000.00	
St. Maarten port-sampling	1,000.00	
Las Palmas port-sampling	500.00	
Venezuela at-sea sampling		
Cumaná (Istiophorids)	3,000.00	
Port de la Cruz (Xiphids)	5,000.00	
Margarita Island (Xiphids)	5,000.00	
Trinidad at-sea sampling	500.00	
U.S. & B.V.I. at sea sampling	1,000.00	
East Atlantic Research		
Dakar, Senegal	1,500.00	
Senegal at-sea sampling (Spanish longline vessels)	0.00	
Cote d'Ivoire	1,000.00	
Ghana	1,000.00	
Benin	500.00	
Sao Tome and Principe	500.00	
South Africa	0.00	
Other West African countries	1,500.00	
E. COORDINATION		19,500.00
Traveling by Coordinators	14,000.00	
Traveling by Assist. Ex. Sec.	2,700.00	
Mailing and miscellaneous - East	500.00	
Secretariat support (data management, mailing, etc.)	2,300.00	
GRAND TOTAL		$56,150.00

Addendum 1 to Appendix 11 to Annex 10

Progress Report on
Program of Enhanced Research for Atlantic Billfish

by ICCAT Secretariat

The Enhanced Research Program, which began in 1987, continued this year and financed its activities through a special fund, donated by private sectors. Dr. B. Brown (U.S. NMFS) continued as General Coordinator, and East Atlantic Coordinators are Mr. M. Mensah (Ghana) and Mr. T. Diouf (Senegal), and West Atlantic Coordinator is Dr. E. Prince (U.S.A.). The Secretariat administered the funds and coordinated the work through correspondence.

Research activities are reported by each of these Coordinators in SCRS/90/20 (for the west Atlantic) and SCRS/90/106 (for the east Atlantic). This document summarizes very briefly all the activities of the Program.

The West Atlantic Coordinator made several trips to the Caribbean areas to improve landing statistics and sampling. Additional observer trips were achieved on Venezuelan longliners.

In the east Atlantic, efforts continued in establishing statistical and sampling systems for billfish in Sao Tomé et Principe, Sierra Leone, Nigeria, Senegal, Benin and Ghana.

The development of a field kit for identification of billfish species from carcass experienced some delay but progress is being made.

Coordination of a tagging program by recreational fishermen continues, and more activities took place in the eastern Atlantic, as the Secretariat started distributing tagging kits to fishermen. The special lottery for the billfish tag recoveries was held once again this year.

The financial status at the end of Fiscal Year 1990 is attached herewith as Table 1. This table shows the budget and expenditures by research item.

Table 2 is the balance sheet at the end of Fiscal Year 1990.

Table 1. Billfish Program Budget and Expenditures at end of Fiscal Year 1990

	Amount Budgeted	Expenditures*
A. SPECIES IDENTIFICATION KITS	6,600.00	5,648.00
B. AGE AND GROWTH	500.00	0.00
Purchase of hard parts		
C. TAGGING		
Tag rewards	500.00	0.00
Lottery rewards	500.00	500.00
Hard part rewards	500.00	0.00
D. STATISTICS AND SAMPLING ENHANCEMENT		
West Atlantic Research		
Cumaná, Venezuela	200.00	200.00
Caracas, Venezuela	2,100.00	2,135.00
Grenada	1,000.00	1,007.00
Barbados	1,000.00	1,007.00
Jamaica	1,000.00	0.00
Dominican Republic	1,000.00	1,007.00
Venezuelan at-sea sampling	2,800.00	3,853.50
Trinidad port sampling	1,000.00	0.00
Mexico at-sea sampling	0.00	0.00
Cuba at-sea sampling	1,000.00	0.00
Caribbean Islands at-sea sampling	500.00	0.00
St. Maarten port sampling	1,500.00	347.00
Las Palmas port sampling	700.00	162.00
East Atlantic Research		
Dakar, Senegal	2,000.00	2,007.00
Senegal at-sea (Spanish longline vessels)	0.00	0.00
Côte d'Ivoire	1,500.00	758.29
Ghana	1,500.00	0.00
Benin	500.00	507.80
E. COORDINATION		
Travel by Coordinators	10,000.00	5,664.57
Travel by Secretariat	2,700.00	0.00
Mailing and miscellaneous - East	500.00	0.00
Secretariat support (data management, mailing, etc.)	2,000.00	2,000.00
TOTAL	43,100.00	26,804.16

*Includes bank charges.

Table 2. Balance sheet for Billfish Program Funds at end of Fiscal Year 1990

Balance at end of 1989		$9,729.93
Income received:		
March 30, Billfish Foundation, Miami.	$5,000.00	
May 4, Billfish Foundation, Miami.....	$7,000.00	
June 28, Billfish Foundation, Miami..	$6,000.00	
Dec. 7, Billfish Foundation, Miami...	$12,000.00	
Jan. 9, Pierre Clostermann, France...	$500.00	$30,500.00
Expenditures..........................		$26,804.16
Balance at end of Fiscal Year 1990......		$6,032.77

Appendix 12 to Annex 10

REPORT ON THE PROGRESS MADE IN THE ALBACORE RESEARCH PROGRAM

A working group met on November 8, 1990, to review the progress of the work carried out in the Albacore Research Program. The progress report previously prepared during the Second Albacore Workshop was updated and completed at this time.

The following items were reviewed:

Observer data

Observer cruises for 1989 were financed by the EEC and jointly conducted by scientists from the Instituto Español de Oceanografía (I.E.O.) and the Institut français de recherche pour l'exploitation de la Mer (IFREMER). The representative of the EEC was asked about the procedure to follow for making these data accessible to the ICCAT scientific community. The representative of the EEC stated that:

-- in principle, the Community agrees to the distribution of information and scientific data;
-- the work carried out was presented in a report received by the EEC. After allowing time for analysis and adoption of the report, the Community will provide all the necessary scientific information, as formally requested by ICCAT.

Observer data for 1990 are being collected and analyzed, and are in a common 1989-1990 file for Spain and France, and will be analyzed by the scientists in charge of this activity in the two countries (V. Ortiz, L. Antoine).

Study of hard parts

Hard parts (otoliths, spines and vertebrae) are collected to validate the growth equation and to make routine double sampling operations; this concerns, in particular, fish over 80 cm, by sex. The collection is being done by the laboratories of France and Spain. (L. Antoine, J. Santiago).

Catch-at-age data

An analysis is planned of the catch at length of the surface fishery by stochastic methods allowing conversion into catch at age (J. Santiago).

-- Tagging

Tagging was done by Spain in 1988 (486 albacore), 1989 (2,669 albacore), and 1990 (4,481 albacore). Recoveries are being made and will continue until 1993, at least. This should provide data on:

--Verification of the growth curve;

-- Comparison of cohorts of tagged albacore and of cohorts of albacore of the same size, according to methods already used during the Skipjack Program (F. X. Bard, V. Ortiz).

South Africa is going to study the possibility of tagging albacore in its baitboat fishery (A. Penney). This would be an interesting approach to south Atlantic stock structure.

Abundance indices, North Atlantic stock

Runs were made to standardize the abundance indices for the surface fishery (J. Mejuto) as well as for the longline fishery (C. C. Hsu).

Fishing power

A detailed study on the introduction of sonar in the baitboat fishery will be made in order to measure the possible impact of this technology on baitboat fishing power (J. Santiago).

Revision of the data base

It was agreed to ask the Secretariat to generate as soon as possible the revised catch-at-length tables for the following fisheries:

--North Atlantic:	Surface catches Longline catches Sum of the two
--South Atlantic:	Surface catches (to be generated) Longline catches Sum of the two

These tables will be circulated as rapidly as possible among the scientists concerned for revisions and/or corrections and returned to the Secretariat.

This revision will lead to a catch-at-age table for the North Atlantic stocks which will be attached as an errata to the Report of the Second Albacore Workshop of October, 1990.

If it is possible to generate such a table for the years 1980-1990 for the south Atlantic, this will be used in the assessment of the south stock (C. C. Hsu, A. Penney).

Stock assessment

For the north stock, VPA calibrations should be made to make more precise the results of the 1990 Workshop according to the recommended methods (Ad Hoc VPA, ADAPT, etc.). The results will be submitted to the next SCRS.

For the south stock, such VPA runs will be attempted (C. C. Hsu, A. Penney). It would be interesting to compare the results to the current production model.

Budget

Expenditures of the Albacore Research Program for 1990 are broken down as follows:

- --Cost of observers for the 1990 cruises, U.S. $30,000.
- -- Cost of collecting hard parts (spines, otoliths, vertebrae) from sampling of large albacore (80 to 120 cm) caught at the end of 1990, U.S. $20,000.

TOTAL: $50,000, being administered by the I.E.O. and IFREMER.

There are no plans to request funds from ICCAT for the Albacore Research Program in 1991. The analyses planned will be conducted by the scientific centers of the participating countries. Minor costs of tagging (purchase of tags, needles, etc.) possibly to be carried out by South Africa will be charged to ICCAT as a regular tagging activity. Tag recovery rewards will be charged to the country doing the tagging.

Scientists present

The following scientists were present at this meeting: L. Antoine (France), F. X. Bard (Côte d'Ivoire), J. C. Rey (EEC), V. Ortiz de Zárate (Spain), J. Mejuto (Spain), C. C. Hsu (Taiwan), J. Santiago (Spain), A. Penney (South Africa).

CHAPTER III
NATIONAL REPORTS

NATIONAL REPORT OF BRAZIL

by

J. H. Meneses de Lima

1. STATUS OF THE FISHERIES

1.1 Fleet development

The 1989 Brazilian tuna fleet was comprised of 17 longliners in the 51-200 GRT class and 47 baitboats, mostly in the 51-150 GRT class. The foreign tuna fleet operating under charter to a Brazilian firm consisted of five longliners and five baitboats with Japanese flag (in the 201-500 GRT and the over 151 GRT classes, respectively) (Table 1).

The increase of the number of boats in the Brazilian longline fleet was due to development of this fishery in the northeastern region of Brazil, which started in 1983-84. Until 1988, only three boats operated, but in 1989, five new units were incorporated to the fleet, and two more units in 1990, totalling ten boats in operations for this year. As regards the baitboat fleet, the number of boats, after an increasing trend since 1979, when fishing began, has levelled off around 45 units during 1985-1989. However, for 1991, 11 boats are being built, which will result in an increase of 23 percent in effort, in number of boats, relative to the present size of the fleet.

The actual number of baitboats in operations shows that there was a decrease in fleet size, in relation to the first years of development of the fishery. However, this has been compensated for by an increase in vessel characteristics, GRT and total size, which showed a rate of increase of 114 percent and 32 percent, respectively, in relation to vessel characteristics in 1980.

As the baitboat fleet was created by adapting boats from other fishing activities (purse seiners and trawlers), this seems to confirm that unsuccessful performance of the small boats prevented their continuing in the baitboat fishery, and they were readapted to their original fishing activities. Also, there were new, larger-sized boats, built specifically for the baitboat fishery, which were incorporated in the fleet after 1985.

Original report in English.

1.2 Fishing areas

National longliners, based in Santos (Sao Paulo), fished in their traditional area of operation (from 23°S to 31°S latitude). National longliners based in the northeastern region operated in an area between 05°N and 15°S latitude and 25°W and 40°W longitude. Japanese longliners operated in the south region, during autumn and winter, and, by the end of spring and summer, concentrated their operations in the northeastern region and near the Ascension Islands, close to the African coast.

The baitboat fishing area extends from 20°S to 34°S, but most fishing operations, by both national and Japanese-leased fleets, concentrated between 24°S and 30°S. Since 1985 a clear pattern of operation of the fleet has been observed. From October-November until March, fishing operations are carried out south of 30°S and in April there is a northward progression of the fleet towards fishing areas as far as 20°S.

1.3 Catches

Longline tuna catches for the period 1979-1989 are shown in Table 2. Data for the Brazilian fleet show that swordfish is the main species in the catches, followed by yellowfin. Although catches of these species have remained stable, albacore and bigeye catches have shown decreases since 1984. As there was a change in fishing strategy of the fleet, which concentrated on the fishing of sharks (60 percent of total catches) in recent years, the decrease in albacore and bigeye catches may not reflect a decrease in abundance of these species. As regards yellowfin, catches have remained at the same levels because of an increase in catches due to the development of longline fishery in the northeast region, where catches mainly consist of yellowfin.

For the leased-longline fleet, data show a predominance of bigeye in the catches, except for 1989. For this year, yellowfin was the most important species in the catch. Until 1983 yellowfin was the main species caught by the longline fishery of the Japanese leased fleet. Since then bigeye has been the principal species, accounting for 35 percent of the total catch in recent years. This seems to indicate a change in fishing strategy of the fleet, which concentrates in the bigeye area near the Ascension Islands in spring and summer. The longline gear used this area has characteristics that differ from those used in the south region of Brazil, with each basket having 16 hooks and, therefore, reaching deeper waters (300 meters).

Catches of tuna taken by baitboats are shown in Table 3. Skipjack tuna is the main species caught, and represents about 90 percent of the catches in weight. In recent years, catches of this species have shown large fluctuations, especially for the Brazilian fleet. The 1989 catch of skipjack represented an increase of 42.7 percent from the 1988 catch of 9,963 MT. The total catch of skipjack (20,548 MT), for both the Brazilian and Japanese fleets, was 19.3 percent higher than in 1988.

Fluctuations in skipjack catches do not seem to be related to fishing effort, as can be seen from the fleet size which remained at almost the same level in recent years, with only a small rate of increase for the Brazilian fleet. Fluctuations in catches are probably the result of variations in environmental conditions.

2. RESEARCH

The principal organizations which conduct tuna research are IBAMA (Instituto Brasileiro do Meio Ambiente e Recursos Naturais Renovaveis), Instituto de Pesca and FURG (Fundaçao Universidade do Rio Grande). Regional units of IBAMA in charge of tuna research work are: CEPSUL (Centro de Pesquisa e Extensao Pesqueira das Regioes Sudeste-Sul) and CEPENE (Centro de Pesquisa e Extensao Pesqueira do Nordeste).

Experiments for the utilization of fish aggregating devices to increase skipjack catches in the south region were discontinued in 1985. The same experiments are now being conducted in the northeast region, by CEPENE, aimed at increasing the efficiency of tuna fishing carried out by the artisanal fleet. Deployment of aggregating devices is being done at a depth of 60 meters and preliminary results have shown some increase in catches of small tunas and dolphins (*Coriphaena hippurus*).

The IBAMA has been collecting and processing catch and effort data as well as size data on tuna and related species from the commercial fishery, as required by the Standing Committee on Research and Statistics (SCRS). The results are routinely reported to the ICCAT Secretariat.

In recent years, deficiencies in the statistical system (mainly limited personnel) for the collection of data particularly in Rio de Janeiro and the northeastern states, has resulted in poor statistical coverage of the Brazilian baitboat and artisanal fisheries, respectively. Full logbook coverage (100 percent) is met for the Japanese-leased fleet.

A new statistical system for the collection of catch data from the artisanal fleet is being developed, based on sampling of the main productive components of the fishery, to allow for an estimate of the total catch. This statistical sampling system has been tried in one state of the northeastern region and there are plans to expand it to other states.

Table 1. Annual number of tuna boats operating in Brazilian waters, 1979-1989

Type of fishery	*Fleet*	*1979*	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1988*	*1989*
Longline	Brazilian	5	5	5	7	12	12	10	11	11	3*	17
	Leased	5	3	4	5	4	3	3	6	5	5	5
Baitboat	Brazilian	7	39	66	97	57	47	50	42	43	46	47
	Leased	-	-	4	5	4	6	5	6	5	5	5
Purse seine	Leased	-	-	-	1	3	2	-	-	-	-	-

*Does not include the longline fleet based in Santos (SP).

Table 2. Catches (MT) of tunas and tuna-like fishes taken by the Brazilian and Japanese longline fleets, 1979-1990

Species	*Fleet*	*1979*	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1988*	*1989*	*1990**
Yellowfin tuna	Brazilian	553	236	459	322	337	344	223**	349	231	366	386	353
	Leased	381	283	727	514	505	132	276	676	409	476	634	95
	Total	934	519	1186	836	842	476	499	1025	640	842	1020	448
Albacore	Brazilian	151	185	63	173	191	171	66	63	61	57	68	41
	Leased	216	204	187	517	472	280	226	436	262	328	372	234
	Total	367	389	250	690	663	451	292	499	323	385	440	275
Bigeye tuna	Brazilian	167	174	102	188	127	136	43	67	55	54	34	24
	Leased	405	393	341	452	378	522	364	789	691	885	471	395
	Total	572	567	443	640	505	658	407	856	746	939	505	419
Swordfish	Brazilian	213	1125	405	613	471	341	321	417	469	555	550	251
	Leased	200	409	223	321	283	122	227	304	511	470	241	142
	Total	413	1534	628	934	754	463	548	721	980	1025	791	393
Billfishes	Brazilian	71	125	77	84	83	148	219	356	189	214	280	95
	Leased	142	47	10	74	47	28	63	68	61	86	61	63
	Total	213	172	87	158	130	176	282	424	250	300	341	158
Others	Brazilian	205	303	34	46	2	8	8	37	21	12	9	16
	Leased	170***	2	3	3	5	6	3	7	1	3	6	-
	Total	375	305	37	49	7	14	11	44	22	15	15	16
TOTAL	Brazilian	1360	2148	1140	1426	1211	1148	880	1289	1026	1258	1327	780
	Leased	1514	1338	1491	1881	1690	1090	1159	2280	1935	2248	1785	929
	Total	2874	3486	2631	3307	2901	2238	2039	3569	2961	3506	3112	1709

*Data for January-June.
**Includes albacore and bigeye.
***May include sharks and dolphins (Coriphaena hippurus).

Table 3. Catches (MT) of tunas and tuna-like fishes taken by the Brazilian and Japanese-leased baitboat fleets, 1979-1990

Species	*Fleet*	*1979*	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1988*	*1989*	*1990**
Skipjack tuna	Brazilian	1818	6070	13620	16299	11673	7379	14038	14322	9359	9963	14217	8682
	Leased	-	-	-	1714	3660	5708	11014	8220	6794	7264	6331	5722
	Total	1818	6070	13620	18013	15333	13087	25052	22542	16153	17227	20548	14404
Yellowfin tuna	Brazilian	117	392	910	1027	1737	1169	1890	624	1379	1446	1331	237
	Leased	-	-	-	4	40	129	286	127	180	149	45	32
	Total	117	392	910	1031	1777	1298	2176	751	1559	1595	1376	269
Others**	Brazilian	169	384	45	146	325	589	463	446	643	342	184	90
	Leased	-	-	-	43	14	41	57	19	-	3	1	24
	Total	169	384	45	189	339	630	520	465	643	345	185	114
TOTAL	Brazilian	2104	6846	14575	17472	13735	9137	16391	15392	11381	11751	15732	9009
	Leased	0	0	0	1761	3714	5878	11357	8366	6974	7416	6377	5778
	Total	2104	6846	14575	19233	17449	15015	27748	23758	18355	19167	22109	14787

*Data for January-June.

**Includes albacore, bigeye and small tunas; data for the period 1979-1983 may include dolphins (Coriphaena hippurus) and other species.

NATIONAL REPORT OF CANADA

by

Douglas Clay[1], Thomas Hurlbut[1] and Julie M. Porter[2]

1. STATUS OF THE FISHERIES

1.1 Bluefin tuna

The Canadian nominal catch of Atlantic bluefin tuna for the calendar year 1989[3] was 3,532 fish weighing 633.6 MT (round), not including 5 fish that disappeared from the St. Margaret's Bay traps (compared to 2,788 fish weighing 391 MT (round) in calendar year 1988). This substantial increase is primarily the result of catches of small, adult bluefin off southwest Nova Scotia (N.S.) (between Browns Bank and the northeast peak of Georges Bank - averaging 172 kg (round)) and the Virgin Rocks area (central Grand Banks of Newfoundland - averaging 345 kg (round)). Although these fisheries occur a considerable distance offshore (< 200 km) the vessels participating are similar to those used in the traditional inshore tended line fishery, although slightly larger.

Eight hundred and seventy of the fish landed were caught by two offshore longline vessels operated by Canadian companies. This was the third year of this experimental offshore project. Fishing effort in this fishery was directed towards non-regulated tuna species (i.e., bigeye, albacore and yellowfin), and was encouraged by a 35 MT per vessel by-catch limit for bluefin tuna. The bluefin landed in this fishery were considerably smaller (average weight 61.2 kg - round weight) than those landed by the traditional inshore fisheries. The catches (in MT and numbers of fish) for this offshore large pelagic fishery from 1987 to 1989 were:

Authorship assigned alphabetically.

[1] Marine and Anadromous Fish Division, Gulf Fisheries Center, Department of Fisheries and Oceans, P. O. Box 5030, Moncton, New Brunswick, Canada E1C 9B6.

[2] Marine Fish Division, Biological Station, Department of Fisheries and Oceans, St. Andrews, New Brunswick, Canada E0G 2X0.

[3] The Canadian bluefin tuna fishing year runs from May 1 of the year to April 30 of the following year. The fishing year 1988 was the "catch up" year to begin this new reporting system. The nominal catches for fishing years 1988 and 1989 were 445.1 MT and 581.8 MT, respectively. Canada's statement giving notice to this change can be found in Appendix 5 to Annex 6 of the 1988 Biennial Report (1988-89).

Original report in English.

	1987 mass/number		1988 mass/number		1989 mass/number	
Bluefin tuna*	33	332	104	1490	53	870
Bigeye tuna	144	3942	95	2584	31	884
Albacore	21	811	47	1856	22	1226
Yellowfin	40	1022	30	771	7	290
Swordfish*	15	163	16	261	6	131

*Species regulated by Canadian quota regulations.

The two Canadian companies engaged in the offshore longline fishery have acquired their own vessels: the "Aquatic Pioneer" based in Newfoundland and the "Pelagic 1" based in Nova Scotia. These vessels both began fishing in the early summer of 1989.
Only three bluefin were harvested in the St. Margaret's Bay, Nova Scotia, trap fishery (5 fish were lost before harvest).

The mean weight of bluefin caught in the Gulf of St. Lawrence in 1989 was 458 kg (round), representing an increase of nearly 30 kg from the 1988 mean weight.

1.2 Swordfish

The Canadian nominal catch of swordfish in 1989 was 1,243 MT (round weight), taken mainly by longline with smaller catches by the harpoon fishery (146 MT).

The mean weight (round) of longlined swordfish caught off Nova Scotia (ICCAT area 02) was 52 kg (n=3,432) while the mean weight of swordfish caught off the tail of the Grand Banks of Newfoundland (ICCAT area 14) was 50 kg (n=470). The mean weight of Nova Scotia harpooned fish was 129 kg (n=637). These weights are similar to those in 1988 (Table 1).

2. RESEARCH STUDIES

2.1 Bluefin tuna

No biological sampling was conducted on the traditional inshore rod and reel or tended line fisheries; however, there was extensive sampling carried out on both the offshore Japanese and Canadian longline fisheries while within the Canadian EEZ.

Individual dressed weights were recorded for all fish landed in the traditional fisheries and observers collected length frequencies (to the nearest cm) from all fish caught in the offshore longline fisheries. An analysis was conducted on available historical sampling data to provide a variety of conversion factors between length and weight.

An analysis of log records (Table 2) collected from inshore vessels in 1989, indicated that the CPUE for the traditional fishery off Prince Edward Island decreased from 0.06

fish per reported vessel day in 1988 to 0.04 fish per reported vessel day (this CPUE index was calculated for fishermen that submitted logs documenting at least 10 days of fishing).

2.2 Swordfish

In 1989, a new research program was established for swordfish based at the Biological Station, St. Andrews, New Brunswick. Port sampling for individual weights of fish was conducted, contacts with industry were established and scientists observed the fisheries first hand. Research on swordfish ageing and growth studies has been initiated with intensive sampling beginning in 1990.

3. MANAGEMENT

3.1 Bluefin tuna

In Canada the bluefin tuna fishery is regulated under the federal Fisheries Act. The regulations for the Atlantic bluefin tuna fishery contain several broad provisions (see Canadian National Report for 1988).

In 1989, 747 licenses were issued to fishermen participating in the traditional inshore bluefin fisheries (this does not include the two offshore longline operations).

There have been no new licenses issued since the implementation of quotas by ICCAT in 1982, although twelve temporary licenses were issued in 1988 and 1989 to fishermen in Newfoundland. The distribution of licenses by province and by Department of Fisheries and Oceans (D.F.O.) administrative region is as follows:

Province	*# of Licenses*
New Brunswick (N.B.)	117
Newfoundland (Nfld.)	29
Nova Scotia (N.S.)	167
St. Margarets Bay (S.M.B.)*	20
Prince Edward Island (P.E.I.)	361
Quebec (Que.)	53
TOTAL	747

D.F.O. Administrative Region	*# of Licenses*
Gulf (N.S.,N.B. and P.E.I.)	613
Newfoundland	29
Scotia-Fundy (N.S.)	32
St. Margarets Bay (S.M.B.)*	20
Quebec	53
TOTAL	747

*Small pelagics trap-net licenses with by-catch of bluefin tuna.

In 1989 a new quota management system based on the "quarterly performance" of the fishery in each bluefin management area was adopted for the inshore and nearshore fisheries. This system was employed with some minor refinements for the 1990 fishing year (See Canadian National Report for 1989).

The following table lists the 1990 dates by D.F.O. bluefin tuna management area for the quarterly management system:

Bluefin Tuna Management Area	*1st Quarter*	*2nd Quarter*	*3rd Quarter*	*4th Quarter*
1) Prince Edward Island	1/8/89 to 6/9/89	7/9/89 to 17/9/89	18/9/89 to 2/10/89	3/10/89 to 31/12/89
2) Newfoundland	15/8/89 to 31/8/89	1/9/89 to 30/9/ 9	1/10/89 to 15/10/89	16/10/89 to 31/12/89
* - Rod and Reel Only	12/7/89 to 31/8/89			
3) New Brunswick	1/8/89 to 1/9/89	2/9/89 to 15/9/89	16/9/89 to 30/9/89	1/10/89 to 15/11/89
4) Quebec	1/8/89 to 31/8/89	1/9/89 to 15/9/89	16/9/89 to 30/9/89	1/10/89 to 15/11/89
5) Nova Scotia: Gulf of St. Lawrence	1/8/89 to 15/9/89	16/9/89 to 19/10/89	20/10/89 to 24/10/89	25/10/89 to 15/11/89
6) Nova Scotia: Southwest (Atlantic)	28/8/89 to 10/9/89	11/9/89 to 17/9/89	18/9/89 to 24/9/89	25/9/89 to 1/10/89
7) Nova Scotia: St. Margaret's Bay (Traps-Atlantic)	1/6/89 to 14/6/89	15/6/89 to 30/6/89	1/7/89 to 19/7/89	20/7/89 to 15/8/89

The modifications to the 1989 plan included refinements to the dates of the "quarters" and a maximum catch limit of 105 MT imposed on each bluefin tuna management area. This catch limit is to be subject to review later in the year in order to facilitate reallocation of any remaining bluefin tuna quota.

The two offshore longline operations were again limited to a by-catch allocation of bluefin tuna that is not to exceed 35 MT each.

3.2 Swordfish

Swordfish longline licenses were issued to 70 vessels in 1989, unchanged since 1987. On the edge of the Scotian Shelf off Nova Scotia and off the tail of the Grand Banks of Newfoundland where the swordfish fishery occurs, there were 52 active longline licenses. Harpoon licenses were issued to more than 900 vessels (some also have longline licenses).

The swordfish fishery on the Atlantic coast was subject to the following management measures in 1989 (no change from 1988):

1) quota of 3,500 MT;
2) allowance for the harvest of all tunas with the exception of bluefin;
3) no gill netting of swordfish is permitted;
4) number of longline licenses limited (since 1984) to a maximum of 70 (strict vessel replacement restrictions apply);
5) establishment of a 60-MT (maximum) swordfish quota for both of the Canadian offshore developmental longline vessels; and
6) a limit of 125 MT of swordfish (not within the Canadian quota) taken by Japanese longline vessels within the Canadian EEZ.

4. SPECIAL MEETINGS

The D.F.O. sent Dr. D. Clay to attend the "World Bluefin Tuna Meeting" in La Jolla, California. He was chairmen of the session on "Parameter Estimates" and was asked to act as editor of the review paper on northern Atlantic and Mediterranean bluefin.

5. TUNA PROCESSING

The only tuna cannery on Canada's Atlantic coast closed in mid-year 1990. This cannery has had a difficult history in recent years and at the present time there is little optimism regarding its future operation.

6. PRELIMINARY INFORMATION FOR 1990

6.1 Bluefin

The nominal Canadian landings as of October 24, 1990 were approximately 492 MT (round weight) from the inshore and nearshore fisheries, and 25 MT from the offshore longline fishery.

Both of the offshore longline vessels were fishing in January of this year but the vessel from Nova Scotia, the 'Pelagic 1' ceased fishing the same month and is no longer involved in the fishery. Reports indicate that the vessel from Newfoundland experienced low catch rates early in the year, but catches improved and the vessel is actively fishing at present.

The nominal catch of bluefin in the St. Margaret's Bay trap fishery was five fish.

Fishing for bluefin has now (24/10/90) concluded in all the traditional inshore areas except St. Georges Bay, N.S. in the Gulf of St. Lawrence, which traditionally commences in the late fall.

A promising fishery for bluefin in the waters adjacent to Canso, N.S. (Atlantic coast) has occurred in the past two years. The management plan for participants in this fishery restricts the gear to rod and reel only. Fishing is continuing in this area with fishermen from New Brunswick, Prince Edward Island and Nova Scotia participating. The average size of fish landed in this fishery is approximately 400 kg (round weight).

Fishing is also continuing near the Virgin Rocks (Newfoundland) and between Georges Bank and Browns Bank; however, reports indicate that the school(s) of bluefin are becoming more dispersed at this time. Fishermen from Quebec, New Brunswick, Prince Edward Island and the Gulf coast of Nova Scotia were active in these fisheries during the first half of the season.

Some bluefin have been seized by enforcement personnel and legal action is pending, but the serious illegal fisheries of 1988 and 1989 have been considerably curtailed as a result of enhanced enforcement measures in 1989 and 1990.

A multiple census, mark-recapture tagging experiment was conducted on the Browns Bank bluefin tuna aggregation in an attempt to estimate the school size during the fishing period.

6.2 Swordfish

The domestic quota for 1990 is 3500 MT, with 70 longline and 640 harpoon licenses issued. Records thus far (30 October 1990) indicate the fishery has landed more than 1200 MT and is still in progress.

The scientific research program is as follows:

1) at-sea sampling on commercial harpoon and longline boats for the duration of the fishery (July to October); hard parts for ageing and growth studies, fecundity data, morphometrics and stomach contents.
2) Biological Sciences Branch, Department of Fisheries and Oceans swordfish longlining cruise to collect the above data, as well as data on bait robbing and by-catch. Collaborative studies on metabolism in large pelagic fishes and growth and population structure in swordfish conducted with the University of Guelph and the Royal Ontario Museum.
3) Development Branch, Department of Fisheries and Oceans conducting a study to determine the influence of hook size on the size of swordfish captured by longline.
4) Improved catch and individual weight data collection from the commercial swordfish fishery.

Table 1. Summary of 1988 and 1989 swordfish catch, average weight of fish (round weights) and number of boats

		1988	*1989*
Catch (MT)			
	longline	869	1,097
	harpoon	25	146
	Total	894	1,243
Average size (kg)			
	longline	50	52
	(# sampled)	(1,315)	(3,902)
	harpoon	--	129
	(# sampled)	(0)	(637)
Number of boats			
	longline	39	52
	harpoon	undetermined number	

Table 2. Four indices of bluefin tuna abundance from the west Atlantic expressed as fish caught per day. Rod and reel (R&R) and tended line (TL) are the only two gears utilized in these series. The rod and reel pre-1981 are not considered comparable to the rod and reel post 1981 - see SCRS/88/71

	P.E.I.		*Nova Scotia*		*New Brunswick*		*Quebec*	
Year	*R&R*	*Tended Line*	*R&R*	*Tended Line*	*R&R*	*Tended Line*	*R&R*	*Tended Line*
1975	.09		.01		.20			
1976	.125				.21			
1977	.09		.01		.22		.18	
1978	.09		.04		.06			
1979	.07				.13			
1980	.07		.06		.19			
1981		.21	.05			.03		
1982	.06	.19	.09	.05	.10	.07		.03
1983	.08	.13	.01	.03	.29	.38	.04	.06
1984	.03	.09	.15	.01	.12	.08		.04
1985	.02	.05				.05		
1986	.02	.05				.04		.03
1987		.04				.04		
1988		.06				.00		
1989		.04						

NATIONAL REPORT OF FRANCE

1. STATUS OF THE FISHERY

	1980	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1988*	*1989*
YFT	43.6	40.6	29.2	31.9	5.8	9.8	16.6	16.6	21.6	30.6
SKJ	22.5	27.2	26.1	20.5	13.2	8.5	11.7	15.1	16.3	15.6
BET	0.8	0.4	3.0	6.0	2.1	4.4	4.6	3.4	3.8	2.8
ALB	4.2	3.3	3.6	3.0	2.9	2.2	1.2	2.0	2.8	3.7
BFT	1.7	2.4	5.0	4.1	4.2	5.6	3.8	4.9	6.2	4.9
TOTAL	72.8	73.9	66.9	65.5	28.2	30.5	37.9	42.0	50.7	57.6

Catches of tunas by the French fleet fishing in the Atlantic in 1989 amounted to 57,600 MT, an increase of 14 percent from the 1988 level. Catches have doubled since 1984, increasing steadily between 1984 and 1989.

1.1 Bluefin tuna

In 1989, twenty-four purse seiners took 4,400 MT of bluefin tuna. In the Atlantic Ocean, the catches for the same year were 306 MT for baitboats, and by-catches were made by other gears targeting albacore (31 MT for the gillnets and 22 MT for the pelagic trawls).

1.2 Albacore

The renewed interest in Atlantic albacore fishery, thanks to the new fishing gears, was confirmed. Of a total catch of 3,700 MT in 1989, the gillnet-trollers caught 1,400 MT (37 boats), the trawlers-trollers took 2,240 MT (36 pairs of boats) and the traditional trollers took 70 MT (5 boats).

1.3 Tropical tunas

Fishing effort for the tropical tuna fishery was stable in 1989, while the catch increased sharply as a result of the very high catch rates of large yellowfin in the first quarter of 1989.

Original report in French.

Catches by the Dakar-based baitboats rose to 9,500 MT for the 13 vessels in operation; the purse seine catch reached 40,400 MT, being a new record since 1984 in spite of the stable fishing effort (11 seiners). This high catch was composed of 70 percent yellowfin and 27 percent skipjack; the catch rates of these two species were excellent, particularly for yellowfin.

Detailed fishery statistics and sampling of the two fleets were submitted to ICCAT.

2. RESEARCH

2.1 Bluefin tuna

Sampling continued in the Mediterranean on the landings of bluefin tuna. The sampling rate established from the data collected at the wholesale fish markets is 46 percent of the total caught in 1989. France participated in the two international meetings in La Jolla and Bari, during which the scientists were able to compare their work on bluefin tuna and on other species.

2.2 Albacore

Atlantic Ocean

A joint French-Spanish research program, co-financed by the EEC, began in June, 1989. Its objective is to study the interactions between the different surface fisheries, according to the 1988 SCRS recommendation. This program includes placing observers on board and direct observation of the behavior of the tunas in conjunction with the new fishing gears. This was achieved in October, 1990. France also participated in 1990 in the ICCAT Albacore Research Program with on-board observers and sampling of hard parts (otoliths and spines). These activities are in progress. France participated in the ICCAT Albacore Workshop in September, 1990.

Mediterranean Sea

The surveys carried out annually by the "Roselys II", IFREMER vessel, led to a better definition of areas of concentration of this species along the French coasts of the Mediterranean, in relation to hydroclimatic factors. In 1988, 1,674 albacore were caught in 20 days fishing. In 1989, the meteorological conditions allowed for catching only 626 fish; more than 2,200 fish were tagged at that time and the recoveries of tagged fish in 1988 led to the hypothesis that the fish return to the same area year after year.

2.3 Tropical tunas

Research on tropical tunas is done by French scientists from ORSTOM working in collaboration with research centers in Senegal, Côte d'Ivoire and Venezuela. Present studies concern the biology and stock evaluations of yellowfin, skipjack and bigeye.

Of particular importance in 1989 was research on the relationships between the environment and tunas.

French research carried out on tunas permitted scientists to present to the SCRS in 1990 eight scientific documents; these documents appear in the List of SCRS Documents (Appendix 3 to Annex 10) and/or in the Collective Volume of Scientific Papers, Vols. XXXIV and XXXV.

NATIONAL TUNA REPORT OF GHANA

1. THE FLEET

Only baitboats continued to operate from Ghana in 1989. The number increased by 4, from 29 in 1988 to 33 in 1989. They were all Ghana flag vessels. The gross registered tonnage of the 33 vessels ranged between 250 and 500.

2. THE FISHERIES

The fleet operated largely in the traditional ICCAT quadrants 1 and 4. As usual, skipjack continued to be the dominant species caught, followed by yellowfin and bigeye. These landings are tabulated in the table below; the quantities are the adjusted values based on multispecies sampling:

Species	*Landings (in MT)*
Yellowfin tuna	6,855
Skipjack tuna	22,163
Bigeye tuna	2,064
Atl. black skipjack	1,212
Total	32,294

Effective October 1, 1989, the Ghana flag vessels resumed transshipment of export tuna from Tema; thus, such operations from Abidjan ceased from that date.

3. RESEARCH AND STATISTICS

Until October 1, 1989, most of the normal port sampling for multispecies estimation, length frequency distribution, collection and the initial processing of Ghana tuna data were carried out by the "Centre de Recherches Océanographiques" (CRO) in Abidjan. However, since that date when total discharges were done in Tema, such research and statistical work has been carried out by the Research and Utilization Branch of the Fisheries Department.

A total of 10,435 yellowfin, 3,460 bigeye and 20,053 skipjack were measured during the year. All the necessary data and information have been submitted on the relevant forms to ICCAT.

Original report in English.

NATIONAL REPORT OF JAPAN

by

National Research Institute of Far Seas Fisheries

1. FISHING ACTIVITIES

The Japanese tuna fishery has operated recently in the Atlantic with the use of two gear types: longline and purse seine. The 1989 Japanese catch of Atlantic tunas and billfishes is estimated to amount to 53,183 metric tons (MT), 92 percent of which was taken by the longline fishery (Table 1). The 1989 total is about the same as that in 1988. The purse seine catch in 1989 was slightly less than 4,500 MT. In 1989, no substantial change in fishing pattern of either fishery was reported.

1.1 The longline fishery

The number of Japanese longliners operating widely in the Atlantic in 1989 is 239 which is highest in the last six years (Table 2). The longline catch in 1989 was estimated to be about 49,000 MT, which resulted in a small change (about 3 percent increase) from the 1988 catch (Table 3). Although the 1989 catch of bigeye tuna decreased slightly to 30,500 MT (63 percent of the total), the predominance of the species in the total longline catch has remained unchanged for more than a decade. Other important species in the longline catch, in order of quantity were: yellowfin, swordfish, and albacore. The yellowfin tuna catch increased from 4,051 MT in 1988 to 5,429 MT in 1989. In 1989, up to now the operational pattern of the longline fleet was similar to that of 1988.

1.2 The purse seine fishery

In 1989, only one purse seiner operated. The operational pattern of this fishery has been stable in recent years. The catch in 1989 was 4,453 MT, which was almost exclusively composed of skipjack and yellowfin tunas (Table 4).

2. ICCAT REGULATIONS

Since the initiation of the fishery regulations set by the International Commission for the Conservation of Atlantic Tunas (ICCAT) for bluefin, yellowfin, and bigeye tunas,

Original report in English.

Japanese fishermen have been concurrently under national regulatory measures. To comply with the bluefin tuna regulations, an areal closure has been in effect in the Mediterranean Sea from May 21 to June 30 since 1975, and in the Gulf of Mexico throughout the year since 1982.

These closures have been effective in reducing the fishing mortality on the spawning stock. In recent years, the entry of Japanese longliners in the northwestern Atlantic and Mediterranean Sea has been limited to certain numbers. In addition, the bluefin catch has been monitored in the western and eastern Atlantic. To monitor the longline fleet, a government patrol boat has been dispatched to the Atlantic Ocean, especially in the Mediterranean Sea during the closure periods previously mentioned. The purse seine fleet has also been under national regulation in accordance with the ICCAT 3.2 kg size limit for yellowfin and bigeye tunas.

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 to conduct 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 intersessional workshops of the Standing Committee on Research and Statistics (SCRS).

3.1 Fishery data

The NRIFSF reported final 1988 catch, catch/effort and size frequency data (Task I, II and biological sampling) of the longline fishery to the ICCAT Secretariat. The compilation of the same data for 1989 is in progress. The preliminary 1989 catch estimates are given in this report. The size data for swordfish, albacore, and bluefin tuna in 1989 were prepared and presented to the SCRS meeting. The quick reporting system of log-books and size data by on-board sampling at a port of call has been effective since its inception in April, 1984. The 1989 Task I and II data from the purse seine fishery were finalized and reported to ICCAT.

3.2 Tuna biology and stock assessment

The biological and stock assessment studies carried out by the NRIFSF on Atlantic tunas and billfishes have continued. Among the five papers presented at the 1990 SCRS meeting, including this national report, two papers were on swordfish and two others related to bluefin stock analysis.

This year the NRIFSF scientists participated in the GFCM-ICCAT Joint Meeting on the Evaluation of Stocks of Large Pelagic Fish in the Mediterranean and the ICCAT Swordfish Stock Assessment Session.

4. PAPERS PRESENTED TO THE 1990 SCRS

Documents presented to the SCRS in 1990 are listed in Appendix 3 to Annex 10 and/or are published in the Collective Volume of Scientific Papers, Vols. XXXIV and XXXV.

Table 1. Japanese catches (MT) of tunas and tuna-like fishes by type of fisheries, in the Atlantic Ocean and Mediterranean Sea, 1984-1989

Type of fishery	*1984*	*1985*	*1986*	*1987*	*1988*	*1989*
Total	42,566	53,731	39,046	34,471	53,213	53,183*
Longline (Home-based)	39,095	48,505	33,241	29,300	47,326	48,730*
Pole-and-line	565	--	--	--	--	--
Purse seine	2,906	5,226	5,805	5,171	5,887	4,453

*Preliminary.

Table 2. Annual number of Japanese tuna boats operating in the Atlantic Ocean, 1984-1989

Type of fishery	*1984*	*1985*	*1986*	*1987*	*1988*	*1989*
Longline (Home-based)	212	208	190	146	183	239
Pole-and-line	2	--	--	--	--	--
Purse seine	1	2	2	2	2	1

Table 3. Catches (MT) of tunas and tuna-like fishes taken by the Japanese longline fishery, 1984-1989

	1984	*1985*	*1986*	*1987*	*1988*	*1989**
Atlantic						
Albacore	800	1,467	1,209	851	1,128	1,470
Bigeye tuna	24,310	31,602	22,800	18,575	31,664	30,500
Bluefin tuna	2,210	1,517	1,323	1,860	2,278	1,300
S. Bluefin	1,636	1,468	389	1,120	548	600
Yellowfin tuna	3,967	5,308	3,404	3,364	5,982	7,400
Swordfish[1]	3,770	4,309	2,653	2,294	4,051	5,429
Blue marlin[2]	833	1,090	508	438	823	1,100
White marlin	76	126	129	134	144	170
Sailfish[3]	97	122	99	43	79	60
Others	342	468	378	341	366	500
Atl. Subtotal	38,041	47,477	32,892	29,020	47,063	48,529
Mediterranean						
Bluefin tuna	1,036	1,006	341	280	258	200
Swordfish	19	14	7	3	4	1
Bigeye tuna	--	--	1	--	--	--
Med. Subtotal	1,055	1,020	349	283	262	201
TOTAL	39,096	48,497	33,241	29,303	47,325	48,730

*Preliminary.
[1]This value was revised at the SCRS Meeting.
[2]Includes minor amount (less than 30 MT) of black marlin.
[3]Includes shortbill spearfish.

Table 4. Catches (MT) of tunas taken by the Japanese Atlantic purse seine fishery, 1984-1989

	1984	*1985*	*1986*	*1987*	*1988*	*1989*
TOTAL	2,906	5,226	5,805	5,171	5,887	4,453
Bigeye tuna	23	10	1	--	14	38
Yellowfin tuna	1,516	2,789	3,152	3,010	2,221	1,873
Skipjack tuna	1,367	2,427	2,652	2,161	3,652	2,542
Albacore	--	--	--	--	--	--

NATIONAL REPORT OF KOREA

by

National Fisheries Research and Development Agency

1. FISHING ACTIVITIES

The Korean tuna fleet fishing in the Atlantic Ocean has decreased continuously in number of vessels since 1977. This fleet was comprised of 29 longliners in 1988. However, the fleet increased to 33 longliners in 1989 (Table 1).

The total Korean commercial catch of tunas and tuna-like fishes amounted to 12,507 MT in 1989, an increase of 60 percent compared to the 1988 catch (Table 2).

The catch composition, by major species, is as follows:

Bigeye tuna	7,896 MT (63 percent of the total catch)
Yellowfin tuna	2,535 MT (20 percent of the total catch)

There have been no significant changes in the fishing pattern or fishing grounds for Korean tuna longliners in recent years. Bigeye tuna is one of the major species since the introduction of Korean deep longline in 1980 in the Atlantic Ocean (Table 3).

2. RESEARCH ACTIVITIES

The National Fisheries Research and Development Agency (NFRDA) collected catch and effort data as well as size data on tunas and related species from the commercial fishing vessels as in the past. Catch, catch/effort (Task I, II) and size frequency data for 1989 were regularly sent to the ICCAT Secretariat. The Annual Bulletin of Korean Longline Catch and Effort Statistics and Fishing Grounds for 1986 to 1987 was published this year.

Original report in English.

Table 1. Number of Korean tuna vessels in the Atlantic Ocean, 1977-1989

Type of Gear	*1977*	*1978*	*1979*	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1988*	*1989*
Longline	120	97	66	54	56	52	53	51	45	28	29	29	33
Pole and line	15	20	18	16	8	4	4	1	1	--	--	--	--
Total	135	117	84	70	64	56	57	52	46	28	29	29	33

Table 2. Korean catches (MT) of Atlantic tunas and tuna-like fishes by type of gear, 1977-1989

Type of Gear	*1977*	*1978*	*1979*	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1988*	*1989*
Longline	38,849	29,094	20,069	18,952	22,306	21,033	16,224	14,785	17,454	9,965	7,625	7,801	12,507
Pole and line	6,202	10,364	17,188	9,901	9,529	3,503	1,697	969	250	--	--	--	--
Total	45,051	39,458	37,257	28,853	31,835	24,536	17,921	15,754	17,704	9,965	7,625	7,801	12,507

Table 3. Nominal catches (MT), by species, of tunas and tuna-like fishes taken by the Korean Atlantic longline fishery, 1977-1989

Year	BFT	YFT	ALB	BET	SKJ	SWO	BUM	WHM	SAI	Other bill-fishes	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

NATIONAL REPORT OF PORTUGAL

by

J. Pereira[1]

1. THE TUNA FISHERY

Portuguese tuna fishing takes place mostly in the Azores and in Madeira, where the local baitboat fleets seasonally catch tunas with live bait. Off continental Portugal, tunas are taken incidentally by different gears, such as longline, purse seine and driftnets.

The surface longline fisheries, targeting swordfish, operate around continental Portugal and the Azores. The longliners based in Portugal increased their area of operation in the last few years.

Catches of tunas and tuna-like species reached 17,736 MT in 1988 and 13,267 MT in 1989. After an increase in the last few years, the catches decreased in 1989, which reflects the low catches of skipjack in the Azores in 1989.

Tables 1, 2 and 3 summarize the catches of tunas and tuna-like species made in the Azores, Madeira and continental Portugal, respectively, during the last few years.

Preliminary estimates of catches made during the first three quarters of 1990 indicate a catch of 3,688 MT in Madeira and 6,716 MT in the Azores.

2. THE TUNA FLEET

The Portuguese tuna fleet is comprised of baitboats in the Azores and Madeira, 20-25 longliners based in continental Portugal, and some longliners in the Azores.

The number of baitboats, classified by gross tonnage (GRT), which comprise the fleets of the Azores and Madeira is shown in Tables 4 and 5.

The Azorean baitboat fleet has developed during the last few years in that the boats have more autonomy and refrigeration capacity, which allows them to extend the duration of the cruises and the fishing areas. Since 1984, several new baitboats have entered the Azorean fishery: 3 in 1986, 6 in 1987, 7 in 1988, 4 in 1989, and 5 in 1990.

A baitboat with live bait operated within the EEZ of continental Portugal in 1988 and 1989, as part of the experimental fishing program.

The number of vessels in the Azorean longline fleet remained stable. In 1988 there were seven boats, of which four were in the 150-200 GRT category; the remainder are less than 50 GRT. The development of the longline fleet which operated in the continen-

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Original report in French.

tal EEZ is also part of the experimental program which has been in operation during the last few years.

As concerns the sport fishery, the Azorean fleet is presently comprised of seven speed boats.

3. RESEARCH

The main organisms participating in research programs on tunas are the Department of Oceanography and Fisheries of the University of Azores, the Fisheries Research Laboratory in Madeira, and the National Institute of Fisheries Research (INIP) in continental Portugal.

The collection of tuna statistics and size sampling of the main species continued. Since 1989, the number of tunas sampled in the Azores has increased considerably, due to an increase in the coverage of sampling points. The data are sent regularly to ICCAT and the scientific results are also presented to the SCRS and working group meetings.

The developing sport and longline fisheries in the Azores, which target swordfish, are closely monitored. Scientific activities conducted include the collection of catch, effort and biological data.

Since 1988, satellites maps of surface temperatures were distributed regularly to the baitboats in Azores and Madeira. Comparisons between the environment, distribution and vulnerability of skipjack to surface gears on the southern coast of Portugal were analyzed.

In 1989 and 1990, an experiment with a longliner targeting swordfish was carried out in Madeira. This experiment was monitored by Madeiran scientists, and detailed data were collected, especially on the sizes of swordfish caught and on the catch rates of the fishery.

Some attempts to catch skipjack using live bait were also made in southern continental Portugal in 1989. Monitoring of these experiments by INIP scientists included the collection of biological data on the species caught and the catch rates of the fishery.

Table 1. Catches of tunas and tuna-like species (MT) made in the Azores, 1986-1989

	1986	*1987*	*1988*	*1989*
Bigeye tuna	5,453	3,877	764	2,758
Skipjack	5,032	7,932	13,751	5,921
Albacore	436	401	142	127
Yellowfin tuna	34	--	--	1
Bluefin tuna	151	58	--	--
Others	170	393	236	135
TOTAL	11,276	12,661	14,893	8,942

Table 2. Catches of tunas and tuna-like species (MT) made in Madeira, 1986-1989

	1986	*1987*	*1988*	*1989*
Bigeye tuna	1,698	593	1,395	2,189
Skipjack	329	79	357	1,752
Albacore	13	29	29	39
Yellowfin tuna	10	44	93	3
Bluefin tuna	1	3	29	3
Others	41	12	7	10
TOTAL	2,092	760	1,910	3,996

Table 3. Catches of tunas and tuna-like species (MT and gilled and gutted weight), by gear, made in the EEZ of continental Portugal in 1989

	LL	*PS*	*UNCL*	*TOTAL*
Bigeye tuna		0.4	13.3	13.7
Skipjack tuna			9.7	9.7
Albacore			2.9	2.9
Yellowfin tuna		0.8	0.4	1.5
Bluefin tuna			0.2	0.2
Bonito		31.9	15.7	47.6
Atl. black skipjack		1.1	90.0	91.1
Frigate tuna		1.3	2.3	3.6
Swordfish	153.8	0.4		154.2
Others		3.3	0.8	4.1
Total	153.8	38.6	135.2	328.6

Table 4. Distribution of the Azorean baitboat fleet by gross registered tonnage (GRT), 1984-1989

GRT	*1984*	*1985*	*1986*	*1987*	*1988*	*1989*
< 50	11	11	12	14	8	5
50-100	18	19	19	19	18	15
101-150	1	1	4	7	11	11
> 150	0	0	0	3	4	8
TOTAL	30	31	35	43	41	39

Table 5. Distribution of the Madeiran baitboat fleet by gross registered tonnage (GRT), 1984-1989

GRT	*1984*	*1985*	*1986*	*1987*	*1988*	*1989*
< 50	17	21	26	19	22	20
50-100	5	5	6	7	10	10
101-150						1
> 150						4
TOTAL	22	26	32	26	32	35

NATIONAL REPORT OF SOUTH AFRICA

by

A. J. Penney[1]

1. THE TUNA FISHERY

Total reported South African tuna catches during 1989 increased by 50 percent over 1988 to 6,669 tons, 83 percent of which consisted of albacore. Approximately 40 percent of this total was only reported on tuna dealer returns, which were not available prior to 1989, and were not reflected in commercial catch logbooks. It therefore appears that catches have been significantly under-reported in commercial logbooks in the past. It is probable that the 1988 catch was only slightly less than that in 1989, and that the 1989 catch exceeded the reported figure.

The increased catch resulted from a 53 percent increase in the reported catch of albacore by the pole-and-line fishery off the west coast and a five-fold increase in the by-catch of yellowfin tuna. By-catches of bigeye and skipjack tuna decreased by a third. There was no directed tuna longline or purse seine effort. As a result of effort reduction in the hake and kingklip longline fishery and a prohibition on directed commercial catches of broadbill swordfish, a minimal swordfish longline by-catch was reported.

2. TUNA RESEARCH

2.1 Catch and Effort Data Collection

Catch and effort data continued to be collected on commercial catch returns submitted by 115 tuna vessels and approximately 3,000 other line fishing vessels. Monitoring of tuna catches was greatly improved by the introduction of a dealer return system to all major tuna dealers. Summaries of submitted dealer returns indicated a total catch 40 percent higher than that obtained from commercial catch returns. It appears that the dealer return total is also underestimated to some extent.

2.2 Length-Frequency Sampling

South Africa continued to monitor and sample transshipments of tuna caught by Taiwanese tuna vessels in Cape Town harbour on behalf of ICCAT. Transshipment activity decreased during the year and only 2,584 albacore were measured from 28 vessels transshipping 3,243 MT of albacore and 108 tons of other tuna species. A further 1,150 albacore were measured from 13 pelagic driftnet vessels that transshipped 2,221 MT of

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Original report in English.

albacore and 783 MT of other tuna in Cape Town. Continued staff shortages curtailed sampling of South African catches and only 1,027 albacore were measured from 10 discharges.

2.3 Environmental Research

A number of multi-disciplinary research cruises were conducted in tuna fishing areas, during which various physical, chemical and biological surveys were conducted.

Table 1. Total reported South African tuna catches during 1988 and 1989

Species	*Catch (tons)*	
	1988	*1989*
Albacore	3,599	5,525
Yellowfin tuna	122	664
Bigeye tuna	547	378
Skipjack tuna	157	102
Swordfish	9	--
TOTAL	4,434	6,669

NATIONAL REPORT OF SPAIN

by

The Spanish Institute of Oceanography

1. STATUS OF THE FISHERIES

Spanish catches of tunas and tuna-like species amounted to 156,621 MT in 1989, remaining at the same level as the average of the last four years, at around 158,000 MT, although they decreased by 4 percent from the 1988 catches.

	1985	*1986*	*1987*	*1988*	*1989*
Yellowfin tuna	67,900	61,198	62,943	46,517	61,640
Skipjack tuna	35,600	42,183	37,757	52,188	35,300
Albacore	21,358	24,587	29,013	27,735	25,447
Bluefin tuna	5,101	3,340	3,392	5,708	5,012
Bigeye tuna	10,340	11,390	7,342	7,083	7,660
Swordfish	8,668	11,119	12,269	15,954	16,485
Small tunas	7,267	5,616	5,281	7,730	5,077
TOTAL	156,234	159,433	157,997	162,915	156,621

The most important changes correspond to the tropical species; yellowfin tuna catches increased by 32.5 percent over 1988 catches, while skipjack catches, however, decreased by the same proportion (32.4 percent).

Swordfish catches continued increasing, mainly due to catches made in the south Atlantic.

2. FISHERIES AND RESEARCH BY AREAS

2.1 Temperate area

2.1.a Bluefin tuna

In the area around the Strait of Gibraltar, the number of traps remained constant in 1989, although the bluefin catches (1,188 MT) decreased with respect to the previous

Original report in Spanish.

year. In the Mediterranean, bluefin catch and effort remained at the same level as in 1988.

In the Cantabrian Sea, catches remained stable (2,376 MT) with respect to recent years. Effort also remained at the same level.

2.1.b Albacore

In recent years, albacore catches have remained at the same level (25,256 MT). Nominal effort expressed in fishing days has remained similar to previous years; however, an increase of 10 percent in troll effort and a decrease of 21 percent in baitboat effort is observed in comparison to 1988. The number of boats remained constant: 500 trollers and 250 baitboats.

The study carried out by IFREMER/IEO of the interaction between gears operating in the albacore fishery was completed. The results obtained will be included in the data of the Albacore Research Program.

In the tagging cruise carried out in the Cantabrian Sea (August, 1990), 4,481 albacore, 973 bluefin and 26 skipjack were tagged.

2.1.d Swordfish

In 1989 there were 14,371 MT of swordfish caught in the North and south Atlantic Ocean, almost all by surface longline, with the catches remaining at the same level as in 1988. It should be noted that catches in the North Atlantic decreased (by 32 percent) due to a decrease in effort on the same order of magnitude. The fleet continued its geographic expansion towards the south Atlantic. During 1989, more than 80,000 fish were sampled and sampling for sex by time/area strata and tagging by the commercial fleet continued. A new, more efficient data base was developed.

The Mediterranean catches of swordfish amounted to 1,077 MT.

2.2 Canary Islands area

2.2.a Baitboat fleet

The total catches remained at the level of previous years. Regarding catches by species, the sharp drop in yellowfin catches (from 2,010 MT to 964 MT) and the significant increase in skipjack (3,103 MT in 1988 to 5,161 MT in 1989) should be noted. Fishing effort, in number of vessels, remained the same as in previous years, at 340 vessels.

A tagging cruise was carried out in the waters around La Gomera, tagging 2,195 skipjack and 2 yellowfin.

Biological sampling (maturity, sex, etc.) continued for yellowfin, skipjack and bigeye.

2.3 Tropical area

2.3.a Tropical baitboat fishery

During 1989, three baitboats, based in Dakar, operated in the northern hemisphere of the eastern intertropical Atlantic. A total of 1,274 MT of yellowfin, skipjack and bigeye tunas were caught.

2.3.b Tropical purse seine fishery

During 1989, 35 vessels with Spanish flag operated in this fishery. Carrying capacity decreased again, to 19,481 MT. This decrease is due to the change of flag of three vessels (one flagged in Mexico and two in Panama). The catches decreased by 7,000 MT as compared to 1988. It should be noted that yellowfin catches increased while skipjack catches decreased in relation to 1988.

NATIONAL REPORT OF THE UNITED STATES: 1990

by

National Marine Fisheries Service[1]

1. INTRODUCTION

The National Marine Fisheries Service (NMFS) has the responsibility for U.S. fishery statistics and for research on Atlantic tunas and other large oceanic pelagic species in support of the ICCAT Convention. Research responsibilities are solely those of the Southeast Fisheries Center (SEFC), Miami, Florida. The activities related to these responsibilities in 1989-90 are described in this report.

2. FISHERIES MONITORING

The NMFS monitors U.S. Atlantic tuna fisheries for yellowfin and skipjack tunas, the principal tropical species; for bluefin and albacore, the principal temperate species; and for bigeye tuna, which occur in both tropical and temperate waters (included under tropical tunas below). Fisheries for blue marlin, white marlin and sailfish, and other scombrids are also monitored. Additionally, significant effort is expended in monitoring the commercial swordfish fishery. These activities include the design of sampling programs; collection of catch, effort and biological data; and maintaining and summarizing fishery data bases for analyses, as well as for dissemination to ICCAT and other management organizations. Historical catches of Atlantic tunas by U.S. fishermen (1967-89) are presented in Table 1.

2.1 Tropical Tunas

Longline catches of yellowfin tuna, particularly in the Gulf of Mexico, dominated the U.S. catch of tropical tunas in 1989, though the total yellowfin catch was down 21 percent from the previous year. The total U.S. yellowfin catch in 1989 was 7,381 MT, as compared to 9,361 MT in 1988. The Gulf of Mexico longline catch for 1989 was 5,724 MT as compared to 7,764 MT in 1988.

The total bigeye catch in 1989 was 762 MT, as compared to 702 MT in 1988. Total catches of other tropical tuna species in 1989 were as follows: 278 MT of bonito, 128 MT of little tunny, 86 MT of blackfin tuna, 110 MT of wahoo, and 138 MT of undifferentiated tuna. These totals include the recreational catch along the U.S. east coast north of 35°N.

[1] Prepared by staff members of the Southeast Fisheries Center, Miami, Florida.

Original report is in English.

No reliable estimates are available for the U.S. recreational catch along the east coast south of 35°N, the Gulf of Mexico, or the Caribbean.

The contributions to the total U.S. yellowfin and bigeye catches (MT) by area and by commercial (Comm.) and recreational (Rec.) gears were:

		YFT Comm.	*YFT Rec.*	*BET Comm.*	*BET Rec.*
NW Atlantic:	LL	543		413	
	R&R	132	708	18	151
	OTH	120		35	
Gulf of Mexico:	LL	5,724		53	
	OTH	3			
Caribbean Sea:	LL (est.)	151		91	

U. S. purse seine catches were very small in 1989, consisting of 35 MT of yellowfin and 36 MT of skipjack in the northwestern Atlantic. For the second consecutive year, there were no U.S. purse seiners fishing in the Atlantic and unloading at Puerto Rican canneries. The Caribbean longline catch was estimated based on logbook reports of number of fish hooked and dealer reports of size distribution.

In addition to monitoring the catches of large pelagic species by U.S. vessels, the NMFS samples for size frequency and species composition of foreign catches of tuna transshipped from Abidjan to canneries in Puerto Rico. Up to September, 1989, an NMFS employee was stationed in Mayaguez to sample the cannery offloadings. Under a contract that formally began in October 1989, the Inter-American Tropical Tuna Commission (IATTC) continues to conduct NMFS sampling at the Mayaguez canneries.

Yellowfin, bigeye and skipjack tunas are the principal species from Abidjan unloaded at Mayaguez. Catches were made in the Gulf of Guinea. Ghanaian baitboats accounted for the majority of this catch. From roughly February 1, 1989, through January 31, 1990, the following total tonnages, reported as unloading weights, arrived in Mayaguez: 1,918 MT of yellowfin, 9,368 MT of skipjack, and 54 MT of bigeye. Units covered by our sampling made up 499 MT of the reported yellowfin (26 percent) and 1,987 MT of reported skipjack (21 percent). A total of 1,390 yellowfin, 290 bigeye and 868 skipjack were measured. The average weights of the sampled fish were: yellowfin, 4.55 kg, bigeye, 3.47 kg, and skipjack, 2.09 kg. Special sampling for species composition indicated that bigeye made up 20.7 percent by weight and 29.1 percent by number of the reported yellowfin offloaded. We estimated that the sampled yellowfin tonnage was separated into size-breakdown categories as follows:

Weight Category (kg)	% of Total Number	% of Total Weight
< 1.4	< 0.5%	2%
1.4 - 1.8	7%	20%
>1.8 - 3.4	31%	56%
>3.4 - 9.1	18%	14%
> 9.1	44%	8%

The percentage weight in the larger weight categories is higher this year than in previous years. For instance, last year, an estimated 73 percent of the yellowfin in the sampled units was 1.8-3.4 kg. The change in weight distribution probably is an artifact. A recent change in unloading practices allows port samplers to obtain better size frequency estimates for the entire offloading. Previously, most of the fish were separated into size categories before unloading and the port samplers took their samples from the two or three most numerous weight categories. This may have biased our sampling against the larger sizes. This year, the samplers had the opportunity to conduct at least some of their sampling before the fish were separated. In addition, IATTC is making a special effort to sample the fish before they are separated.

2.2 Temperate tunas

The U.S. bluefin tuna fishery continues to be regulated by quotas and size limits. U.S. vessels fishing in the northwestern Atlantic killed an estimated 1,647 MT of bluefin tuna in 1989, of which 1,399 MT were landed. Those landings represent an increase of 109 MT from the 1,290 MT landed in 1988. The landings by gear were: 385 MT by purse seine, 187 MT harpoon, 227 MT handline, 126 MT longline (of which 78 MT was from the Gulf of Mexico), 472 MT by rod and reel (of which 216 MT was the estimated catch of the small bluefin fishery from off the northeastern U.S. coast), and 2 MT were taken by other gears. The estimated catch of small bluefin was lower than the 1987 and 1988 estimated catches of 401 and 263 MT, respectively, but was higher than the 1986 estimated catch of 186 MT. In addition to the landed catch, an estimated 1,189 bluefin (about 249 MT) were released dead by U.S. longline vessels.

Uncertainty about the estimated number of small fish caught by rod and reel was calculated by incorporating variability in the samples used in the estimation (see section 3.1). A thousand independent estimates of the total catch were made, incorporating random values for the variability; the median of the estimates was 18,241 fish (216 MT), and 95 percent of the estimates of the total catch were between about 16,600 and 20,200 fish.

Information on the numbers of bluefin tuna discarded alive and dead from the U.S. longline fishery off the northeastern coast was obtained. This information (1988-89) indicated that a higher proportion of the fish were dead (64 percent) than had been observed in the Japanese longline fishery (1982-87) in the U.S. EEZ (35 percent). Until this year, the estimate from the Japanese fishery had been utilized. The new estimate of the proportion of dead fish from the U.S. fleet was used for the 1989 estimate of dead discards from that region, and was also used to revise those estimates for earlier years.

The albacore catch by U.S. vessels in the western North Atlantic totaled 260 MT in 1989, compared to 115 MT in 1988. About 96 percent of the 1988 albacore catch was off the northeastern U.S. In that area, albacore were caught by longline (48 MT), rod and reel (5 MT commercial and 158 MT recreational), and by other gears, namely handline, trawl, and gillnet (38 MT). Other longline landings were from the Gulf of Mexico (4 MT) and from the Caribbean (estimated 6 MT).

2.3 Swordfish

U.S. vessels landed 6,187 MT of swordfish in 1989, surpassing the previous year's record high of 6,129 MT. Swordfish landings and catch-at-size data for years 1986 through 1988 have been revised and submitted to ICCAT. The landings by ICCAT area for 1989 (compared to 1988) were: 2,651 MT (2,284 MT) from the northwestern Atlantic; 1,541 MT (1,952 MT) from the north central Atlantic; 1,046 MT (1,034 MT) from the Gulf of Mexico; and 949 MT (859 MT) from the Caribbean. U.S. landings of swordfish are monitored in two ways. Landings are tracked through reports submitted by dealers, vessel owners and operators, and NMFS port samplers. Landings are also tracked through mandatory daily logbook reports submitted by U.S. vessels permitted to fish for swordfish.

2.4 Billfishes

Blue marlin, white marlin and sailfish are landed by recreational rod and reel fishermen and are a major by-catch of the U.S. commercial tuna and swordfish longline fisheries. This year (1989) represents the first full year of compliance under the regulations of the U.S. Fisheries Management Plan for Atlantic Billfishes which was implemented in October, 1988. The Plan allows that billfish caught by recreational gear (rod and reel) may only be landed if the fish are larger than the size limit specified for each species covered by the Plan. Recreational landings of each billfish species are estimated using two data sources: (a) the Large Pelagics Recreational Survey conducted by the Northeast Fisheries Center provides estimates of total billfish catch from waters along the northeastern U.S. (north of 35°N latitude); and (b) the SEFC Recreational Billfish Survey which provides numbers of billfish caught during tournaments held along the southeastern U.S. coast (south of 30°N latitude), in the U.S. Gulf of Mexico, and U.S. Caribbean Sea regions (i.e., U.S. Virgin Islands and Puerto Rico).

In addition to restrictions on the U.S. recreational harvest, the Management Plan also imposed regulations on commercial fisheries by prohibiting retention and sale of the three species at U.S. ports. For this reason, no official U.S. commercial landings were reported for any of the three Atlantic species in 1989. However, estimates of by-catch mortality in the U.S. longline fleet are made using the data from mandatory pelagic logbooks by U.S. captains and vessel owners in which numbers of billfish species caught and kept or discarded at sea are reported. The proportion of billfish caught and retrieved dead on longline gear were estimated from observer trips taken on various vessels. The estimated proportion of billfish dead on retrieval of longlines from these data and used in estimating by-catch mortality of billfish on longlines ranges from 0.30 - 0.51, depending on species and geographical area.

The estimates of 1989 U.S. recreational catches for these billfish species, combining the geographical areas of the Gulf of Mexico, Caribbean Sea, and the northwestern Atlantic Ocean (west of the 60°W longitude), are 122 MT for blue marlin, 16 MT for white marlin, and 2 MT for sailfish. The estimates for 1988 were 173 MT, 72 MT, and 7 MT, respectively, for the three species. Preliminary estimates of billfish that were discarded by-catch in the U.S. longline fishery for 1989 and presumed to be dead were 214 MT for blue marlin, 36 MT for white marlin, and 16 MT for sailfish. These are the estimated 1989 U.S. commercial longline by-catch kill of billfish. The estimated 1988 U.S. commercial landings and by-catch kill of billfish were 140 MT, 41 MT, and 40 MT, respectively, for the three species.

3. RESEARCH ACTIVITIES

In addition to monitoring the various fisheries, scientists from the SEFC continued research activities on bluefin tuna, swordfish, and billfishes designed to increase biological knowledge of these species and to provide information for management to east coast Fishery Management Councils and ICCAT. This research includes continued updating and revision of data bases, preparation of software and analyses in support of domestic and ICCAT goals, and participation in special working groups.

A method of calculation of the uncertainty about the estimates of catches of large pelagic fish from the recreational fishery off the northeast U.S. was developed. Catches were estimated using three components: fleet size, trips per vessel and catch per trip, all of which are not known and are derived from sampling. A system was developed to translate variability in the samples of those three components into the uncertainty about the estimate of total catch. This involved repeatedly estimating the total catch using randomly drawn subsamples to estimate fleet size and then for each vessel randomly drawing the number of trips and the catch per trip by time and area.

3.1 Bluefin Tuna Research

Monitoring of catch and effort the in U.S. rod and reel and handline fisheries for large and small bluefin tuna was continued. These data are used to estimate total catches of small bluefin and to develop indices of abundance. The index of abundance for large fish from the rod and reel and handline fisheries in the New England region was updated. For the first time an index of abundance for small fish was developed using catch rates from the fishery off Virginia where small bluefin consistently occur in the late spring and early summer.

During 1989 and 1990, ichthyoplankton surveys were conducted in the Gulf of Mexico during the bluefin spawning season. As in recent years, two transits of the sampling grid were made in late April and May of each year. The results from the 1989 survey are available, and the 1990 survey results are being processed. In 1988, the SCRS recommended that this survey and the larval index derived from it be reviewed. As noted last year, a panel of outside experts was convened in the spring of 1989 to review the survey, and in response to the panel's recommendations additional sampling was conducted in 1989 and 1990. Additional surveys were made in June of each year to attempt to delineate the end of the spawning season. In 1989 a survey in the eastern Gulf was conducted in late June using only neuston nets because of time constraints; no bluefin larvae were caught. During 1990, two full transits of the sampling grid were conducted in June. Since 1989, at each station two samples from each type of net (bongo and neuston) have been collected, and one sample is preserved for routine sorting and the second sample is preserved in alcohol for aging of bluefin larvae. Alcohol-preserved bluefin larvae from stations where bluefin larvae were observed in the sorted samples were aged, under contract with Dr. Edward Brothers who has aged bluefin larvae in the past. The sizes at age from the 1989 survey were similar to those observed in earlier studies.

The survey review panel also recommended that the ichthyoplankton survey data be checked, revised and made easily accessible. This has been accomplished and the revised data have been used to recalculate the index of spawning stock abundance that the SCRS has used in recent assessments.

Bluefin tuna frequently are landed without the head. An equation for conversion of measurements from the base of the pectoral fin to the form of the tail was derived. It was used for reassigning sizes to longline landings from 1985-1988 and in sizing the 1989 longline catch.

The growth of bluefin tuna was examined in two studies. As recommended by the SCRS in 1989, mark-recapture data were used to examine growth rates during different time periods and specifically to determine whether growth might have changed in recent years. In the second study, hard parts (vertebrae and otoliths) were used to estimate the age of nine bluefin which had been tagged and recaptured. The resulting estimates were generally within a year of those derived from the size at tagging and the time at liberty.

3.2 Swordfish Research

In response to ICCAT recommendations, the NMFS, SEFC began a research project directed primarily at determining the reproductive biology (sex determination, sex-at-size, sex ratio, and fecundity) of Atlantic swordfish. This project was initiated in January 1990. Collection of swordfish reproductive tissue is being achieved through observer agents contracted by NMFS to monitor the species diversity of each set aboard U.S. vessels using longline or gillnet gear, as well as through the cooperative assistance of a number of commercial longline vessel owners/captains and their crews. In addition, morphometric data (length and weight), date of capture, and location are also being recorded. To date, approximately 450 samples have been received through these efforts. Swordfish range in weight from 1.8 to 194 kg, with the major portion of the samples in the size range of 11 to 80 kg. Most of the swordfish sampled were caught off the Mid-Atlantic Bight, George's Bank, and the Grand Banks. Sampling efforts are also being initiated in the Gulf of Mexico, Florida East Coast, and the Caribbean Sea. Joint international cooperation is also being sought with Canada and several countries in the lower Caribbean area to assist in this research endeavor.

Continued effort was spent in reviewing and correcting the 1988 and 1989 mandatory swordfish logbook data base. A report was completed that summarizes the nearly 34,000 records received and processed for 1987 and 1988. Analysis included an evaluation of possible sampling strategies as an alternative to the present census method to aid in future logbook sampling designs. This was accomplished by examining the sensitivity of the precision of average CPUE's to reductions in sampling effort for swordfish, tuna species (bigeye, bluefin, yellowfin and albacore), and billfishes (white marlin, blue marlin and sailfish). Considerable effort was also made evaluating the potential costs and benefits of alternative management measures proposed for the U.S. swordfish fishery.

A total of nine working documents were prepared by the U.S. scientific delegation for the 1990 ICCAT swordfish species group meeting. Several documents describe research efforts undertaken in the analysis of sexually dimorphic growth hypotheses and the potential effects of dimorphic growth assumptions on stock assessment results. One document describes reanalysis of the available data on swordfish growth by sex and an alternative set of sex-specific growth curves fit to these data. Documents detailing the available data on swordfish sex ratio at size and size frequency data providing a basis for estimation of swordfish catch at size by sex were also prepared. The potential effect of neglecting a range of dimorphic growth assumptions in analysis of swordfish stock status was examined through simulation and presented in another document. New methods for incorporating uncertainty in inputs to virtual population analyses have been developed to allow quantitatively expressing this uncertainty in resulting estimates of fishing mortality rate for swordfish relative to target rates. Preliminary evaluation of production models for assessment of swordfish stock status have also been completed and summarized in a document. Updated information on swordfish CPUE from the U.S. longline fishery was also summarized in a working document submitted to the SCRS.

3.3 Billfish Research Monitoring

Routine sampling of recreational billfish tournaments continued to be conducted along the U.S. east coast, Gulf of Mexico, Bahamas, and Caribbean. A total of 140 billfish tournaments were sampled, representing over 101,091 hours of fishing effort, an increase of 25 tournaments and 16,091 hours over the 1988 levels. Additionally, recreational billfish fishermen were surveyed at seven docks in the northern Gulf of Mexico. (In 1988, nine docks were sampled.) Morphometric measurements of sexed billfish landings were also taken in conjunction with the ICCAT Enhanced Research Program for Billfish, but the amount of these data was greatly reduced because of the implementation of the U.S. Fisheries Management Plan for Atlantic Billfishes. A summary of these efforts has been documented in a report on SEFC billfish research.

Research on age and growth of blue marlin continued at the Miami Laboratory but at a reduced level. Analyses of microstructural increments on otoliths from young blue marlin (larvae, juveniles and young adults) up to 212 cm were completed and an extensive manuscript was prepared and submitted for peer review publication. A summary of that paper was prepared as a working document for the 1990 SCRS.

The NMFS, SEFC, again played a substantial role in the ICCAT Enhanced Research Program for Billfish in 1990, with SEFC scientists acting as general coordinator and coordinator for the western Atlantic Ocean. Major accomplishments in 1990 include the following: (1) Successful completion of five at-sea observer trips aboard Venezuelan industrial longline vessels out of Cumaná since the last SCRS (including November/ December 1989) and receipt of data from observer trips on Spanish industrial longline boats off Dakar, Senegal; (2) continuing of shore-based sampling in St. Maarten (Netherlands Antilles), Venezuela, Barbados, Jamaica, Grenada, Dominican Republic, Senegal, Ivory Coast, and Benin; (3) distribution of the ICCAT billfish tagging kits (including new logo patch) and associated tagging posters; (4) continuation of recreational shore-based sampling in Venezuela; (5) progress towards the development of technology for field species identification kits for Atlantic billfish; (6) finalization of initial tests to determine the sex of dressed billfish that have been eviscerated at sea; and (7) developing plans for 1990 shore-based sampling in Trinidad, Bermuda, U.S. and British Virgin Islands and at-sea sampling in Barbados, Port de la Cruz, Venezuela, and U.S. and British Virgin Islands. The details associated with the above progress are reported in the 1990 SCRS program summary, the 1991 research plan, and in various SCRS working documents.

3.4 Tagging

Cooperators in the NMFS, SEFC, tagging program tagged and released 5,330 billfish and 536 tunas in 1989. The numbers of tagged billfishes recaptured in 1989 were: 17 sailfish, 15 white marlin, 4 blue marlin, and 5 swordfish. There were 104 bluefin and 296 yellowfin tagged and released in 1989. The degree of cooperation in the tagging program is evidenced by the fact that for the latest year, approximately 50 percent of all tagged and returned fish reported to ICCAT were from U.S. fishermen.

There were nine bluefin tuna recaptured in 1989, six by commercial fishermen, two by recreational fishermen, and one by unknown gear. Six of the recaptures were from fish released off the mid-Atlantic states: two were recaptured near their release points, three were recaptured off the northeastern United States, and one was recaptured near Malta in the Mediterranean Sea. There were three recaptures from releases off the northeastern United States: two were recaptured in the same general area and one was recaptured east of Newfoundland. There was one 1988 recapture reported in 1989. The longest time at large was 5,509 days. The available information on growth characteristics from these fish and others, is used in an updated study of bluefin growth presented in an SCRS working document.

There were eight yellowfin recaptured in 1989. Six yellowfin were recaptures from mid-Atlantic releases: four were recaptured near their release points, and two made trans-atlantic migrations to the west coast of Africa, one traveling at least 4,414 miles in 836 days to an area 600 miles southwest of Liberia, and the other traveling at least 4,100 miles in 1,231 days to an area 821 miles southeast of Liberia. There were two recaptures of yellowfin that were released and recaptured in the Gulf of Mexico.

An annual newsletter was published and distributed to program cooperators in 1990.

3.5 Fishery Observers

3.5.1 Domestic Longline Observer Project

The SEFC, Miami Laboratory, continued operation of a limited domestic longline observer project through contract with the Louisiana State University. The contractor placed observers aboard voluntary domestic longline vessels. The vessels fished in the Gulf of Mexico and primarily were targeting yellowfin tuna. The observers collected catch, effort, size frequency, and environmental data. These data, plus data from other observer programs, are used in an analysis of fish survivorship after capture on longline gear. The analysis report is presented as an SCRS working document.

3.5.2 Foreign Fishery Observer Project

The NMFS, NEFC, has coordinated a program to place observers on foreign fishing vessels, including Japanese longline vessels fishing within the EEZ since 1982. The information collected by the observers is processed and maintained by the SEFC, Miami Laboratory. The Japanese longline fleet has not fished in the U.S. EEZ since 1988. Although no foreign longlining was observed in the U.S. EEZ in the past year, the NEFC attained complete observer coverage of foreign fishing along the U.S. east coast. Foreign fishing off the U.S. east coast EEZ involved East Germany, Holland, Poland, and the Soviet Union. These foreign vessels were involved in the Atlantic mackerel (*Scomber scombrus*) fishery, either directly catching fish or engaging in at-sea transfer of U.S.-caught fish.

3.5.3 Swordfish Drift Gillnet Fishery Observer Project

The NMFS, NEFC, initiated an observer project to place sea sampling personnel aboard swordfish drift gillnet vessels operating off the northeastern U.S. coast to collect data and biological samples. In 1989, a total of 13 trips made from August through November by nine different commercial fishing vessels were observed. Data from swordfish taken on these trips have been used in updating the available sex ratio at size data base as well as other morphometric data bases for this species.

3.6 Special Working Groups and Scientific Meetings

3.6.1 World Bluefin Meeting

NMFS scientists from the SEFC, NEFC and Southwest Fisheries Center participated in the May 25-31, 1990, World Bluefin Meeting hosted by the IATTC in La Jolla, California, and sponsored jointly by the IATTC and the Australian Fisheries Service. The purpose of this meeting was to discuss and report on the strengths and weaknesses of stock assessment techniques used on bluefin tuna stocks worldwide. Stock assessment methods applied to Atlantic bluefin tuna by the ICCAT bluefin species group were reviewed and compared to methods applied for other bluefin stocks worldwide at this meeting of international scientists.

3.6.2 GFCM/ICCAT Expert Consultation on Evaluation of Stocks of Large Pelagic Fishes in the Mediterranean Area

An SEFC scientist participated in the joint meeting of ICCAT and the General Fisheries Council of the Mediterranean (GFCM) in Bari, Italy. The meeting was attended by scientists from eleven Mediterranean countries, the United States, Japan, ICCAT, FAO, and the EEC. The purpose of the meeting was to examine the status of some large pelagic fish stocks of the Mediterranean. Extensive progress was made in improving the data bases for bluefin tuna, swordfish and albacore. The participants concluded that the reported landings of swordfish were substantially lower than the actual landings before 1985 and that every effort should be made to improve those data so that conventional stock assessment techniques, which rely on long series of catch information, could be applied. After examining the available information on the stock structure of bluefin, swordfish and albacore, the participants reaffirmed the ICCAT hypothesis that bluefin caught in the east

Atlantic and Mediterranean Sea are from the same stock, and concluded that Mediterranean swordfish and albacore most likely had relatively low rates of mixing with their conspecifics in the Atlantic and should thus be considered as separate stocks for analysis and management purposes.

3.6.3 MAFMC SSC Review of Northeast Recreational Survey

NMFS scientists from SEFC and NEFC participated in a review of the survey of the recreational fishery for large pelagic fish from Virginia through Massachusetts held by the Mid-Atlantic Fishery Management Council (MAFMC). In general, the survey was found to have high rates of coverage of effort and catch. Recommendations were made for improving the survey estimates, including increased sampling rates and improvement of analytical techniques for treating these data. The meeting also recommended greater involvement of states and universities in the region in the survey.

3.6.4 EEC/US Scientific Meeting on Swordfish

During the week of 23 April, 1990, scientists from the European Economic Community and the U.S. met in Brussels, Belgium, to review the results of the 1989 ICCAT swordfish stock assessment. This review group concluded that there were basic tendencies in the stock assessment that are quite clear, whatever the uncertainties in analysis: 1) "there is a declining CPUE on older ages and a declining average size of the catch", and 2) "since 1986, there has been a very rapid and intense increase in fishing effort, accompanied by a southward geographical expansion, with a corresponding increase in the catch". This group noted that the fishing mortality is probably higher than most common biological reference points and recommended "that $F_{0.1}$ is an appropriate target fishing mortality rate for swordfish as it is a robust estimate of F_{MSY}".

3.6.5 U.S. Swordfish Stock Assessment Review Panel Meeting

During the week of 9 July, 1990, the U.S. South Atlantic Fishery Management Council (SAFMC) convened a panel of independent U.S. scientific experts in fishery population dynamics to review the results of ICCAT and NMFS swordfish stock assessments with respect to the goals of U.S. fisheries management. The Panel concluded that continued fishing at current levels could put the swordfish population in danger of stock collapse in a short period of time and recommended reducing fishing mortality to avert this danger. This Panel recommended that the risk-adverse $F_{0.1}$ constant harvest rate strategy was appropriate for swordfish.

3.6.6 ICCAT Swordfish Stock Assessment Session

From 12-19 September, 1990, U.S. scientists from SEFC, University of Miami, National Fisheries Institute, and SAFMC, participated in the 1990 ICCAT Swordfish Stock

Assessment Session in Madrid, Spain. This working meeting was also attended by scientific representatives from Spain, Japan, Portugal, Italy, the European Economic Community, and the ICCAT Secretariat. The status of the Atlantic swordfish resource was assessed by the working group using updated catch at age and effort information through 1989. The results of this assessment were consistent with results of previous assessments. Due to concerns raised about uncertainties identified in prior analyses, the working group addressed the sensitivity of the assessment results to a number of factors, including several alternative stock structure hypotheses, possible error in estimation due to sexually dimorphic growth, possible changes in catchability of small fish over the available time series of data, a dome-shaped partial recruitment pattern, uncertainty in the estimates of total catch, in natural mortality rates and in CPUE series used to tune the virtual population analyses. The results of the analyses conducted by the working group and the results presented to the group in numerous working documents indicated that the estimate of the current (1989) fishing mortality rate expressed relative to the $F_{0.1}$ target rate is largely unaffected by potential errors in analysis due to these uncertainties.

3.7 Mackerels

King and Spanish mackerel research continued through the collection of catch and catch-per-unit-effort data, size and age frequencies, stock- and sex-specific growth rates, and stock identification data. These data were integrated into separate stock assessments of king and Spanish mackerel taken by U.S. fishermen in the Gulf of Mexico and the Atlantic. Recovery of the Gulf of Mexico stocks of king mackerel continues in response to fisheries regulation. Atlantic king mackerel catches remained relatively stable in recent years. Atlantic and Gulf of Mexico Spanish mackerel populations are recovering at a somewhat slower rate. While management strategies have not yet resulted in significant increases in spawning biomass, recruitment indices suggest this situation may improve in the near future.

3.8 Sharks

Shark landings in the southeastern states continued to increase in 1989, resulting in increased concerns about the status of the stocks and the future of the fishery. An Emergency Shark Fisheries Management Plan was drafted and submitted for consideration and implementation. The SEFC is actively conducting stock assessment research on sharks. This work has included the collection and analysis of landing data from commercial shark fishermen, shark tournament directors, recreational shark catches and shark by-catch in trawls. A management plan is expected to become effective in early 1991. Regulations prohibiting the finning of sharks are being implemented at this time as an interim measure until the plan becomes effective. Methods for improving shark data collection are being evaluated. U.S. scientists have worked closely with industry and sportsmen to obtain accurate information on shark landings.

Table 1. Catches and landings (MT) of Atlantic tunas and tuna-like fishes by United States fishermen, 1967-89[1]

Year	BFT	YFT[2,3]	ALB	BET[2]	LTA	SKJ[2]	BON	SWO[4]	SSM[5]	KGM[5]	OTH[6]	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	-	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	-	34,550
1973	1,294	3,590	0	113	20	21,246	261	406	4,437	2,710	-	34,1077
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	5,086	3,747	9,863	962	22,883
1983	1,394	226	18	255	107	589	253	4,801	2,784	7,069	453	17,949
1984	1,320	1,252	25	408	41	817	217	4,538	3,904	7,264	883	20,669
1985	1,423	6,259	17	353	74	1,786	109	4,618	3,984	6,010	247	24,880
1986	1,142	5,775	162	747	103	1,004	83	5,100	5,957	5,682	337	26,092
1987	1,351	6,993	270	1008	118	650	130	5,160	5,071	5,628	386	26,765
1988	1,290	9,361	115	702	204	36	88	6,129	5,094	6,380	430	29,829
1989[7]	1,647	7,381	260	762	128	56	278	6,187	3,624	4,935	334	25,592

[1]Estimates of recreational catches off the northeast U.S. are included for all years for bluefin tuna and for all other tunas since 1986.
[2]Prior to 1981, figures include some catches of purse seiners flying other flags (Bermuda, Netherlands Antilles, Nicaragua, and Panama.
[3]Includes small quantities of bigeye tuna prior to 1975. Reported landings revised for 1986, 1987 and 1988.
[4]Swordfish landings revised for 1986, 1987 and 1988.
[5]Does not include Spanish mackerel (1967-83) and king mackerel (1967-78) caught by recreational fishery. Landings revised for 1988.
[6]Includes blackfin, wahoo, and other unclassified tunas. Landings revised for 1988.
[7]Includes estimated bluefin dead discards.

NATIONAL REPORT OF THE U.S.S.R.

by

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1. THE FISHERIES

In 1989, the total catch of tunas and related species taken with all types of fishing gears amounted to 20,472 MT. The catch included: 4,246 MT of yellowfin tuna, 1,915 MT of skipjack tuna, 424 MT of bigeye tuna, 543 MT of Atlantic black skipjack, 5,054 MT of frigate tuna, 723 MT of bullet tuna, 5 MT of blue marlin, 4 MT of sailfish, 7,363 MT of Atlantic bonito and 195 MT of king mackerel.

The largest tuna catch from the eastern tropical Atlantic was taken by purse seiners and amounted to 6,393 MT, including 3,676 MT of yellowfin tuna, 1,915 MT of skipjack, 543 MT of black skipjack, 195 MT of bullet tuna and 69 MT of frigate tuna. The longline yields from the open sea of this region constituted 1,003 MT, with 570 MT of yellowfin tuna, 424 MT of bigeye tuna, 5 MT of blue marlin and 4 MT of sailfish.

A total of 11,825 MT (6,191 MT of Atlantic bonito, 4,911 MT of frigate tuna, 528 MT of bullet tuna and 195 MT of king mackerel) was caught in the northeastern part of the eastern tropical Atlantic and 1,246 MT (1,172 MT of Atlantic bonito and 74 MT of frigate tuna) were yielded from the southeastern part.

The data on the tuna fishery for 1989 by main fishing ground, period and fishing gear, number of vessels, effort and species composition of the catches are given in Table 1, and the preliminary data for the first half of 1990 are presented in Table 2.

The bigeye tuna catch decreased markedly in 1989 as compared with 1988, due to reduced fishing effort in the longline fishery. The catch of Atlantic bonito, Atlantic black skipjack and frigate tuna dropped as a result of a reduction in the trawl fishery.

2. RESEARCH

Size composition of 4,956 specimens of tunas from longline, purse seine and trawl catches was determined and 600 specimens of tunas from first dorsal fin ray sections were aged. Mature fish (ages 3-7) (bigeye and yellowfin tunas) made up the bulk of the catches from all fishing grounds.

As is evident from the results of the exploratory fishing in the area of 9°-11°N and 35°-39°W, the tuna catches taken by longlines constituted 75-100 kg per 100 hooks. This area is located in the divergence zone formed at the boundary of the Northern Trade Wind Current and the northern branch of the Equatorial Countercurrent. In July-

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September, bigeye tuna were represented in the catches by spawning and post-spawning specimens measuring 85-165 cm in length (116.4 cm on the average) and yellowfin tuna by specimens measuring 110-162 cm (144.1 cm on the average).

In the purse seine tuna fishery around Sao Tomé and Principe, in July, commercial tuna aggregations were formed in the area where a sharp temperature gradient was observed with the water temperatures of 25.6-26.2°C, 25.2-26.2°C and 24.4-25.7°C at depths of 0, 30 and 50 m, respectively. Tuna aggregations were most common in the northern part of the zone, particularly in the areas of convergence resulting from the insular effect. Large skipjack weighing 3-5 kg (42.6 percent) and yellowfin tunas of 10-50 kg (42.6 percent) predominated the catches. The tuna had mature and maturing gonads, fed little and were characterized by high mobility. Most of the catches were taken from mobile mixed schools of skipjack and yellowfin tunas up to 5 MT. Large schools of 40-80 MT of large tunas made up less than 5 percent of the total number of fish in the catch.

In March the temperature gradient was 3°C per 60 miles (23.0-26.0°C) in the purse seine fishery grounds off Sierra Leone, while in April it was 3.5°C per 180 miles (27.5-29.5°C). These fishing grounds were formed as a result of the interaction of the Canary Current and the central branch of the Equatorial Countercurrent. The weakening or strengthening of the Canary Current in the spring caused the displacement of the gradient zones to the southeast and northeast, and late in May the tuna fishery in the Sierra Leone area ceased due to maximum weakening of the Canary Current. It seems likely that the school size depends on the development of gradient. The schools of large yellowfin tunas up to 100 MT predominated in March, while in April-May the mixed schools of 50-70 MT in weight were most common. The catches were mainly comprised of yellowfin and skipjack tunas at the age of 3-5.

The data of the tuna catch taken by trawl in the past 12 years in the area of West Sahara were summarized. In January-March and May-December, the largest tuna catches by pelagic trawl on the continental shelf and slope in that area were associated with a surface sea temperature of 18-24°C. The annual catch during that period fluctuated from 1.5 to 7.0 MT. Bullet tuna (90 percent) 27-39 cm and Atlantic black skipjack 35-37 cm predominated the catches. Skipjack tuna (45-54 cm), frigate tuna (28-40 cm), yellowfin tuna (60-72 cm) and bigeye tuna (59-75 cm) occurred in the catch. All the species aggregations were feeding. Bullet tuna, Atlantic black skipjack and frigate tuna fed on euphausiids, myctophiids and small squid. The stomachs of skipjack, yellowfin and bigeye tunas contained mainly clupeids.

3. WORK AT SEA

Observers worked on board commercial vessels in 1989. No research cruises were carried out.

4. REFERENCES

The following papers dealing directly or indirectly with tunas were published in 1989:

Bataljants, K. Ya., 1989. On spawning of skipjack tuna (*Katsuwonus pelamis* L.). ICCAT Col. Vol. Sci. Pap., Vol. XXX(1), pp. 20-27.

Ivchenko, V. V., S. V. Savanovich, V. V. Ovchinnikov, *et al.* 1989. Development of the fisheries in the open ocean. Kaliningrad, 174 pp (in Russian).

Ovchinnikov, V. V. 1989. Distant migrants - ecology, behaviour and practical importance. Moscow, 47 pp. (in Russian).

Ovchinnikov, V. V., *et al.* 1989. Bioresources of the economic zones of the West African countries: analytical review. Deposited scientific papers of VNIERKh, No. 1 (207). Moscow, 149 pp. (in Russian).

Ovchinnikov, V. V., *et al.* 1989. Commercial description of the tropical zone of the Atlantic Ocean - tunas, sailfish, marlin, spearfish and swordfish. Leningrad, 174 pp. (in Russian).

Table 1. The tuna fishery in Sierra Leone (1), Sao Tomé and Principe (2), the open sea of the central tropical Atlantic (3), and West Sahara (4) areas, fishing gears, fishing period, number of vessels, effort and catches (MT) by species, 1989

Area	Gear	No. of vessels	Period	Effort in days at sea	CATCHES (MT) YFT	SKJ	BET	LTA	BLT	FRI	TOTAL
1	PS	7	Feb.-June	647	2,770	1,447	--	529	193	69	5,008
2	PS	4	June-Nov.	168	287	128	--	13	--	--	428
3	PS	5	January, June-Nov.	367	619	340	--	1	2	--	962
3	LL	2	Jan.-Nov.	235	570	--	424	--	--	--	994
4	Trawl		Jan.-Dec.	--	--	--	--	--	528	4,911	5,439
Other areas	Trawl		Jan.-Dec.	--	--	--	--	--	--	74	74
TOTAL					4,246	1,915	424	543	723	5,054	12,905

Table 2. Soviet catches (MT) of tuna and other species in the first half of 1990

Skipjack	3,050
Yellowfin tuna	2,165
Black skipjack	800
Frigate tuna	836
Bullet tuna	240
Bigeye tuna	50
Atlantic bonito	129
Mackerel	317
Total	7,587