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for the
CONSERVATION of ATLANTIC TUNAS

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INTERNATIONAL COMMISSION FOR THE CONSERVATION OF ATLANTIC TUNAS

CONTRACTING PARTIES

(as of 31 December 2011)

Albania, Algeria, Angola, Barbados, Belize, Brazil, Canada, Cape Verde, China, Côte d'Ivoire, Croatia, Egypt, Equatorial Guinea, European Union, France (St. Pierre & Miquelon), Gabon, Ghana, Guatemala, Guinea (Rep.), Honduras, Iceland, Japan, Korea (Rep.), Libya, Mauritania, Mexico, Morocco, Namibia, Nicaragua, Nigeria, Norway, Panama, Philippines, Russia, Sao Tomé & Principe, Senegal, South Africa, Sierra Leone, St. Vincent and the Grenadines, Syria, Trinidad & Tobago, Tunisia, Turkey, United Kingdom (Overseas Territories), United States, Uruguay, Vanuatu, Venezuela

COMMISSION OFFICERS

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M. MIYAHARA, Japan (since 19 November 2011)	M. AGUILAR, Mexico (since 19 November 2011)	M. TACKEY, Ghana (since 19 November 2011)

PANEL MEMBERSHIP

Panel No.		***Chair***
-1- Tropical tunas	Angola, Belize, Brazil, Canada, Cape Verde, China, Côte d'Ivoire, Equatorial Guinea, European Union, France (St. Pierre & Miquelon), Gabon, Ghana, Guatemala, Honduras, Japan, Korea (Rep.), Libya, Mauritania, Mexico, Morocco, Namibia, Nigeria, Panama, Philippines, Russia, Sao Tome & Principe, Senegal, Sierra Leone, South Africa, St. Vincent & the Grenadines, Trinidad & Tobago, Turkey, United States, Uruguay, Venezuela.	Côte d'Ivoire
-2- Temperate tunas, North	Albania, Algeria, Belize, Brazil, Canada, China, Croatia, Egypt, European Union, France (St. Pierre & Miquelon), Iceland, Japan, Korea (Rep.), Libya, Mexico, Morocco, Norway, Panama, St. Vincent and the Grenadines, Syria, Tunisia, Turkey, United States.	European Union
-3- Temperate tunas, South	Belize, Brazil, European Union, Japan, Mexico, Namibia, Philippines, South Africa, Turkey, United States, Uruguay.	South Africa
-4- Other species	Algeria, Angola, Belize, Brazil, Canada, China, Côte d'Ivoire, Equatorial Guinea, European Union, France (St. Pierre & Miquelon), Gabon, Japan, Korea (Rep.), Mexico, Morocco, Namibia, Nigeria, Norway, Sao Tome & Principe, Senegal, South Africa, St. Vincent & the Grenadines, Trinidad & Tobago, Tunisia, Turkey, United Kingdom (Overseas Territories), United States, Uruguay, Venezuela.	Brazil

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	Chair
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STANDING COMMITTEE ON RESEARCH & STATISTICS (SCRS) Sub-Committee on Statistics: G. SCOTT (United States), Convener Sub-Committee on Ecosystems: S. Cass-Calay (United States), Convener	J. SANTIAGO, EU (since 8 October 2010)
CONSERVATION & MANAGEMENT MEASURES COMPLIANCE COMMITTEE	C. ROGERS, United States (since 18 November 2007)
PERMANENT WORKING GROUP FOR THE IMPROVEMENT OF ICCAT STATISTICS AND CONSERVATION MEASURES (PWG)	T. EL KTIRI, Morocco (since 19 November 2011)

ICCAT SECRETARIAT

Executive Secretary: MR. D. MESKI
Assistant Executive Secretary: DR. P. PALLARÉS
Address: C/Corazón de María 8, Madrid 28002 (Spain)
Internet: http://www.iccat.int - *E-mail:* info@iccat.int

FOREWORD

The Chairman of the International Commission for the Conservation of Atlantic Tunas presents his compliments to the Contracting Parties of the International Convention for the Conservation of Atlantic Tunas (signed in Rio de Janeiro, May 14, 1966), as well as to the Delegates and Advisers that represent said Contracting Parties, and has the honor to transmit to them the ***"Report for the Biennial Period, 2010-2011, Part II (2011)"***, which describes the activities of the Commission during the second half of said biennial period.

This issue of the Biennial Report contains the Report of the 22nd Regular Meeting of the Commission (Istanbul, turkey, November 11-19, 2011) and the reports of all the meetings of the Panels, Standing Committees and Sub-Committees, as well as some of the Working Groups. It also includes a summary of the activities of the Secretariat and the Annual Reports of the Contracting Parties of the Commission and Observers, relative to their activities in tuna and tuna-like fisheries in the Convention area.

The Report is published in four volumes. ***Volume 1*** includes the Proceedings of the Commission Meetings and the reports of all the associated meetings (with the exception of the Report of the Standing Committee on Research and Statistics-SCRS). ***Volume 2*** contains the Report of the Standing Committee on Research and Statistics (SCRS) and its appendices. ***Volume 3*** includes the Annual Reports of the Contracting Parties of the Commission. ***Volume 4*** includes the Secretariat's Report on Statistics and Coordination of Research, the Secretariat's Administrative and Financial Reports, and the Secretariat's Reports to the ICCAT Conservation and Management Measures Compliance Committee (COC), and to the Permanent Working Group for the Improvement of ICCAT Statistics and Conservation Measures (PWG). Volumes 3 and 4 of the Biennial Report are only published in electronic format.

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

FABIO HAZIN
Commission Chairman

AREPORT OF THE STANDING COMMITTEE OF RESEARCH AND STATISTICS
(Madrid, Spain, October 3-7, 2011)

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

(Madrid, Spain - October 3 to 7, 2011)

1. Opening of the meeting

The 2011 Meeting of the Standing Committee on Research and Statistics (SCRS) was opened on Monday, October 3, at the Hotel Velázquez in Madrid by Dr. Josu Santiago, Chairman of the Committee. Dr. Santiago welcomed all the participants to the annual meeting.

The ICCAT Executive Secretary, Mr. Driss Meski, addressed the meeting and welcomed all the participants to Madrid. The Executive Secretary reminded the relevance of the work conducted by the Committee and the important role of the SCRS in providing scientific advice to the Commission. Mr. Meski recognized that as the stock status becomes complicated our Commission is requested to provide more clarifications. Mr. Meski highlighted that the SCRS work is very much appreciated by our Commission and on the international level, even though participation of the national scientists has shown a sharp decline in recent years.

Finally, the Executive Secretary hoped that the delegations that have undergone a reduction in their activities will renew their interest by participating more in the work of the SCRS so as to assure that our Committee has the reputation it deserves and wished every success in the work of our Committee.

2. Adoption of Agenda and arrangements for the meeting

The Tentative Agenda was reviewed and adopted (attached as **Appendix 1)**. Stock assessments were carried out this year on South Atlantic and Mediterranean albacore (ALB-Med and ALB-S), blue marlin (BUM) and yellowfin tuna (YFT).

The following scientists served as rapporteurs of the various species sections (Agenda Item 8) of the 2011 SCRS Report.

Tropical tunas- General			J. Pereira
YFT	-	Yellowfin tuna	C. Brown
BET	-	Bigeye tuna	D. Die
SKJ	-	Skipjack tuna	D. Gaertner
ALB	-	Albacore	H. Arrizabalaga, J. Ortiz de Urbina (Med)
BFT	-	Bluefin tuna	C. Porch (W), J.M. Fromentin (E)
BIL	-	Billfishes	F. Arocha
SWO	-	Swordfish	J. Neilson, P. Travassos (Atl.), G. Tserpes (Med.)
SBF	-	Southern bluefin	
SMT	-	Small tunas	N. Abid
SHK	-	Sharks	A. Domingo

The Secretariat served as rapporteur for all other Agenda items.

3. Introduction of Contracting Party delegations

The Executive Secretary introduced the 19 Contracting Parties present at the 2011 meeting: Brazil, Canada, Cape Verde, China, Côte d'Ivoire, Croatia, European Union, Ghana, Japan, Korea, Mexico, Morocco, Norway, Russian Federation, Senegal, Turkey, United Kingdom (Overseas Territories), United States and Uruguay. The List of Participants at the Species Groups Meetings and the Plenary Sessions is attached as **Appendix 2**.

4. Introduction and admission of observers

Representatives from the following Cooperating non-Contracting Party, Entity, or Fishing Entity (Chinese Taipei), intergovernmental organizations (General Fisheries Commission for the Mediterranean-GFCM), and

non-governmental organizations (Birdlife International, Federation of Maltese Aquaculture Producers-FMAP, Federation of European Aquaculture Producers-FEAP, Fundatun, Greenpeace, Institute for Public Knowledge-IPK, International Seafood Sustainability Foundation-ISSF and The Pew Environmental Group were admitted as observers and welcomed to the 2011 SCRS (see **Appendix 2**).

5. Admission of scientific documents

The Secretariat informed the Committee that 182 or scientific papers had been submitted at the various 2011 inter-sessional meetings. However, the Secretariat noted that a considerable number of documents (34), presented during the meetings were not provided later in the standard format for SCRS documents.

Besides the scientific documents, there are 11 reports of inter-sessional meetings and Species Groups, 28 Annual Reports from the Contracting Parties, and non-Contracting Cooperating Parties, Entities and Fishing Entities, as well as various documents by the Secretariat. The List of SCRS Documents is attached as **Appendix 3**.

6. Report of Secretariat activities in research and statistics

The Secretariat presented the "Secretariat Report on Statistics and Coordination of Research 2011" which summarizes activities in 2011. This document was discussed at length during the Species Groups meetings and during the session of the Sub-Committee on Statistics. The first eight tables of this document point out the improvements in data submission and the use of the electronic forms. This report also notes the Secretariat's efforts to implement last year's recommendations from the Commission and SCRS concerning the implementation of the Data Confidentiality policy and it's implication for the ICCAT database management and organization.

A comment was made to extend the presentation of the catalog of data submitted to include by-catch species in addition to the main tuna species and the three shark species commonly presented. The Secretariat indicated that this proposal should be presented to the Sub-Committee on statistics for its approval.

A summary of the activities carried out by the ICCAT/Japan Data Management and Improvement Project (JDMIP) was presented (ICCAT, 2012, *in press*). This project continues to support port sampling developed in Tema (Ghana) and the eastern Caribbean (Venezuela). This program has also made financial contributions towards the participation of scientists from developing countries to SCRS meetings.

Likewise, the Secretariat informed of the activities carried out in 2011 in relation to publications, noting that in 2011 a forth volume has been added to the Biennial Report which includes the reports from the Secretariat and other committees.

A protocol for the allocation of capacity building and data improvements was discussed during the Sub-Committee on Statistics. The protocol defines three major areas for funding requests and provides guidelines on the proposal request, evaluation, awarding and deadlines for all requests.

7. Review of national fisheries and research programs

Brazil

In 2010, the Brazilian tuna longline fleet consisted of 96 vessels. Of these 96 boats, 92 were national and 4 were foreign chartered vessels. The total number of vessels increased by about 10% from 2009, when 86 vessels operated. The number of bait-boats operating in 2010 was 41, which all of them are national boats. The number of purse seiner boats decreased from 8 in 2009 to 5 in 2010.

The Brazilian catch of tunas and tuna-like fishes, including billfishes, sharks, and other species of minor importance, was 33,419.9 t, in 2010, representing a decrease of 16.6%, from 2009. Despite the catch estimates for the bait-boat fishery are still preliminary, in 2010, the majority of the catch again was taken by this fishery (14,475.2 t; 43.0%), with skipjack tuna being the most abundant species (87.9% of the baitboat catches). Yellowfin tuna was the second dominant species in the bait-boat fishery, with a total catch of 627.3 t.

The total catch of the tuna longline fishery was 12,349.4t, which was 58.3% higher than 2009, with dolphin fish being the most abundant species, accounting for 41.4% of the longline catches, following by swordfish (21.5%) and blue shark (12.1%). Yellowfin tuna was the fourth most abundant species in the Brazilian longline fishery, accounting for 9.2%. The total catch of white marlin and blue marlin was, respectively, 35 t and 130 t, representing a decreasing trend of 32.7% and 12.7% from 2009, respectively.

Part of the Brazilian catches resulted again from the fishing activities of small scale fishing boats based mainly in Itaipava-ES (southeast coast) which includes several target species with different gears, including longline, handline, trolling and other surface gears. In 2010, this fleet caught 5,813.0 t of fish, of which dolphin fish contributed with 42.5%. Yellowfin was the second most caught species with 28% following by the skipjack tuna, which accounts with 12.5% of the catches taken by this fishery.

Besides the catch and effort data regularly collected from Brazilian tuna fisheries, in 2010, around 5,000 fishes were measured at sea and while landing. The main fish species measured were: dolphin fish; blue shark; yellowfin; bigeye; swordfish; sailfish; white marlin; and blue marlin.

Brazilian research efforts continued on tunas, billfish and sharks, as well as on the incidental catches of seabirds and sea turtles, aiming at monitoring by-catch and testing mitigation measures.

Canada

In 2010, Canada landed 1,346 t of swordfish in 2010, 505 t of bluefin tuna, 14 t of albacore tuna, 103 t of bigeye tuna, and 166 t of yellowfin tuna. Canada also landed 41 t of shortfin mako, and 83 t of porbeagle. When compared with 2009, these amounts are generally similar.

Bluefin tuna research focused on post-release survival, migration studies, understanding the influences of ocean environment on catch rates and cooperation with the GBYP to improve our understanding of the age and stock origin of the catch in Canadian waters. Swordfish research targeted improved understanding of stock structure, and documenting the recovery of swordfish in the Atlantic, along with many other scientists from the SCRS. Shark research has been directed to improved estimates of post-release mortality, determining spawning areas, and improving biological statistics in support of improved assessments. More details of the Canadian research program may be found in the Annual Report of Canada.

Cape Verde

The Cape Verde tuna fleet in 2010 was comprised of 101 operational vessels over 11 meters. The catch data on tunas and tuna/like species in 2010 are provisional and estimated at 13.304 tonnes, caught mainly by purse seine and pole and line in the industrial or semi-industrial fishery and with hand line in artisanal fishing.

In Cape Verde, at the national level, there was no industrial fishing vessel targeting sharks since 2007. Shark catches are caught incidentally. Due to the fragility of our surveillance, sharks are often part of the by-catches of the foreign longline fleet that fishing in the Cape Verde EEZ.

Sport fishing has been, over time, an important activity for economic, cultural and political development, but unfortunately this fishery is still not monitored.

Billfishes are caught in Cape Verde waters, mainly by EU vessels and by sport fishing. The authorized foreign fleet, fishes in the Cape Verde EEZ based on fishing agreements or contracts. The vessels mostly pertain to European Union and Asian countries.

The objective of the research is to formulate recommendations for the optimal and sustainable exploitation of the aquatic living resources, taking into account the economic and social objectives established in the policy on development, but without neglecting the protection of the environment, the conservation of the resources and the preservation of nature, particularly the biological marine heritage. Research on fishing and the environment and socio-economic studies are thus instruments of considerable importance for the development of fishing. The data compiled are regularly transmitted to the ICCAT Secretariat, thereby contributing to the updating of statistics and to the ICCAT stock assessments.

The implementation of the ICCAT conservation and management measures is carried out through the Fishing Management Plan, which was updated in 2009.

China

Longline is the only fishing gear used by the Chinese fishing fleet to fish tunas in the Atlantic Ocean. Thirty Chinese tuna longliners operated in 2010, with a total catch of 6,873 t including tuna, tuna-like species and sharks (in round weight), 515.5 t more than that of 2009 (6,357.5 t). The target species were bigeye tuna and bluefin tuna, of which catches amounted to 5,489 t and 38.22 t, in 2010, respectively. Bigeye tuna was the major target species in Chinese catch, accounting for 79.9% of the total, however, it was 516 t more than that of 2009 (4,973 t). Yellowfin tuna, swordfish and albacore were taken as by-catch. The catch of yellowfin tuna decreased from 462 t in 2009 to 426.9 t in 2010. The catch of swordfish was 369.1 t, with a tiny decrease from the previous year (383 t in 2009). The catch of albacore was 239.6 t, which represented a 106.6% increase from the previous year.

The data compiled, including Task I and Task II as well as the number of fishing vessels, have been routinely reported to the ICCAT Secretariat by the Bureau of Fisheries (BOF), Ministry of Agriculture of the People's Republic of China. China has carried out a national scientific observer program for the tuna fishery in ICCAT waters since 2001. Two observers have been dispatched on board two Chinese Atlantic tuna longline fishing vessels covering the area of N3°53'~N14°15', W30°07'~W40°20', S4°21'~N10°32', W22°57'~W35°58' (targeting bigeye tuna), N48°49'~N52°42', W16°00'~W33°20' and N47°51'~N52°35', W16°48' ~W34°40' (targeting bluefin tuna) since September, 2010. Data of target species and non-target species (sharks, sea turtles, especially) were collected during the observation.

In terms of implementation of the relevant ICCAT conservation and management measures, the BOF requires all fishing companies operating in the Atlantic Ocean to report their fisheries data on a monthly basis to the Branch of Distant Water Fisheries of China Fisheries Association and the Tuna Technical Working Group in order to comply with the catch limits. The BOF has established a fishing vessel management system, including the issuance of licenses to all the approved Chinese fishing vessels operating on the high seas of world oceans. The Chinese high seas tuna fishing fleet has been required to be equipped with a VMS system since October 1, 2006. The BOF has strictly followed the National Observer Program and the ICCAT Regional Observer Program for transshipment at sea.

Croatia

Total Croatian catch of bluefin tuna in 2010 in commercial fisheries was 385.69 metric tons (t). The bluefin tuna were predominantly transferred into farming cages (353.764 t; 91.7%) and 16.14 t (4.19 %) were landed. Bluefin catches were mostly realized by purse seiners (369.54 t; 95.81%), while the remaining was caught using hook and line gears. A difference of 15.77 tons (4.1%) has been registered between the purse seine catch (369.54 t) and caging (353.764 t). The difference is due to the fact that counting and recording of transfers to farm is performed in conditions which allow better results. However, Croatia closed the fishery based on the catch reported and authorized.

The total Croatian catch of Mediterranean (Adriatic) swordfish in 2010 amounted to 5,740 kg.

Research was continued on issues of growth and reproductive biology of bluefin tuna. National sampling program targeting bluefin tuna harvested from aquaculture facilities has been carried out. The research activities are under way aiming to estimate the impact of increased abundance of small bluefin tuna in the Adriatic on small pelagic fishery. Preliminary research on the use of stereoscopic camera for bluefin sizing and counting has been carried out.

Croatia has adopted the Regulation on catch, farming and trade of bluefin tuna that includes all provisions of the relevant ICCAT Recommendations and transposes them into national legislation in full. Croatia has implemented the ROP programme in full accordance with the provisions of the relevant ICCAT Recommendations.

European Union

The European Union fleets caught 192,000 tonnes (t) in 2010, which is close to 40% the total catches of ICCAT. These 2010 catches increased slightly as compared to the 155,000 t in 2007, this following the increasing catches of tropical tunas and the return to the Atlantic of the purse seiners that operated in the Indian Ocean. These catches fall far short of the 300,000 t. that were landed in the early 1990s for the same EU countries. Eight EU countries carry out tuna fishing in the Atlantic and the Mediterranean, whose catches in descending order in

2010 were: Spain (116,000 t), France (43.000 t), Portugal (20,500 t) with high catches of skipjack in 2010, Italy (9,300 t), Greece (1,800 t), Ireland (900 t), Malta and Cyprus. The major species caught by the EU countries in 2010 were skipjack, which sharply increased (68,900 t.), yellowfin (46,500 t), swordfish (21,100 t) and bigeye (18,300 t), albacore (17,100 t), and bluefin tuna (6,060 t). It is noted that while the 2010 catches of tropical tunas have been increasing slightly every year since 2007, the catches of albacore and swordfish are stable, and bluefin tuna catches are declining. All the traditional fishing gears are active in the EU: purse seiners, baitboats, longliners, hand lines, troll, driftnets, harpoons, pelagic trawl, traps and sport fishing.

Since 2001, the EU also largely and routinely finances the collection of biological data and a number of research projects on the tunas of all its member countries. Biological sampling of the tropical tunas catches from European purse seiners is also carried out routinely at the Abidjan canneries and, since 2008, in the French Antilles artisanal fisheries. The Task I and II statistical data submitted to ICCAT in 2011 by the EU countries are overall complete and in accordance with the ICCAT rules. It should be noted that the EU also supports observer programmes on various fleets, the tropical purse seiners with about 10% of the fishing effort monitored by observers, and since 2009, 100% of the fishing days observed on purse seiners fishing bluefin tuna in the Mediterranean. Also of note again in 2011 is the considerable financial support from the EU towards the ICCAT GBYP intensive research on bluefin tuna.

The active participation of European scientists at all the ICCAT scientific meetings and the large number of SCRS documents co-authored by EU scientists covering all ICCAT research areas and species was also noted. EU countries also carry out considerable research of a more fundamental nature on tunas on, for example, ecosystems, the reduction of by-catches, tuna-environment relations, tuna behavior, FADs, spawning and reproduction of larvae and juvenile bluefin tuna, marine protected areas used the for tuna resources, reduction of unwanted by-catches, modeling of high seas pelagic ecosystems, etc. The participation of EU countries is, for example, active in the framework of the CLIOTOP/GLOBEC programme which has broad objectives that are multi-disciplinary and worldwide, and which are aimed at carrying out better modelling of the sustainable exploitation of the tuna resources based on the environment and the ecosystems.

Ghana

The tuna industry in Ghana comprises skipjack (*Katsuwonus pelamis*), yellowfin (*Thunnus albacares*) and bigeye tuna (*Thunnus obesus*). Twenty-two (22) baitboats and 15 purse seiners are currently fishing within the EEZ of Ghanaian coastal waters and beyond and exploit these tuna species amongst other minor tuna-like species such as the black skipjack (*Euthynnus alletteratus*). During the year under review, skipjack catches were the highest (69%) followed by yellowfin (16%) and bigeye (9%), respectively.

Both fleets employ Fish Aggregating Devices (FADs) in fishing and collaborate extensively sharing their catch during fishing operations. Over 80% of catches are conducted off FADs. Catches for the year 2010 rose slightly to 77,876 t, from 66,470 t in 2009. All data for 2010 were submitted via the AVDTH format during the inter-sessional meeting on Ghana's statistics in May 2011.

Recent improvements in sampling, coupled with the provision of more logbook information from the fishery, has contributed to a better understanding of the spatio-temporal distribution of the species. It is envisaged that further synthesis of the database on Ghana since 1980-2010 which is ongoing will give a clear sampling strategy to improve the catch and species composition of the entire catch in relation to innovations observed in the fishery.

An observer programme was organized in March-May 2010 on board four purse seine vessels with the aim of training officers on proper methods of estimating catches and filling out of information in logbooks. Further in early 2011, four observers sponsored by the JDMIP project were deployed on purse seiners. Reports have been duly sent to the ICCAT Secretariat. Increased port sampling was also carried out during the months of May-July 2011 also sponsored by the JDMIP.

Beach sampling of billfishes under the ICCAT Enhanced Research Programme for Billfish continued off the western coast of Ghana from artisanal drift gill operators with slight declines in catches.

Japan

Longline is the only tuna-fishing gear deployed by Japan at present in the Atlantic Ocean. The final coverage of the logbook from the Japanese longline fleet has been 90-95% before 2009. The current coverage for 2010 is estimated to be about 90%. In 2010, fishing days was about 22,000 days, which was about 80% of average value in recent ten years. The catch of tunas and tuna-like fishes (excluding sharks) is estimated to be about 30,000 t,

which are about 90% of the past ten years average catch. The most important species was bigeye representing 55% of the total tuna and tuna-like fish catch in 2010. The next dominant species was yellowfin occupied 17% in weight and third species was swordfish (9%). Observer trips on longline boats in the Atlantic were conducted and total of about 600 fishing days were monitored. In addition to the logbook submission mentioned above, Fisheries Agency of Japan (FAJ) has set catch quotas for western and eastern Atlantic bluefin as well as for northern, southern Atlantic swordfish, blue marlin, white marlin and bigeye tuna, and has required all tuna vessels operating in the Atlantic Ocean to submit catch information every day (bluefin tuna) and ten-day (other tunas) period by radio or facsimile. All Japanese longline vessels operating in the Convention Area has been equipped with satellite tracking devices (VMS) onboard. In accordance with ICCAT recommendations, the FAJ has taken necessary measures to comply with its minimum size regulations, time area closures and so on by a Ministerial Order. Each species statistical or catch document programs have been conducted. Records of fishing vessels larger than 24 meters in length overall (LSTLVs) have been established. The FAJ has dispatched patrol vessels to the North Atlantic to monitor and inspect Japanese tuna vessels and also observe fishing activities of other nations' fishing vessels, and inspected landings at Japanese port to enforce the catch quotas and minimum size limit. A prior permission from the FAJ has been required in the case that Japanese tuna longline vessels transship tuna or tuna products to reefers at foreign ports or at sea.

Korea

In 2010, a total of 16 Korean longliners and two purse seiners were operated in the ICCAT area, of which three longliners and one purse seiner were operated under the chartering arrangement with Côte d'Ivoire, and caught a total of 3,423 t, which was a decrease by 11.3% compared to the previous year. Almost 95.7% of the total catch were from three major species, of which bigeye tuna catch was 2,657 t (77.6%), yellowfin tuna 380 t (11.1%) and albacore 240 t (7.0% of the total). It was notable that no bluefin tuna catch was made in 2010 although one purse seiner was operated in the Mediterranean. Korean longliners have mainly operated in the tropical area of the Atlantic Ocean and targeted bigeye tuna and yellowfin tuna. Fishing season was throughout the year from January to December in 2010 in the central Atlantic Ocean (15°N ~15°S, 10°E~50°W). Compared to the previous year, longline fishing area was slightly extended further south and eastward. However, the fishing grounds have fluctuated every year depending on the fishing and oceanographic condition**s** for target species, with main fishing grounds located in statistical area 34 of the Atlantic Ocean. The National Fisheries Research and Development Institute (NFRDI) has carried out routine scientific monitoring work over the past years. The monitoring was for the collection of catch and fishing effort statistics from the Korean tuna longliners and purse seiners operated in the Atlantic Ocean. The requested Task I and Task II data were already provided to the ICCAT Secretariat. The data coverage for longline fishery was 65.1% of total catch in 2010. There are two sources of statistical data collection. The Korea Overseas Fisheries Association (KOFA) collects total catches by gear from Korean tuna industries, which are used as the official total catch that cover all tunas and tuna-like species. NFRDI collects logsheet sampling data from fishing vessels. The logsheet contains operation location, catches by species, number of hooks and sets, etc. The estimates of annual catch for the ICCAT area presented in this report are made by cross-checking the logsheet data and the official total catch. Korea began developing its observer program for distant-water fisheries including tuna fisheries in 2002. In 2010, the NFRDI's observer program deployed 13 trained observers who carried out 16 trips on Korean distant-water fishing vessels in the major oceans including the Antarctic Ocean. For tuna fisheries in the Atlantic, one observer was deployed on the Korean tuna longline vessel that operated in the central Atlantic. To help with the identification of the species of seabird**s,** sea turtles and sharks incidentally caught by tuna longline and purse seine fishing, guide books and posters summarizing information on these species have been distributed to fishing vessels along with the by-catch logbook sheet since 2008.

Mexico

Fishing for yellowfin tuna (*Thunnus albacares*) in the Gulf de Mexico was carried out by mid-water vessels using longline. In this activity besides catching the target species, other species are also caught incidentally, such as: skipjack tuna (*Katsuwonus pelamis*), bigeye tuna (*Thunnus obesus*), Atlantic bluefin tuna (*Thunnus thynnus*), among others. Yellowfin tuna fishing is carried out throughout the year, with the major catches taken in the months of May, June and July. This fishery has certain economic importance at the national as well as the international level, since the export of fresh yellowfin tuna has been one of the important activities in the fishing sector and it has an important place in the economy. The total number of vessels that have maintained a continuous fishing activity has remained between 25 and 32 vessels during the 2001-2010 period. On the other hand, the total catches of yellowfin tuna and similar species amounted to 1,177 t in 2010, which was a decrease of 21% compared to 2009. The *Instituto Nacional de Pesca*-INAPESCA (National Fishing Institute) is in charge of carrying out the scientific research on these fishing resources, besides having the responsibility for the

research and collection of statistics on longline tuna fishing in the Gulf of Mexico. The monitoring of this fishery has been strengthened thanks to the Programme of on-board observers who register biological, fishery, and fishing method information with observer coverage on each fishing trip.

Morocco

The fishing of tuna and tuna-like species attained a production of 10,722 metric tons (t) in 2010 compared to 13,956 t in 2009, i.e. a decrease of about 23% in terms of volume.

The major species caught along the Moroccan coasts are bluefin tuna, swordfish, bigeye tuna, yellowfin tuna, albacore, small tunas, and some shark species.

The collection of statistical data on catch and effort data is carried out in an exhaustive manner by the fisheries administration structures, such as the *Département des Pêches* (Department of Fishing) and the *Office National des Pêches* (National Office of Fishing), which are all along the Atlantic and Mediterranean coasts of Morocco. Monitoring of the export of fishing products is also carried out by the *Office des Changes* (the Currency Exchange Office).

With regard to the scientific work, the *Institut National de Recherche Halieutique*-INRH (National Institute of Fisheries Research), through its Regional Centers (of which there are five) covering the entire Moroccan coast, reinforces the collection of biological data on the major species (bluefin tuna and swordfish). The Regional Center of the INRH in Tangiers serves as coordinator of the collection of all these data. In recent years, the monitoring of other species has been started, particularly tropical tunas (bigeye tuna among others), with an extension of the research work towards areas located to the south of Morocco.

Considerable progress has also been reported regarding the collection of biological data, as noted by the series of scientific documents as well as the Task II databases, submitted by Moroccan scientists at the various SCRS meetings for purpose of stock assessments on tunas.

Norway

Approximately 100 kg of Atlantic bonito (*Sarda sarda*) were landed and measured in Norway in 2010. A report entitled: “Atlantic bonito in Nordic waters: biology, distribution and feeding” has been written. There have been no catches and observations of Atlantic bluefin tuna (*Thunnus thynnus*) and Atlantic swordfish (*Xiphias gladius*) in Norway in 2010. Norway continuously works on historical data on tuna and tuna like species, and aims to put the data on these species into an ecosystem perspective. During 2010 new historical data on Atlantic bluefin tuna were found after considerable search in various places along the coast of Norway. The search for bluefin tuna material resulted in Task II data (weight, date of catch and catching area) from a total of 14,839 individuals during the time period 1950-1954. Norway participated in all major international scientific meetings concerning Atlantic bluefin tuna in 2010.

Russia

The fishery. In 2010 and 2011 the specialized purse seine tuna fishery was not carried out by Russian flag vessels. The trawl fishery vessels caught 605 t of tunas and 1042 t of bonito as by-catch from the Central-East Atlantic Ocean during 2010. In the first half of 2011, the trawl fishery vessels caught 640 t of tunas and 968 t of bonito.

Scientific research and statistics. In 2010, observers from AtlantNIRO collected biological material for tunas on board the trawlers in the Central-East Atlantic Ocean (the area SJ71 according to ICCAT classification). The fish length and weight were measured, fish sex, gonads maturity stage and stomach fullness index were determined. The species of the group “little tunas” occurred in trawls as by-catch in amounts from few a individuals to several tens. Material on frigate tuna, bullet tuna, black skipjack and bonito was collected from 4,625 specimens for mass measurements and 2,738 specimens for biological analyses.

Implementation of ICCAT conservation and management measures. During the fishery in the areas where tunas and tuna-like species occur in catches, the ICCAT requirements and recommendations concerning restrictions in the tuna fishery and a ban imposed on fishing quoted species were observed.

Senegal

In 2010, the Senegalese industrial tuna fleet was comprised of 6 baitboats that mainly fish yellowfin tuna (*Thunnus albacares*), bigeye tuna (*Thunnus obesus*) and skipjack tuna (*Katsuwonus pelamis*), and 1 longline vessel that targets swordfish. Furthermore, some artisanal fisheries (hand line, pole and line and purse seine) and the sport fishery catch billfishes (marlins, swordfish and sailfish) and small tunas (Atlantic black skipjack, mackerel, bonito, frigate tuna, etc.).

The total Senegalese baitboat catch in 2010 is estimated at 4,606 tonnes (1,168 t of yellowfin tuna, 2,412 t of skipjack tuna, 844 t of bigeye). Catches have shown a decline as compared to 2009 (6,720 t). This reduction is due to the decrease in fishing effort that went from 1,574 fishing days in 2009 to 1,220 in 2010. Longline catches in 2010 are estimated at 312 t (590 t in 2009). The catches are comprised mainly of swordfish, sharks and billfishes. As regards the artisanal fisheries, the catches of small tunas and tuna-like species reached 8,719 t. Catches have shown an increase as compared to (5,315 t). With regard to sport fishing, catches are estimated at 288 t in 2010 with an effort of 682 fishing trips.

Regular monitoring of the tuna fishing activities is assured by the CRODT team in place at the port of Dakar. The work consists of the collection of statistics on catches and fishing effort. This work is supplemented by information from different sources (factories, boat owners, Directorate of Marine Fishing, etc.). Some multi-species sampling is also carried out on industrial and artisanal fishing. Thanks to funds from the Enhanced Research Program on Billfish (EPBR), sampling of the billfish catches, effort and sizes has been intensified at the major landing centers of the artisanal fishery.

Turkey

During the course of 2010, the total catch of tuna and tuna-like fishes amounted to 10,546 t. In 2010, Turkey's total catches of bluefin tuna, albacore, Atlantic bonito and swordfish were 409.377 t, 402 t, 9,401 t, and 334 t, respectively. All bluefin catch was caught by purse seiners, the majority of which have an overall length 30-50 m and 200-300 GRT. The fishing operations were conducted intensively off Antalya Bay and in the region between Antalya Gazi Paşa and Cyprus. In the Mediterranean, fisheries were conducted in the region between Cyprus-Turkey and in the region Cyprus-Syria. The highest bluefin tuna catch amount was obtained in June. Recommendations and resolutions imposed by ICCAT were transposed to national legislation and implemented. All conservation and management measures regarding bluefin tuna fisheries and farming are regulated by national legislation through notifications, considering ICCAT's related regulations. The Fisheries Information System has been updated in order to meet the requirements of data exchange at the national and regional levels. Major research activities in 2010 focused on albacore and swordfish.

United States

Total (preliminary) reported U.S. catch of tuna and swordfish, including dead discards, in 2010 was 9,190 tons (t), a decrease of about 5% from 9,632 t in 2009. Estimated swordfish catch (including estimated dead discards) slightly decreased from 2,878 t in 2009 to 2,845 t in 2010, and provisional landings from the U.S. fishery for yellowfin slightly decreased from 2,788 tons in 2009 to 2,648 tons in 2010. U.S. vessels fishing in the northwest Atlantic caught in 2010 an estimated 925 t of bluefin, a decrease of 303 t compared to 2009. When compared to the levels in 2009, provisional skipjack landings decreased by 65 t to 54 t in 2010, estimated bigeye landings increased by about 157 t to an estimated 673 t in 2010, and estimated albacore landings increased by 140 t to 328 t in 2010.

In 2010, the United States continued research on several tuna and tuna like species in several areas such as genetics, age and growth, tagging, habitat utilization, and assessment modeling among others. The U.S. Atlantic tagging program continued in 2010 and it tagged and released 1,865 billfishes (including swordfish) and 431 tunas during the year. The U.S. Pelagic Observer Program in 2010 had a target coverage of 8% of the sets of the fleet; however, the expanded observer coverage in the Gulf of Mexico during the bluefin tuna spawning season continued this year observing approximately 58% of the longline sets during this period. The bottom longline observer program was also active from January to December 2010, and total of 161 hauls on 105 trips were observed.

Uruguay

In 2010 fishing effort in the tuna fleet was reduced. The majority of the vessels were less than 27 m in length and target mainly swordfish and tunas. The total catch (preliminary) landed and reported in 2010 was approximately 654 tons.

Various activities were carried out in 2010 related to statistics, research and management. Some of these activities are carried out jointly with other national and international institutions. In 2010, independent research continued on board the DINARA research vessel to collect more detailed information on the pelagic oceanic species, experiments on mitigation measures, etc.

The research was carried out mainly on information from the Observers Programme (PNOFA) and during 2010 data obtained on the research vessel were integrated. PANOFA covered part of the activity of the national fleet in 2010 and 100% of the deep longline fleet. The tagging program continued and approximately 100 fish were tagged. Uruguay collaborated in various inter-sessional meetings presenting papers for the stock assessments and the data preparatory meetings (bigeye tuna, blue marlin, sharks, ecosystems, etc.).

Besides, various studies were carried out on biology, genetics, by-catch mitigation, among others, for many of the species under ICCAT mandate. The ICCAT Shark Identification Guide was completed and work was started on the second volume of the Guide.

In 2010, a survey project was continued to determine the possibility of bigeye tuna fishing in Uruguayan waters. This fishing was carried out by Japanese vessels which had 100% coverage by Uruguayan observers.

Venezuela

The Venezuelan fleet that fished in the Atlantic targeting pelagic resources was comprised of 69 industrial vessels in 2010: 53 longliners, 8 purse seiners and 8 baitboats. Besides, 35 artisanal vessels were registered that fish using driftnets. This year, landings of tunas and tuna-like species in the Atlantic Ocean amounted to 8,437 t. Of these, 98.2% were tunas, among which the most important species was yellowfin tuna (*T. albacares*) with 56.7%, while skipjack tuna (*K. pelamis*), black skipjack (*T. atlanticus*) and bigeye tuna (*T. obesus*) catches amounted for 25,1%, 3.9% and 3.4% of the catch, respectively. The by-catch was comprised of billfishes, notably sailfish (*Istiophorus albicans*) with 2.1% and blue marlin (*Makaira nigricans*) with 1.6% and sharks whose landings represented 1.7%. The majority of the landings (61.2%) are from the purse seine fishery, 12.9% from baitboat, 22.5% from longline and 3.3% from the artisanal fisheries. In 2010 research continued on the fishery for large pelagic species, including tunas, billfishes and sharks. The program of scientific observers on board industrial longline vessels continued as did the coverage of the sport fishing tournaments along the central coast of Uruguay.

− ***Cooperating Parties, Entities or Fishing Entities***

Chinese Taipei

In 2010, the total number of longline vessels authorized to operate in the Atlantic Ocean was 117, which included 67 vessels authorized to target bigeye tuna and 50 vessels authorized to target albacore. The total catch of tuna and tuna-like species of the longline fleet was estimated to be 31,007 metric tons (t) in 2010. Tropical tunas (bigeye tuna, 13189 t and yellowfin tuna, 824 t) were the most dominant species caught accounting for 45% of the total catch, and albacore (12,562 t) accounted for 41%. The Fisheries Agency has set catch quotas for Atlantic bigeye tuna, northern and southern Atlantic albacore, and for by-catch species, namely swordfish, blue marlin and white marlin. Catches of these species were well below catch limits allocated by the ICCAT for 2010. All Chinese Taipei longline vessels operating in the Atlantic Ocean were equipped with satellite tracking devices (Vessel Monitoring System, VMS) on board. Statistics (fleets characteristics/Task I/Task II/size/observer by-catch data) were submitted to the ICCAT Secretariat within the required timeframe. In 2010, 18 observers were placed on fishing vessels in the Atlantic Ocean, and the observer coverage was above the requirement set by ICCAT. The research programs for 2010 conducted by scientists included stock assessments, standardizations of catch-per-unit-effort on bigeye tuna, swordfish, albacore and blue marlin (and other incidental catch species), shark fin ratio, shark by-catch re-estimation, incidental catch rate and mortality rate by sighting of seabirds, sea turtles and cetaceans. The research results were presented at the regular meeting and inter-sessional working group meetings of the SCRS.

8. Executive Summaries on species

The Committee reiterated that in order to achieve a more rigorous understanding of these Executive Summaries from a scientific point of view, the previous Executive Summaries should be consulted, as well as the corresponding Detailed Reports which are published in the *Collective Volume of Scientific Papers.*

The Committee also pointed out that the texts and tables of these Summaries generally reflect the information available in ICCAT immediately prior to the SCRS plenary sessions, since they were prepared during the meetings of the Species Groups. Therefore, the catches reported to ICCAT during or after the SCRS meeting cannot be included in these Summaries.

8.1 YFT – YELLOWFIN TUNA

A stock assessment for yellowfin tuna was conducted in 2011, at which time catch and effort data through 2010 were available **(YFT-Table 1)**. Readers interested in a more complete summary of the state of knowledge on yellowfin tuna should consult the detailed report of the 2011 ICCAT Stock Assessment of Atlantic Yellowfin Tuna (SCRS/2011/020).

Other information relevant to yellowfin tuna is presented elsewhere in this SCRS Report:

- The Tropical Tunas Work Plan **(Appendix 4)** includes plans to address research and assessment needs for yellowfin tuna.

YFT-1. Biology

Yellowfin tuna is a cosmopolitan species distributed mainly in the tropical and subtropical oceanic waters of the three oceans. The sizes exploited range from 30 cm to 170 cm FL; maturity occurs at about 100 cm FL. Smaller fish (juveniles) form mixed schools with skipjack and juvenile bigeye, and are mainly limited to surface waters, while larger fish form schools in surface and sub-surface waters. The main spawning ground is the equatorial zone of the Gulf of Guinea, with spawning primarily occurring from January to April. Juveniles are generally found in coastal waters off Africa. In addition, spawning occurs in the Gulf of Mexico, in the southeastern Caribbean Sea, and off Cape Verde, although the relative importance of these spawning grounds is unknown. Although such separate spawning areas might imply separate stocks or substantial heterogeneity in the distribution of yellowfin tuna, a single stock for the entire Atlantic is assumed as a working hypothesis. This assumption is based upon information such as observed transatlantic movements (from west to east) indicated by conventional tagging and longline catch data that indicates yellowfin are distributed continuously throughout the entire tropical Atlantic Ocean. However, movement rates and timing, routes, and local residence times remain highly uncertain. In addition, some electronic tagging studies in the Atlantic as well as in other oceans suggest that there may be some degree of extended local residence times and/or site fidelity. Natural mortality is assumed to be higher for juveniles than for adults; this is supported by tagging studies for Pacific and Indian Ocean yellowfin. Uncertainties remain as to the scale of these natural mortality rates. Males are predominant in the catches of larger sized fish (over 145 cm), which could be explained if females experience a higher natural mortality rate (perhaps as a consequence of spawning). On the other hand, females are predominant in the catches of intermediate sizes (120 to 135 cm), which could support a hypothesis of distinct growth curves between males and females, with females having a lower asymptotic size than males. These uncertainties in both natural mortality and growth have important implications for stock assessment.

Growth rates have been described as relatively slow initially, increasing at the time the fish leave the nursery grounds; this characterization is supported by results size frequency distributions as well as from tagging data. Nevertheless, questions remain concerning the most appropriate growth model for Atlantic yellowfin tuna; this discrepancy in growth models could have implications for stock assessments.

The younger age classes of yellowfin tuna exhibit a strong association with FADs (natural or artificial fish aggregating devices/floating objects). The Committee noted that this association with FADs, which increases the vulnerability of these smaller fish to surface fishing gears, may also have a negative impact on the biology and on the ecology of yellowfin due to changes in feeding and migratory behaviors.

YFT-2. Fishery indicators

Overall Atlantic catches declined by nearly half from the peak catches of 1990 (194,000 t) to the lowest level in nearly 40 years (100,000 t) in 2007, although catches have increased by about 10% from that level in recent years (a provisional 108,343 t was estimated for 2010 at the time of the assessment; 107,546 t was reported as of the SCRS Plenary session).

In the eastern Atlantic, purse seine catches declined by 60% from 128,729 t in 1990 to 50,392 t in 2007, but then increased by about 40% from that level to 69,953 t in 2010 **(YFT-Table 1; YFT-Figure 2)**. Baitboat catches declined by more than half from 1990 to 2007 (from 19,648 t to 8,896 t), and have since fluctuated at about that level. Longline catches, which were 10,253 t in 1990, have fluctuated since between 5,790 t and 14,638 t and were 13,437 t in 2007 (a 30% increase from 1990), but have steadily declined since to a level of 5,834 t in 2010.
In the western Atlantic, purse seine catches (predominantly from Venezuela) declined by more than 90% from a peak in 1994 to 2009 (from 19,612 t to 1,365 t), the lowest level in more than 30 years, before reversing the

trend by increasing to 4,219 t in 2010. Baitboat catches also reached a nearly 30 year low (886 t) in 2008, declining nearly 90% from 7,094 t in 1994, before increasing again to 1,436 t in 2010. Longline catches, which were 11,790 t in 1994, have fluctuated since between 10,059 t and 16,019 t, were 12,640 t in 2010.

The most recent available catch distribution is given in **YFT-Figure 1.** However, it should be noted that official reports are not yet available from several Contracting and/or non-Contracting Parties, and some of these figures are based upon data provided by CPC scientists and/or derived from recent catch levels.

Purse seine catch levels had been held in check until 2007 in large part by a continued decline in the number of purse seine vessels in the eastern Atlantic. As a recent indicator, the number of purse seiners from the European and associated fleet operating in the Atlantic had declined from 44 vessels in 2001 to 25 vessels in 2006, with an average age of about 25 years (see **SKJ-Figure 7** for trends in number of vessels and carrying capacity**)**. Since then, however, the number of purse seiners has increased by about 40% to 35, as vessels have moved from the Indian Ocean to the Atlantic. At the same time, the efficiencies of these fleets have been increasing, particularly as the vessels which had been operating in the Indian Ocean tend to be newer and with greater fishing power and carrying capacities. Overall carrying capacity of the total purse seine fleet in 2010 has increased to about the same level as in the 1990s and FAD based fishing has accelerated more rapidly than free school fishing (although both have substantially increased), with the number of sets on FADs reaching levels not seen since the mid 1990s.

Unreported purse seine catches were estimated by comparing monitored landings in West African ports and cannery data to catches reported to ICCAT. Estimates of unreported purse seine catches are large and increasing since 2006 and now may exceed 20,000 t for the three main species of tropical tunas. The Committee expressed the need for countries and the involved industry in the region to cooperate to estimate and report these catches correctly to ICCAT. These estimates have not been incorporated into assessments (although the sensitivity of stock status estimates to the inclusion of these catch estimates was evaluated at the 2011 yellowfin tuna stock assessment meeting). These estimates of unreported catch are not included in the total catch estimates presented in this report. The magnitudes of these estimates of unreported catch, however, are likely to influence the assessments and the resulting perception of stock status.

Available catch rate series from purse seine data, after an initial period of apparent declines, showed high variability without clear trend in recent years **(YFT-Figure 3)**. Baitboat catch rate trends **(YFT-Figure 4)** also exhibit large fluctuations, with a somewhat declining overall trend. Such large fluctuations may reflect changes in local availability and/or fishing power, which do not necessarily reflect stock abundance trends. Standardized catch rates for the longline fisheries **(YFT-Figure 5)** generally show a declining trend until the mid-1990s, and have fluctuated without clear trend since.

The average weight trends by fleet (1970-2010) are shown in **YFT-Figure 6**. The recent average weight in European purse seine catches, which represent the majority of the landings, has declined to about half of the average weight of 1990. This decline is at least in part due to changes in selectivity associated with fishing on floating objects beginning in the 1990s. A declining trend is also reflected in the average weight of eastern tropical baitboat catches. Longline mean weights have been more variable.

Apparent changes in selectivity can also be seen in the overall trends in catch at age shown in **YFT-Figure 7**. The variability in overall catch at age is primarily due to variability in catches of ages 0 and 1. These ages are generally taken by the surface fisheries around FADs.

YFT-3. State of the stock

A full stock assessment was conducted for yellowfin tuna in 2011, applying both an age-structured model and a non-equilibrium production model to the available catch data through 2010. As has been done in previous stock assessments, stock status was evaluated using both production and age-structured models. Models used were similar in structure to those used in the previous assessment, however, other alternative model structures of the production model and the VPA were explored in sensitivity runs. These runs confirmed that some of the estimated benchmarks obtained from production models are somewhat sensitive to the assumption used that MSY is obtained at half of the virgin biomass. This assumption was used in the production models that contributed to benchmark estimates found in this report.

The estimate of MSY (~144,600 t) may be below what was achieved in past decades because overall selectivity has shifted to smaller fish (**YFT-Figure 7**); the impact of this change in selectivity on estimates of MSY is

clearly seen in the results from age structured models (**YFT-Figure 8**). Bootstrapped estimates of the current status of yellowfin tuna based on each model, which reflect the variability of the point estimates given assumptions about uncertainty in the inputs, are shown in **YFT-Figure 9**. When the uncertainty around the point estimates from both models is taken into account, there was only an estimated 26% chance that the stock was not overfished and overfishing was not occurring in 2010 (**YFT-Figure 10)**.

In summary, 2010 catches are estimated to be well below MSY levels, stock biomass is estimated to most likely be about 15% below the Convention Objective and fishing mortality rates most likely about 13% below F_{MSY}. The recent trends through 2010 are uncertain, with the age-structured models indicating increasing fishing mortality rates and decline in stock levels over the last several years, and the production models indicating the opposite trends.

YFT-4. Outlook

Projections were made considering a number of constant catch scenarios, and the results from all models are summarized to produce estimated probabilities of achieving Convention Objective ($B>B_{MSY}$, $F<F_{MSY}$), for a given level of constant catch, for each year up to 2025 (**YFT-Figure 11** and **YFT-Table 2)**. Maintaining current catch levels (110,000 t) is expected to lead to a biomass somewhat above B_{MSY} by 2016 with a 60% probability. Higher catch levels would have a lower probability of achieving that goal and may require a longer time frame for rebuilding.

The overall catches of yellowfin tuna estimated for 2008-2010 were about 10% or more higher than the recent low of 2007. The relative contribution of purse seine gear to the total catch has increased by about 20% since 2006, which is related to the increasing purse seine effort trend. Estimates of fishable biomass trends from production modeling indicate a slow, continued rebuilding tendency, but estimates of spawning stock and total biomass trends from the age-structured assessment indicates recent decline and corresponding increasing F. In either case, continued increasing catches are expected to slow or reverse rebuilding.

YFT-5. Effects of current regulations

Recommendation 04-01 implemented a closure for the surface fishing in the area 0º-5ºN, 10ºW-20ºW during November in the Gulf of Guinea. Analyses of purse seine catches which have been presented to the Committee confirmed that the new closure has been less effective than previous moratoria in reducing the proportional catch of small fish harvest and avoiding growth overfishing. If management objectives include reductions in juvenile mortality, there is a general agreement that larger time/area moratoria are likely to be more precautionary than a smaller moratoria, providing that the moratoria are fully complied with.

In 1993, the Commission recommended “that there be no increase in the level of effective fishing effort exerted on Atlantic yellowfin tuna, over the level observed in 1992”. As measured by fishing mortality estimates from the age-structured model, effective effort in 2010 appeared to be near (estimates range from about 5% above to about 10% below) the 1992 levels.

YFT-6. Management recommendations

The Atlantic yellowfin tuna stock was estimated to be overfished in 2010. Continuation of current catch levels (110,000 t) is expected to lead to a biomass somewhat above B_{MSY} by 2016 with a 60% probability. Catches approaching 140,000 t or more would reduce the chances of meeting Convention Objectives below 50%, even after 15 years (2025). In addition, the Commission should be aware that increased harvest of yellowfin on FADs could have negative consequences for bigeye tuna in particular, as well as other by-catch species. Should the Commission wish to increase long-term sustainable yield, the Committee continues to recommend that effective measures be found to reduce FAD-related and other fishing mortality of small yellowfin.

If the provisional estimates of unreported purse seine catches are considered, estimates of current stock status and projections would be more pessimistic. It is especially important to implement effective full monitoring of the fleet for which the Committee has provisionally estimated unreported catch.

ATLANTIC YELLOWFIN TUNA SUMMARY

Maximum Sustainable Yield (MSY)		144,600[1] (114,200 - 155,100)
2010 Yield [2]		107,546 t
Relative Biomass	B_{2010}/ B_{MSY}	0.85 (0.61-1.12)[3]
Relative Fishing Mortality: $F_{current(2010)}/F_{MSY}$		0.87 (0.68-1.40)[3]

Management measures in effect:

- Effective fishing effort not to exceed 1992 level [Rec. 93-04].

NOTE: $F_{current(2010)}$ refers to F_{2010} in the case of ASPIC, and the geometric mean of F across 2007-2010 in the case of VPA. As a result of the constant trend in recruitment estimated by the VPA model, F_{MAX} is used as a proxy for F_{MSY} for VPA results. Relative biomass is calculated in terms of spawning stock biomass in the case of VPA and in fishable biomass in the case of ASPIC.

[1] Estimates (with 80% confidence limits) based upon results of both the non-equilibrium production model (ASPIC) and the age-structured model (VPA).

[2] Reported as of the SCRS Plenary session. The assessment was conducted using the available catch data through 2010. A provisional 108,343 t was estimated for 2010 at the time of the assessment.

[3] Median (10^{th}-90^{th} percentiles) from joint distribution of age-structured and production model bootstrap outcomes considered.

YFT-Table 1. Estimated catches (t) of yellowfin tuna (*Thunnus albacares*) by area, gear and flag.

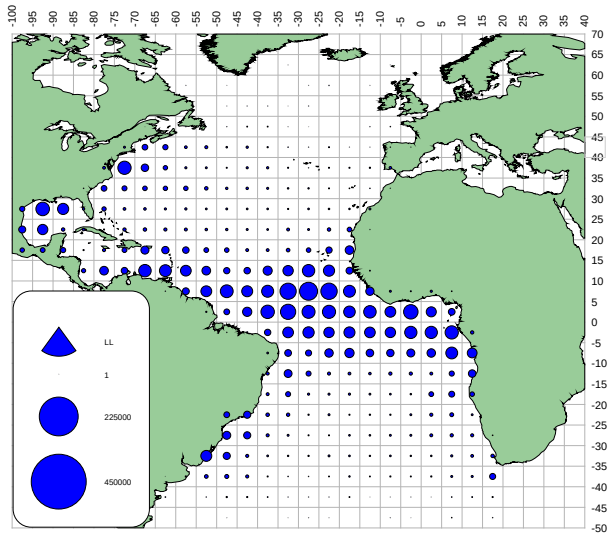
																									as of Plenary		as of Assess.	
			1986	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009***	**2010***	**2009**	**2010**
TOTAL			146673	145361	136265	162247	193536	166901	163762	162753	172584	153251	153043	137218	148566	140366	136249	164650	140279	125590	119972	107234	106564	99619	109590	117340	107546	115671	108343
	ATE		108839	113379	101671	125345	160805	130004	126050	124009	124369	117977	119987	104877	117647	109656	101730	124327	110619	100608	88735	81166	78292	75452	91466	98326	85761	96663	86133
	ATW		37834	31982	34594	36902	32731	36897	37712	38745	48215	35274	33056	32341	30919	30710	34519	40323	29660	24982	31238	26068	28272	24167	18123	19008	21785	19008	22210
	MED		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	6	0
Landings	ATE	Bait boat	15301	16750	16020	12168	19648	17772	15095	18471	15652	13496	13804	12907	17330	19256	13267	19071	13432	11513	15354	12012	10434	8896	11721	10949	8132	10949	8132
		Longline	5779	6624	8956	7566	10253	9082	6518	8537	14638	13723	14236	10495	13872	13561	11369	7570	5790	9075	11442	7317	7219	13437	8566	6321	5834	6321	6229
		Other surf.	2296	2932	2646	2586	2175	3748	2450	2122	2030	1989	2065	2136	1674	1580	2424	2074	1826	2540	2928	3062	3615	2726	1731	2843	1842	2843	1819
		Purse seine	85464	87074	74049	103025	128729	99402	101987	94880	92050	88770	89882	79339	84771	75260	74670	95612	89572	77481	59011	58776	57024	50392	69449	78213	69953	76550	69953
	ATW	Bait boat	2421	5468	5822	4834	4718	5359	6276	6383	7094	5297	4560	4275	5511	5349	5649	5315	6009	3764	4868	3867	2695	2304	886	1331	1436	1331	1436
		Longline	18490	14291	19046	17128	18851	13667	16594	11439	11790	11185	11882	11554	11671	13326	15760	14872	11921	10166	16019	14449	14249	13557	13192	13019	12640	13019	13065
		Other surf.	7101	5557	3692	3293	2362	3457	3483	4842	9719	12454	5830	4801	4581	5345	5241	7027	3763	6445	7134	5118	6880	5959	1973	3285	3482	3285	3482
		Purse seine	9822	6665	6034	11647	6800	14414	11359	16081	19612	6338	10784	11710	9157	6523	7870	13108	7966	4607	3217	2634	4442	2341	2067	1365	4219	1365	4219
	MED	Longline	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	6	0
		Other 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
Discards	ATW	Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	167	0	0	0	0	0	0	5	6	5	9	8	9	8
	ATE	Angola	59	51	246	67	292	510	441	211	137	216	78	70	115	170	35	34	34	34	34	111	0	405	98	98	98	98	98
		Belize	0	0	0	0	0	0	0	0	0	1	0	3	0	0	5	0	0	0	0	0	0	0	0	0	273	0	273
		Benin	19	3	2	7	1	1	1	1	1	1	1	3	1	1	1	1	0	0	0	0	0	0	0	0		0	
		Cambodia	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0		0	
		Canada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	
		Cape Verde	3326	2675	2468	2870	2136	1932	1426	1536	1727	1781	1448	1721	1418	1663	1851	1684	1802	1868	3236	7154	8112	4057	8413	3273	4492	3273	4492
		Cayman Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	
		China P.R.	0	0	0	0	0	0	0	139	156	200	124	84	71	1535	1652	586	262	1033	1030	1112	1056	1000	365	214	169	214	169
		Chinese Taipei	254	193	207	96	2244	2163	1554	1301	3851	2681	3985	2993	3643	3389	4014	2787	3363	4946	4145	2327	860	1707	807	1180	532	1180	532
		Congo	20	15	15	21	22	17	18	17	14	13	12	0	0	0	0	0	0	0	0	0	0	0	0	0		0	
		Cuba	1332	1295	1694	703	798	658	653	541	238	212	257	269	0	0	0	0	0	0	0	0	0	0	0	0		0	
		Curaçao	0	0	0	0	0	0	0	0	0	0	3183	6082	6110	3962	5441	4793	4035	6185	4161	0	1939	1368	7351	6293	5302	6293	5302
		Côte D'Ivoire	0	0	0	0	0	0	0	0	0	0	0	2	0	0	673	213	99	302	565	175	482	216	626	90	470	90	470
		EU.España	61878	66093	50167	61649	68603	53464	49902	40403	40612	38278	34879	24550	31337	19947	24681	31105	31469	24884	21414	11795	11606	13584	24409	32793	25560	32793	25560
		EU.Estonia	0	0	0	0	0	234	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	
		EU.France	17756	17491	21323	30807	45684	34840	33964	36064	35468	29567	33819	29966	30739	31246	29789	32211	32753	32429	23949	22672	18940	11330	16115	18923	20280	17261	20280
		EU.Ireland	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	
		EU.Latvia	0	0	0	0	0	255	54	16	0	55	151	223	97	25	36	72	334	334	334	334	334	0	0	0		0	
		EU.Lithuania	0	0	0	0	0	332	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	
		EU.Poland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	
		EU.Portugal	295	278	188	182	179	328	195	128	126	231	288	176	267	177	194	4	6	4	5	16	274	865	300	990	554	990	554
		EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	0	
		Faroe Islands	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	
		Gabon	0	0	0	0	0	0	0	12	88	218	225	225	295	225	162	270	245	44	44	44	44	0	0	0		0	
		Gambia	0	0	0	0	2	16	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	
		Georgia	0	0	0	0	0	25	22	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	
		Ghana	11821	10830	8555	7035	11988	9254	9331	13283	9984	9268	11720	15437	17657	25268	17662	33546	23674	18457	15054	17493	11931	15463	14250	18355	12512	18355	12512
		Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2906	5265	3461	3736	2603	3124	2603	3124
		Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	892	892	892	892
		Guinée Conakry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	730	0	730
		Honduras	0	0	0	0	0	0	2	0	0	4	3	4	3	0	0	0	0	0	0	0	0	0	0	0		0	
		Japan	3634	4521	5808	5882	5887	4467	2961	2627	4194	4770	4246	2733	4092	2101	2286	1550	1534	1999	5066	3088	4206	8496	5266	3563	3037	3563	3037
		Korea Rep.	965	1221	1248	1480	324	259	174	169	436	453	297	101	23	94	142	3	8	209	984	95	4	303	983	375	324	375	324
		Libya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	208	73	73	0	0	0	0	0	0		0	
		Maroc	2266	1529	0	0	0	0	0	0	0	0	0	0	0	0	0	0	79	108	95	183	95	102	110	110	44	110	44
		Mixed flags (FR+ES)	138	933	932	825	1056	2220	2455	2750	1898	1172	1166	981	1124	1369	1892	1427	599	992	1052	933	1063	655	626	459	533	459	533
		NEI (ETRO)	0	2077	3140	5436	12601	4856	10921	9875	8544	8970	9567	6706	7225	5418	5448	10169	8209	5396	4294	1781	219	0	0	0		0	
		NEI (Flag related)	150	285	206	280	1115	2310	1315	1157	2524	2975	3588	3368	5464	5679	3072	2090	133	466	0	0	0	0	0	0		0	
		Namibia	0	0	0	0	0	0	0	0	35	14	72	69	3	147	59	165	89	139	85	135	59	28	11	1	9	1	9
		Norway	813	418	493	1787	1790	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	0	
		Panama	1944	1858	1239	901	1498	7976	8338	10973	12066	13442	7713	4293	2111	1315	1103	574	1022	0	1887	6170	8557	9363	6175	5813	5048	5813	5048
		Philippines	0	0	0	0	0	0	0	0	0	0	0	0	126	173	86	0	50	9	68	13	30	88	53	10	21	10	21
		Russian Federation	0	0	0	0	0	3200	1862	2160	1503	2936	2696	4275	4931	4359	737	0	0	0	0	4	42	211	42	33	**0**	33	
		S. Tomé e Príncipe	180	178	298	299	164	187	170	181	125	135	120	109	124	114	122	122	122	122	134	145	137	0	160	165	169	165	169
		Senegal	0	0	0	2	90	132	40	19	6	20	41	208	251	834	252	295	447	279	681	1301	1262	819	588	1279	1212	1279	1212

			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009*	2010*	2009	2010
		Seychelles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	11	0	0	0	0	0	0	0		0	
		South Africa	55	68	137	671	624	52	69	266	486	183	157	116	240	320	191	342	152	298	402	1156	1187	1063	351	303	235	303	235
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	14	0	101	209	83	74	28	74	28
		U.S.A.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	
		U.S.S.R.	1851	1275	3207	4246	3615	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	
		UK.Sta Helena	82	93	98	100	92	100	166	171	150	181	151	109	181	116	136	72	9	0	0	0	344	177	97	104	65	104	65
		Ukraine	0	0	0	0	0	215	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	
		Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	145	483	450	331	26	331	421
		Venezuela	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0
	ATW	Argentina	23	18	66	33	23	34	1	0	0	0	0	0	0	0	0	0	0	0	327	327	0	0	0	0		0	
		Barbados	39	57	236	62	89	108	179	161	156	255	160	149	150	155	155	142	115	178	211	292	197	154	156	79	129	79	129
		Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	143	1164	1160	988	1785	988	1785
		Brasil	1837	2266	2512	2533	1758	1838	4228	5131	4169	4021	2767	2705	2514	4127	6145	6239	6172	3503	6985	7223	3790	5468	2749	3313	3617	3313	3617
		Canada	2	40	30	7	7	29	25	71	52	174	155	100	57	22	105	125	70	73	304	240	293	276	168	53	166	53	166
		China P.R.	0	0	0	0	0	0	0	0	0	0	0	0	628	655	22	470	435	17	275	74	29	124	284	248	258	248	258
		Chinese Taipei	1156	709	1641	762	5221	2009	2974	2895	2809	2017	2668	1473	1685	1022	1647	2018	1296	1540	1679	1269	400	240	315	211	292	211	292
		Colombia	211	258	206	136	237	92	95	2404	3418	7172	238	46	46	46	46	46	46	46	46	46	46	0	0	0		0	
		Cuba	2081	1062	98	91	53	18	11	1	14	54	40	40	15	15	0	0	65	65	65	65	65	0	0	0		0	
		Curaçao	150	160	170	170	170	150	160	170	155	140	130	130	130	130	130	0	0	0	0	0	0	0	0	0		0	
		Dominica	0	0	0	0	18	12	23	30	31	9	0	0	0	80	78	120	169	119	81	119	65	103	124	102	110	102	110
		Dominican Republic	0	0	0	0	0	0	0	0	0	0	0	0	89	220	226	226	226	226	226	226	226	0	0	0		0	
		EU.España	0	0	1	3	2	1462	1314	989	7	4	36	34	46	30	171	0	0	0	0	0	1	84	81	69	27	69	27
		EU.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	
		EU.Netherlands	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	
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	151	60	88	179	260	99	260	99
		FR.St Pierre et Miquelon	0	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		
		Grenada	506	186	215	235	530	620	595	858	385	410	523	302	484	430	403	759	593	749	460	492	502	633	756	630	673	630	673
		Jamaica	0	0	0	0	0	0	0	0	0	0	21	21	0	0	0	0	0	0	0	0	0	0	0	0		0	
		Japan	2103	1647	2395	3178	1734	1698	1591	469	589	457	1004	806	1081	1304	1775	1141	571	755	1194	1159	437	541	986	1431	1668	1431	1668
		Korea Rep.	853	236	120	1055	484	1	45	11	0	0	84	156	0	0	0	0	0	0	0	580	279	270	10	52	56	52	56
		Mexico	658	33	283	345	112	433	742	855	1093	1126	771	826	788	1283	1390	1084	1133	1313	1208	1050	938	890	956	1211	916	1211	916
		NEI (ETRO)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36	0	0	0	0	0	0	0	0		0	
		NEI (Flag related)	806	1012	2118	2500	2985	2008	2521	1514	1880	1227	2374	2732	2875	1730	2197	793	42	112	0	0	0	0	0	0		0	
		Panama	5278	3289	2192	1595	2651	2249	2297	0	0	0	0	0	0	5	0	0	0	0	0	0	2804	227	153	288	2134	288	2134
		Philippines	0	0	0	0	0	0	0	0	0	0	0	0	36	106	78	12	79	145	299	230	234	151	167	142	67	142	67
		Seychelles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	0	0	0	0	0	0	0	0	0		0	
		St. Vincent and Grenadines	0	0	0	1	40	48	22	65	16	43	37	35	48	38	1989	1365	1160	568	4251	0	2680	2989	2547	2274	854	2274	854
		Sta. Lucia	125	76	97	70	58	49	58	92	130	144	110	110	276	123	134	145	94	139	147	172	103	82	106	97	223	97	223
		Trinidad and Tobago	0	0	1	11	304	543	4	4	120	79	183	223	213	163	112	122	125	186	224	295	459	615	520	629	788	629	788
		U.S.A.	9938	9661	11064	8462	5666	6914	6938	6283	8298	8131	7745	7674	5621	7567	7051	6703	5710	7695	6516	5568	7091	5529	2473	2788	2648	2788	2648
		UK.Bermuda	44	25	23	22	15	17	42	58	44	44	67	55	53	59	31	37	48	47	82	61	31	30	15	41	37	41	37
		UK.British Virgin Islands	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	
		UK.Turks and Caicos	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	
		Uruguay	270	109	177	64	18	62	74	20	59	53	171	53	88	45	45	90	91	95	204	644	218	35	66	76	122	76	122
		Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	681	689	661	555	873	816	323	816	748
		Venezuela	11755	11137	10949	15567	10556	16503	13773	16663	24789	9714	13772	14671	13995	11187	10558	18651	11421	7411	5774	5097	6514	3911	3272	3198	4783	3198	4783
	MED	EU.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
		Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6		6	
Discards	ATW	Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	6	5	9	8	9	8
		U.S.A.	0	0	0	0	0	0	0	0	0	0	0	0	0	167	0	0	0	0	0	0	0	0	0	0		0	

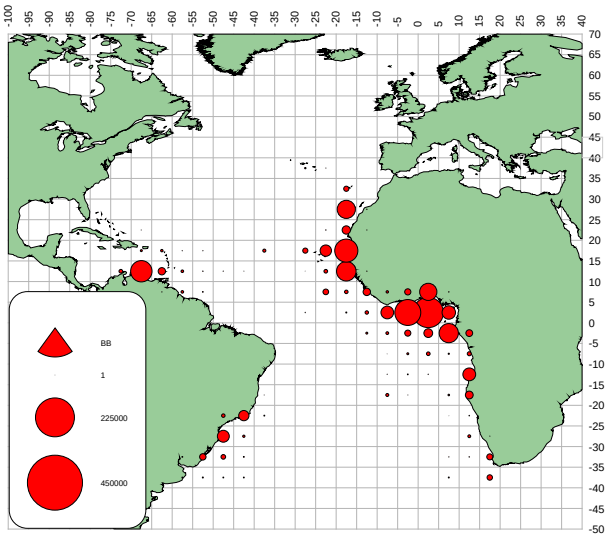
* Current Task I figures (2009 and 2010) where the shaded cells indicate which catches have changed since the assessment.

YFT-Table 2. Kobe II matrices giving the probability that the biomass will exceed the level that will produce MSY and the fishing mortality will fall below the fishing mortality rate that would maintain MSY, in any given year, for various constant catch levels based on combined model results.

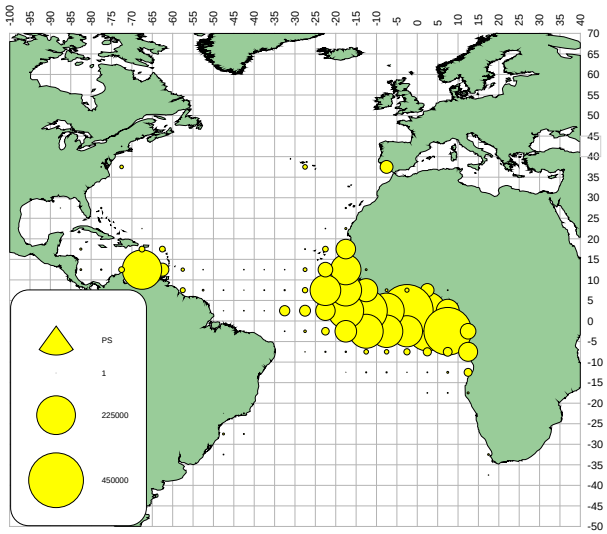
Constant Catch (t, in 1000s)	*Probability (%) that $B>B_{MSY}$ and $F<F_{MSY}$ in each year*													
	2012	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*	*2022*	*2023*	*2024*	*2025*
50	25	51	70	78	84	87	89	91	92	93	94	95	95	96
60	24	48	66	76	81	85	87	89	90	92	93	93	94	94
70	24	45	63	73	78	82	85	87	89	90	90	92	92	93
80	24	43	59	69	75	79	82	84	86	87	88	89	90	90
90	24	40	54	65	71	75	78	81	82	84	85	86	87	88
100	24	37	49	59	66	70	73	76	78	80	81	82	83	84
110	23	35	45	53	59	64	67	70	72	74	75	76	77	78
120	23	32	40	46	51	55	58	61	64	65	66	68	69	70
130	23	29	35	39	43	45	47	49	51	53	54	55	56	58
140	22	26	29	31	33	34	36	36	37	38	39	39	40	40
150	20	21	22	22	22	21	21	21	21	21	21	21	20	20



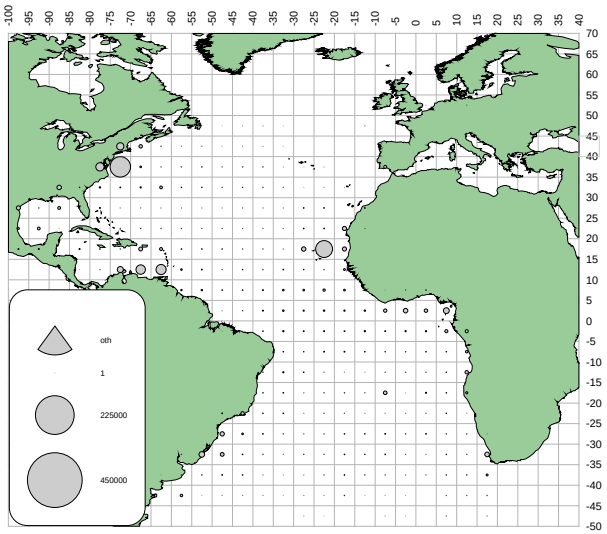
a. YFT (LL)



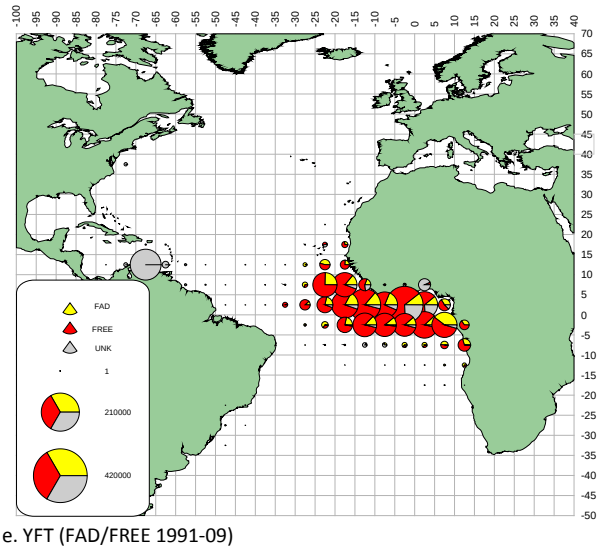
b. YFT (BB)



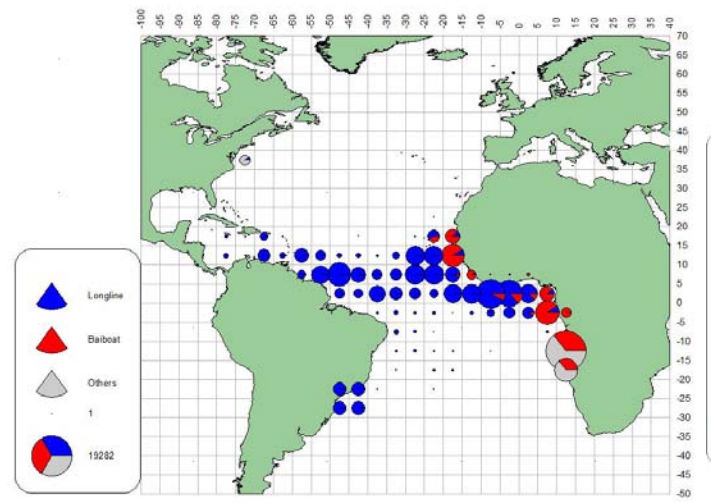
c. YFT (PS)



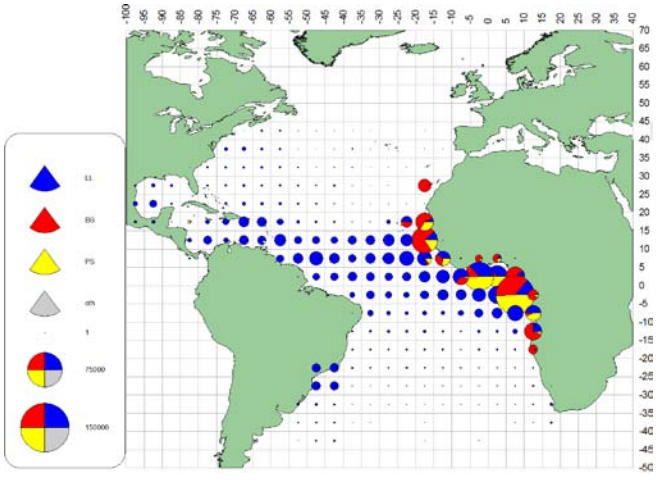
d. YFT (oth)



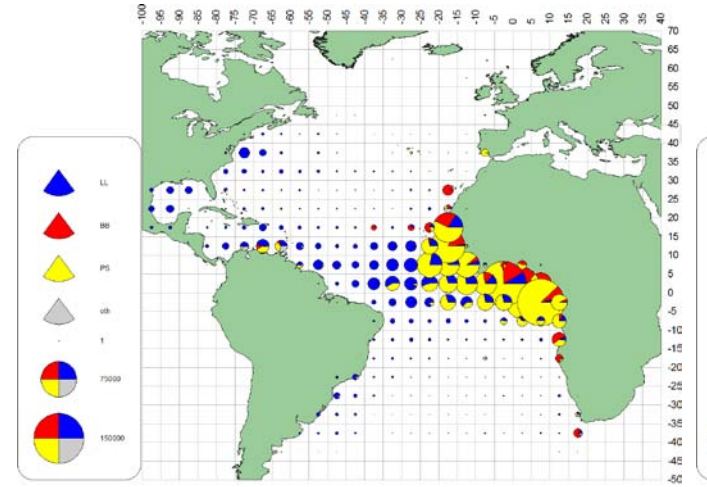
e. YFT (FAD/FREE 1991-09)



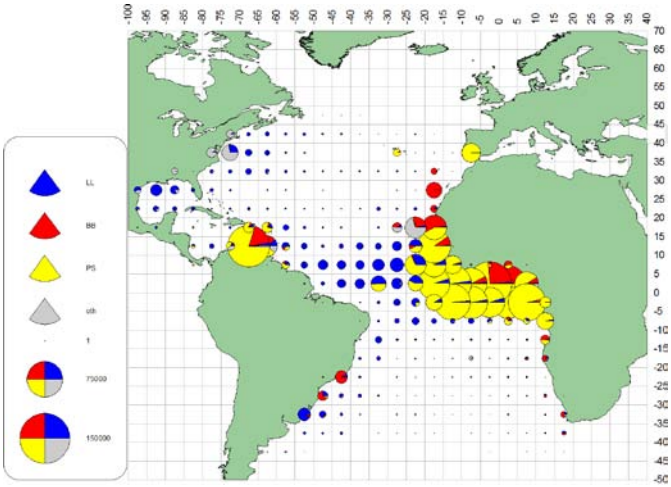
f. YFT(1950-59)



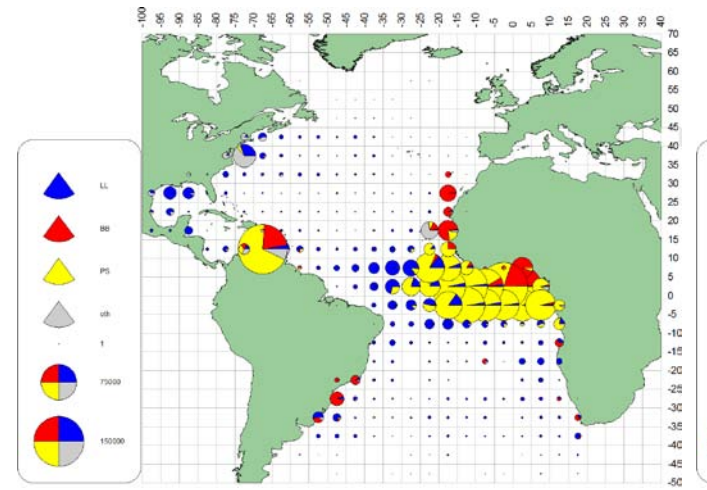
g. YFT(1960-69)



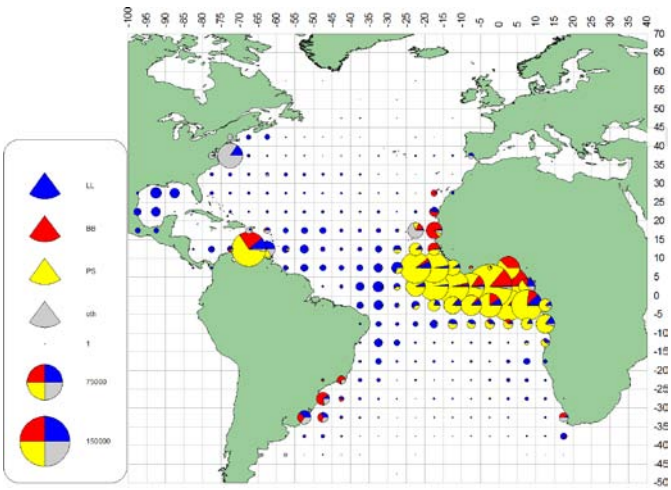
h. YFT(1970-79)



i. YFT(1980-89)

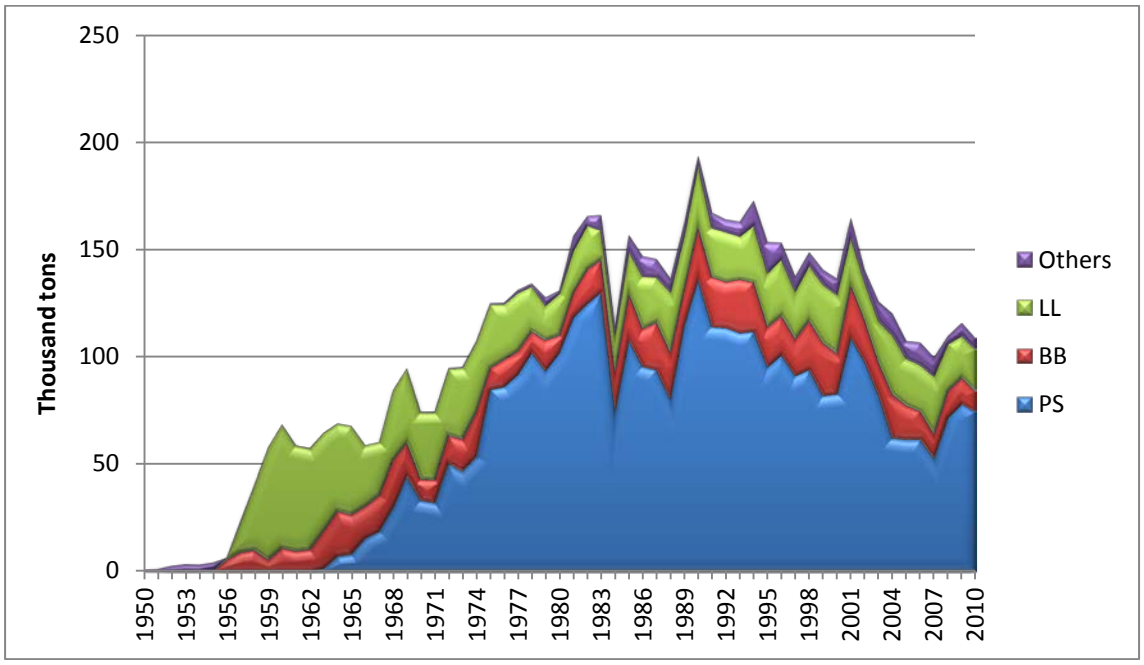


j. YFT(1990-99)

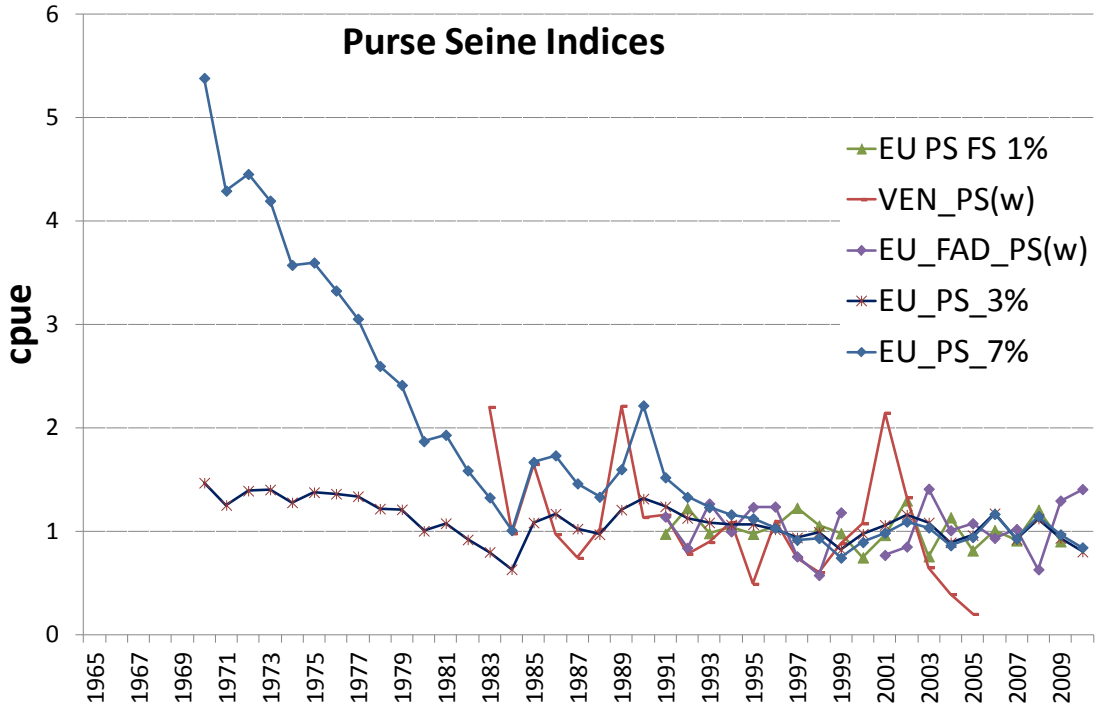


k. YFT (2000-09)

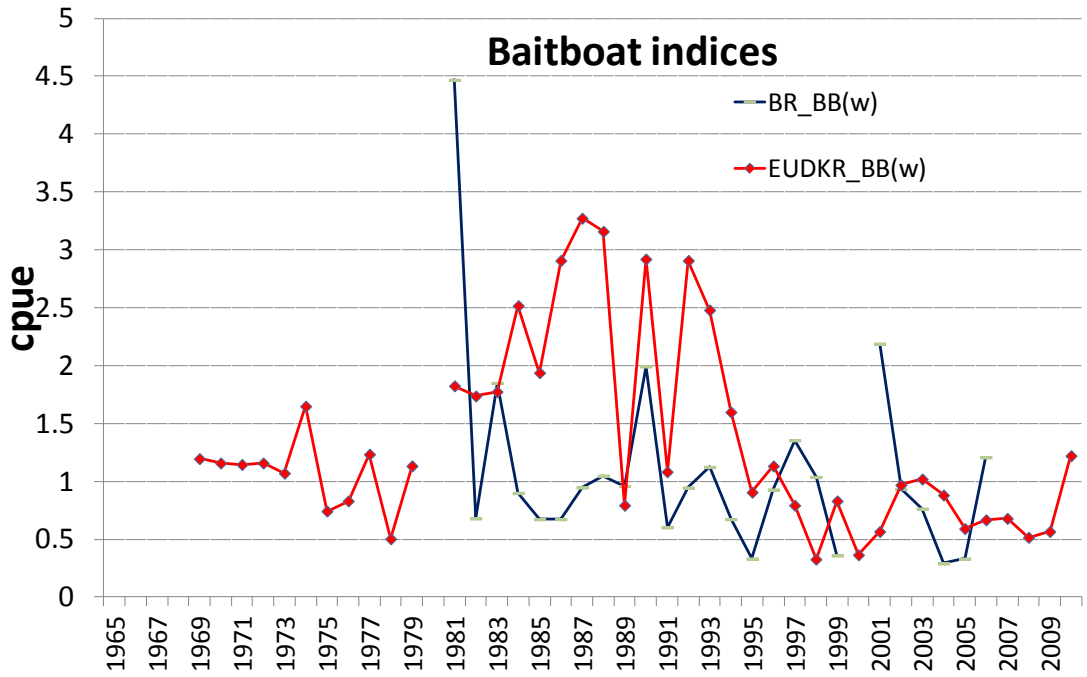
YFT-Figure 1. Geographical distribution of yellowfin tuna catches by major gears **[a-e]** and decade **[f-k]**. The symbols for the 1950s information (top left) are scaled to the maximum catch observed during the 1950s, whereas the remaining plots are scaled to the maximum catch observed from 1960 to 2009.



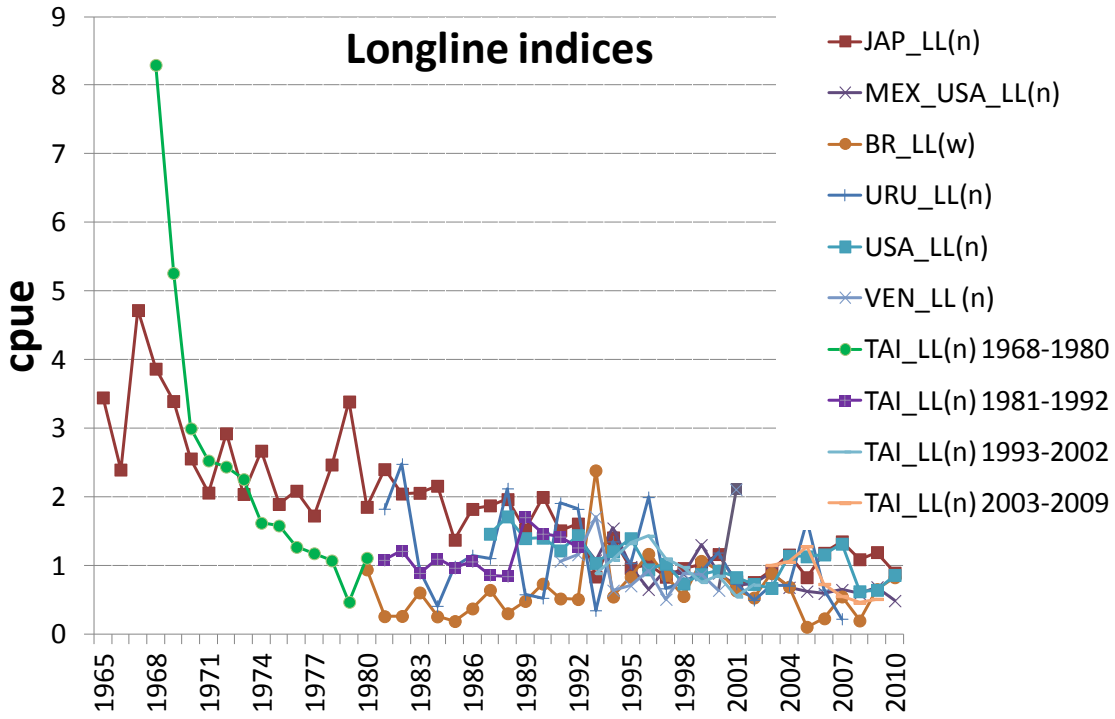
YFT-Figure 2. Estimated annual catch (t) of Atlantic yellowfin tuna by fishing gear, 1950-2010.



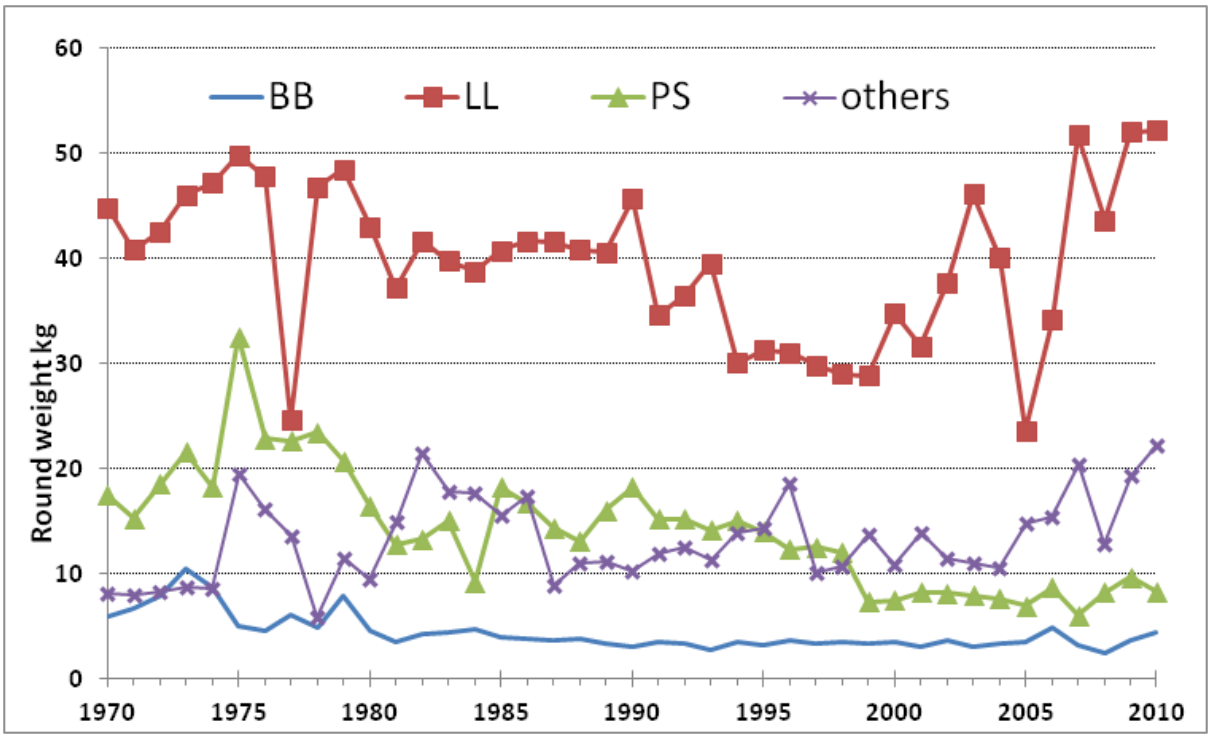
YFT-Figure 3. Yellowfin relative catch rate trends (both nominal and applying various annual increases in effectiveness) from purse seine fleets, in weight.

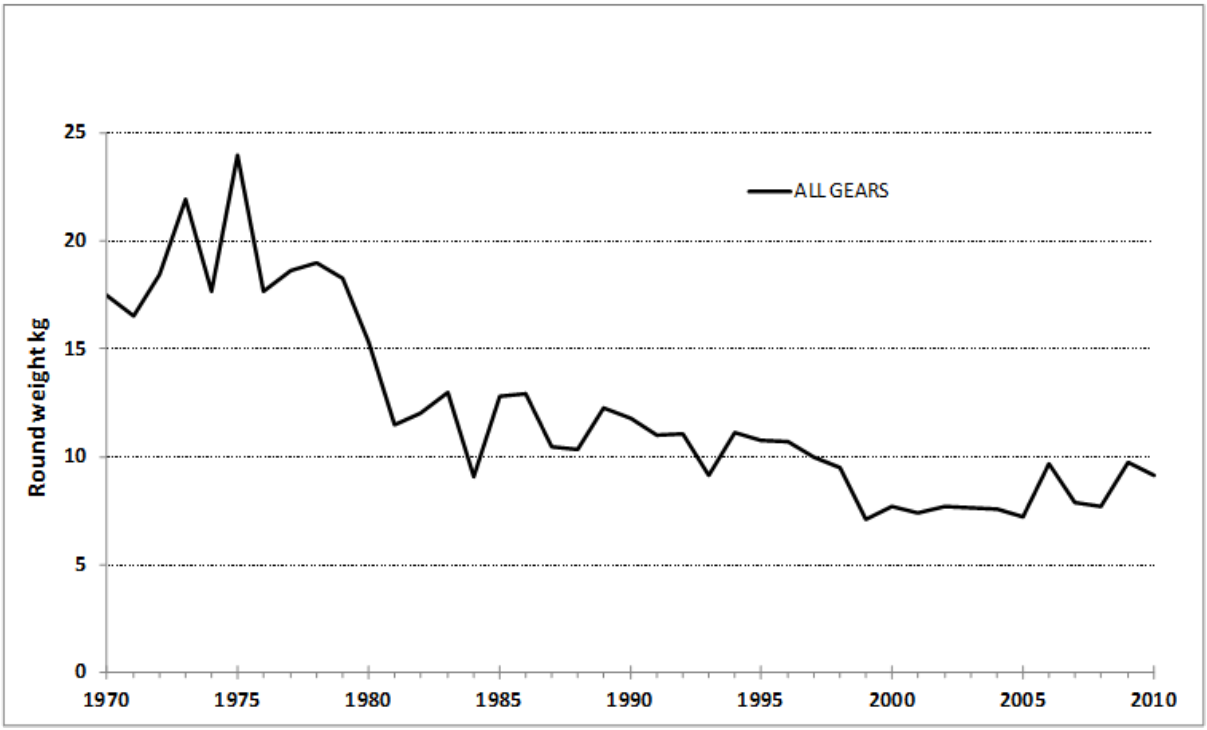


YFT-Figure 4. Yellowfin standardized catch rate trends from baitboat fleets, in weight.

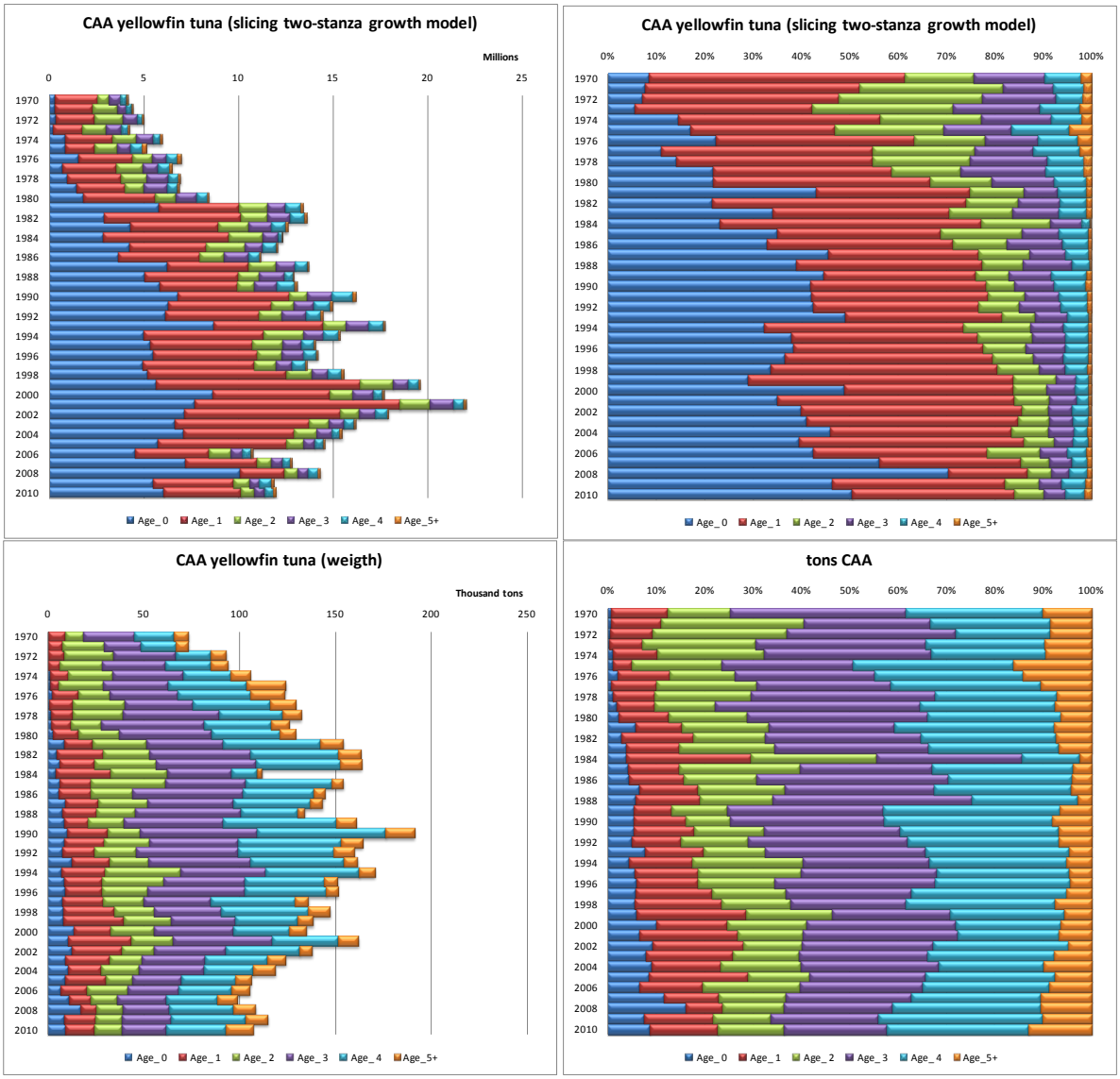


YFT-Figure 5. Yellowfin standardized catch rate trends from longline fleets, in weight and numbers.

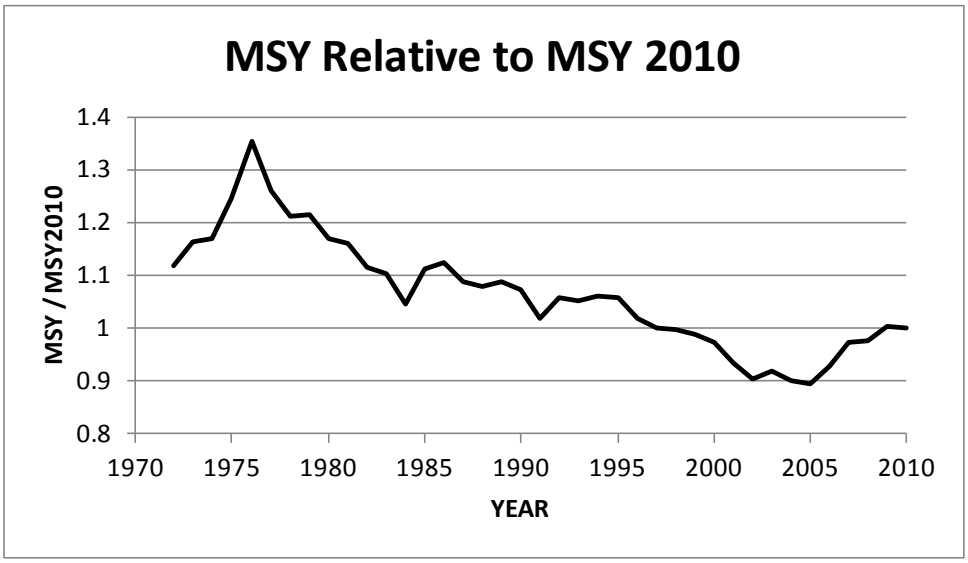




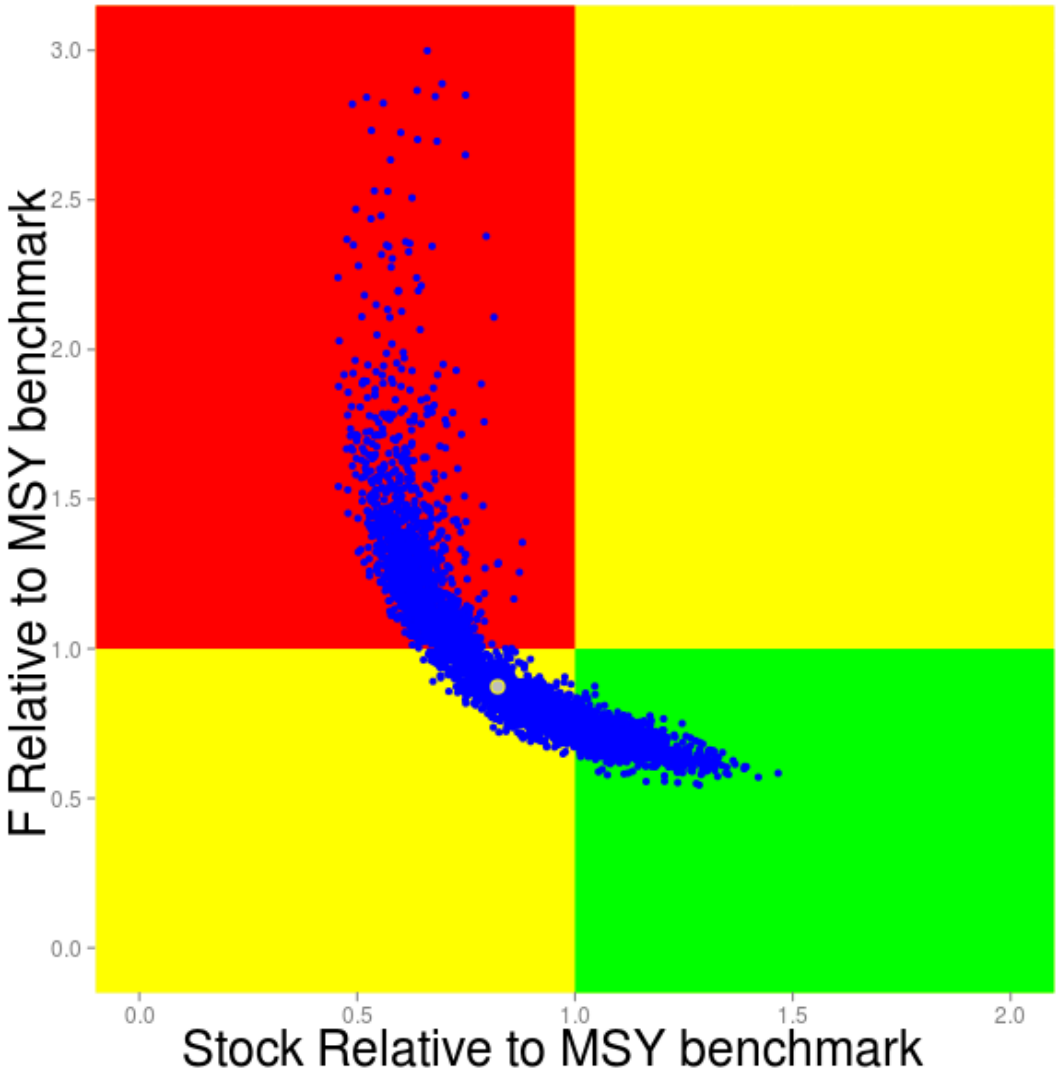
YFT-Figure 6. Trend in yellowfin tuna average weight by gear group (top) and total (bottom) calculated from available catch-at-size data. Purse seine averages are calculated across all set types (floating object and free school).



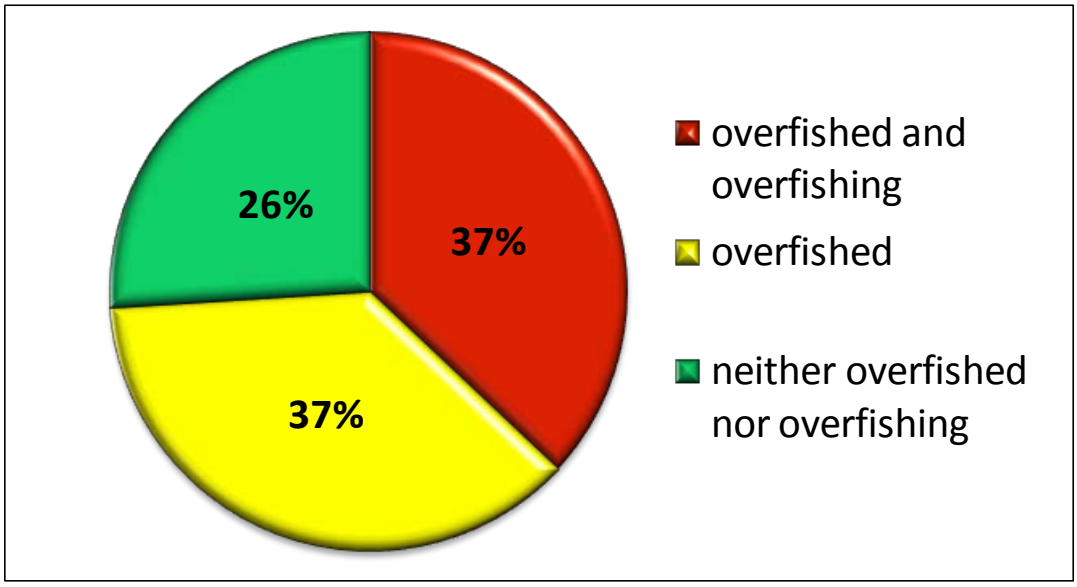
YFT-Figure 7. Distribution of Atlantic yellowfin catches by age (0-5+) in numbers of fish (top row) and in weight (bottom row) for 1970 – 2010.



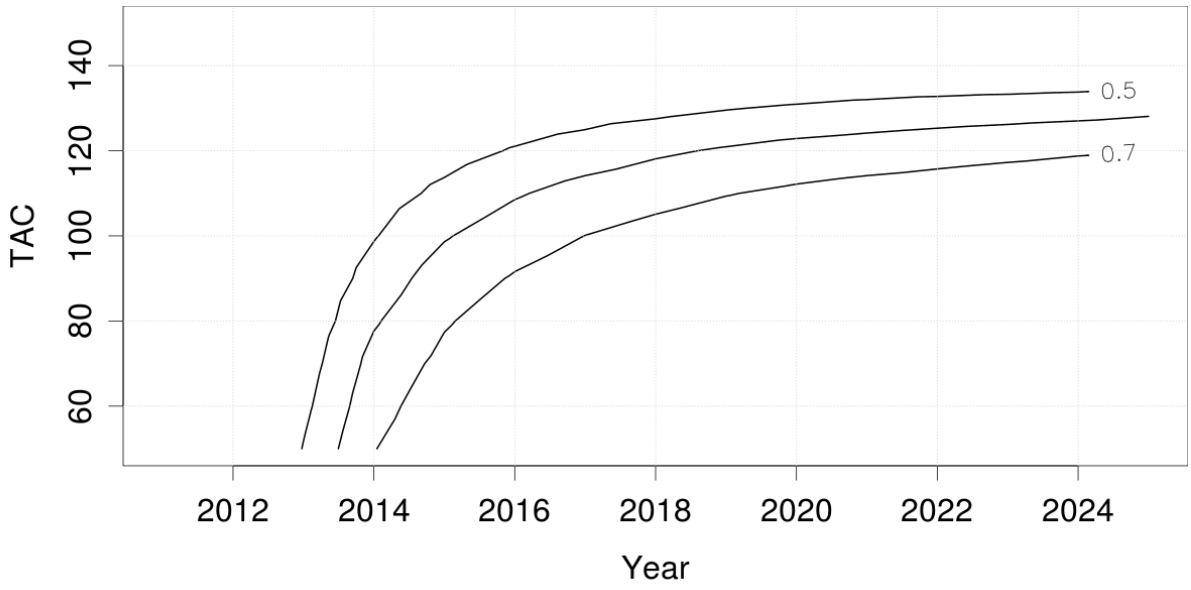
YFT-Figure 8. Estimates of historical MSY values, relative to the MSY estimated for 2010, for Atlantic yellowfin obtained through the age-structured model analysis, which considers the changes in selectivity that have occurred.



YFT-Figure 9. Current status (2010) of yellowfin tuna based on age structured and production models. The results are shown combined in a joint distribution. The median point estimate is shown as a gray circle and the clouds of symbols depict the bootstrap estimates of uncertainty for the most recent year.



YFT-Figure 10. Summary of current status estimates for the yellowfin tuna stock based on age structured and production models making use of the catch and effort data through 2010.



YFT-Figure 11. Probability plot based on Kobe II matrices giving the probability that the biomass will exceed the level that will produce MSY and the fishing mortality will fall below the fishing mortality rate that would maintain MSY, in any given year, for various constant catch levels based on combined model results.

8.2 BET- BIGEYE TUNA

The last stock assessment for bigeye tuna was conducted in 2010 through a process that included a data preparatory meeting in April (Anon. 2011a) and an assessment meeting in July (Anon. 2011b). The last year fishery data used was 2009 but most indices of relative abundance stopped in 2008.

BET-1. Biology

Bigeye tuna are distributed throughout the Atlantic Ocean between 50ºN and 45ºS, but not in the Mediterranean Sea. This species swims at deeper depths than other tropical tuna species and exhibits extensive vertical movements. Similar to the results obtained in other oceans, pop-up tagging and sonic tracking studies conducted on adult fish in the Atlantic have revealed that they exhibit clear diurnal patterns: they are found much deeper during the daytime than at night. In the eastern tropical Pacific, this diurnal pattern is exhibited equally by juveniles and adults. Spawning takes place in tropical waters when the environment is favorable. From nursery areas in tropical waters, juvenile fish tend to diffuse into temperate waters as they grow larger. Catch information from surface gears indicate that the Gulf of Guinea is a major nursery ground for this species. Dietary habits of bigeye tuna are varied and prey organisms like fish, mollusks, and crustaceans are found in their stomach contents. Bigeye tuna exhibit relatively fast growth: about 105 cm fork length at age three, 140 cm at age five and 163 cm at age seven. Bigeye tuna over 200 cm are relatively rare. Bigeye tuna become mature after they reach 100 cm at between 3 and 4 years old. Young fish form schools mostly mixed with other tunas such as yellowfin tuna and skipjack. These schools are often associated with drifting objects, whale sharks and sea mounts. This association appears to weaken as bigeye tuna grow larger. Estimated natural mortality rates for juvenile fish, obtained from tagging data, were of a similar range as those applied in other oceans. Various pieces of evidence, such as a lack of identified genetic heterogeneity, the time-area distribution of fish and movements of tagged fish, suggest an Atlantic-wide single stock for this species, which is currently accepted by the Committee. However, the possibility of other scenarios, such as north and south stocks, should not be disregarded.

BET-2. Fisheries indicators

The stock has been exploited by three major gears (longline, baitboat and purse seine fisheries) and by many countries throughout its range of distribution and ICCAT has detailed data on the fishery for this stock since the 1950s. Scientific sampling at landing ports for purse seine vessels of the EU and associated fleets have been conducted since 1980 to estimate bigeye tuna catches **(BET-Figure 1, BET-Table 1)**. The size of fish caught varies among fisheries: medium to large for the longline fishery, small to large for the directed baitboat fishery, and small for other baitboat and for purse seine fisheries.

The major baitboat fisheries are located in Ghana, Senegal, the Canary Islands, Madeira and the Azores. The tropical purse seine fleets operate in the Gulf of Guinea in the East Atlantic and off Venezuela in the West Atlantic. In the eastern Atlantic, these fleets are comprised of vessels flying flags of Ghana, EU-France, EU-Spain and others which are mostly managed by EC companies. In the western Atlantic the Venezuelan fleet dominates the purse-seine catch of bigeye tuna. While bigeye tuna is now a primary target species for most of the longline and some baitboat fisheries, this species has always been of secondary importance for the other surface fisheries. In the surface fishery, unlike yellowfin tuna, bigeye tuna are mostly caught while fishing on floating objects such as logs or man-made fish aggregating devices (FADs). During 2009, landings in weight of bigeye tuna caught by the longline fleets of Japan and Chinese Taipei, and the purse seine and baitboat fleets of the EU and Ghana represented 75 % of the total bigeye tuna catch.

The total annual Task I catch **(BET-Table 1**, **BET-Figure 2)** increased up to the mid-1970s reaching 60,000 t and fluctuated over the next 15 years. In 1991, catch surpassed 95,000 t and continued to increase, reaching a historic high of about 133,000 t in 1994. Reported and estimated catch has been declining since then and fell below 100,000 t in 2001. This gradual decline in catch has continued, although with some fluctuations from year to year. The preliminary estimate for 2010 is 75,833t.

After the historic high catch in 1994, all major fisheries exhibited a decline of catch while the relative share by each fishery in total catch remained relatively constant. These reductions in catch are related to declines in fishing fleet size (longline) as well as decline in CPUE (longline and baitboat). The number of active purse seiners declined by more than half from 1994 until 2006, but then increased since 2007 as some vessels returned from the Indian Ocean to the Atlantic. The number of purse seiners operating in 2009 and 2010 was similar to the number operating in 2003-04 **(SKJ-Figure 6)**.

IUU longline catches were estimated from Japanese import statistics but the estimates are considered uncertain. These estimates indicate a peak in unreported catches of 25,000 t in 1998 and a quick reduction thereafter. The Committee expressed concern that historical catches from illegal, unreported and unregulated (IUU) longliners that fly flags of convenience from the Atlantic might have been poorly estimated. The magnitude of this problem has not yet been quantified, because available statistical data collection mechanisms are insufficient to provide alternative means to calculate unreported catch.

Unreported purse seine catches were estimated by comparing monitored landings in West African ports and cannery data to catches reported to ICCAT. Estimates of unreported purse seine catches are larger and increasing since 2006 and now may exceed 20,000 tons for the three main species of tropical tunas. The Committee expressed the need for countries and the involved industry in the region to cooperate to estimate and report these catches correctly to ICCAT. These estimates have not been incorporated into assessments and are not included in the catch estimates presented in this report. The magnitudes of these estimates of IUU catch, however, are likely to influence the assessments and the resulting perception of stock status.

Significant catches of small bigeye tuna continue to be channeled to local West African markets, predominantly in Abidjan, and sold as "*faux poissons*" in ways that make their monitoring and official reporting challenging. Monitoring of such catches has progressed in some countries but there is still a need for a coordinated approach that will allow ICCAT to properly account for these catches and thus increase the quality of the basic catch data available for assessments.

Mean average weight of bigeye tuna decreased prior to 1998 but has been relative stable, at around 10 kg during the last decade **(BET-Figure 3)**. This weight, however, is quite different according to the fishing gear, around 62 kg for longliners, 7 kg for bait boats, and 4kg for purse seiners. In the last ten years all longline fleets have shown increases in mean weight of bigeye tuna caught, with the average longline-caught fish increasing from 40 kg to 60 kg between 1999 and 2010. During the same period purse seine-caught bigeye tuna had weights between 3 kg and 4 kg. Bigeye tuna caught in free schools are more than two times heavier than those caught around FADs. This difference in weight between these two fishing modes is even more pronounced since 2006. Since FAD catches began being identified separately in 1991 by EU and associated purse seine fleets, the majority (75%-80%) of bigeye tuna are caught in sets associated with FADs. Similarly baitboat-caught bigeye tuna weighted between 6 and 10 kg over the same period, showing greater inter-annual variability in fish weight than longline or purse seine caught fish.

BET-3. State of the stock

The 2010 stock assessment was conducted using similar assessment models to those used in 2007 (Anon. 2008) but with updated data and a few new relative abundance indices and data. In general, data availability has continued to improve, notably with the addition of relative abundance indices for an increasing number of fleets. There are still missing data on detailed fishing and fish size from certain fleets. In addition, there are a number of data gaps on the activities of IUU fleets (e.g., size, location and total catch). All these problems forced the committee to assume catch-at-size for an important part of the overall catch.

Three types of indices of abundance were used in the assessment. A number of indices were directly developed by national scientists for selected fleets for which data was available at greater spatial and or temporal resolution to that available in the ICCAT databases. These indices represented data for seven different fleets, all of them longline fleets, except for one baitboat fleet **(BET-Figure 4)**. Other indices were estimated by the committee from data available within the ICCAT databases. These two types of indices were used for age-structured assessment models. Finally, a series of combined indices (**BET-Figure 5)** were calculated by the committee by synthesizing the information existing in individual indices for the seven fleets mentioned above. The later were used to fit production models.

Consistent with previous assessments of Atlantic bigeye tuna, the results from non-equilibrium production models are used to provide the basic characterization of the status of the resource. Results were sensitive to the combined abundance index trends assumed. As the relative likelihoods of each trend could not be estimated, results were developed from the joint distribution of model run results using each of three alternative combined indices. The plausible range of MSY estimated from the joint distribution using three types of abundance indices was between 78,700 and 101,600 tons (80% confidence limits) with a median MSY of 92,000 t. In addition, these estimates reflect the current relative mixture of fisheries that capture small or large bigeye tuna; MSY can change considerably with changes in the relative fishing effort exerted by surface and longline fisheries. Historical estimates show large declines in biomass and increases in fishing mortality, especially in the mid

1990s when fishing mortality exceeded F_{MSY} for several years. In the last five or six years there have been possible increases in biomass and declines in fishing mortality (**BET-Figure 6)**. The biomass at the beginning of 2010 was estimated to be at between 0.72 and 1.34 (80% confidence limits) of the biomass at MSY, with a median value of 1.01 and the 2009 fishing mortality rate was estimated to be between 0.65-1.55 (80% confidence limits) with a median of 0.95. The replacement yield for the year 2011 was estimated to be about MSY.

The Committee notes, as it did in previous assessments, that there is considerable uncertainty in the assessment of stock status and productivity for bigeye tuna. There are many sources of uncertainty including which method represents best the dynamics of the stock, which method is supported more by the available data, which relative abundance indices are appropriate to be used in the assessment, and what precision is associated with the measurement/calculation of each of the model inputs. In general, data availability has improved since 2007 but there is still a lack of information regarding detailed fishing effort and catch-at-size data from certain fleets. This, combined with the lack of detailed historical information on catch and fishing activities of IUU fleets (e.g., size, location and total catch), forces the Committee to make many assumptions about the catch-at-size for an important part of the overall catch. In order to represent this uncertainty the Committee decided to combine sensitivity runs from a range of method/data combinations. There are differences in the estimates of management benchmarks, including the estimates of the current biomass and fishing mortality, depending on both the method used as well as the input data used (**BET-Figure 7**).

BET-4. Outlook

The outlook for Atlantic bigeye tuna, considering the quantified uncertainty in the 2010 assessment, is presented in **BET-Table 2** and **BET-Figure 8**, which provide a characterization of the prospects of the stock achieving or being maintained at levels consistent with the Convention Objective, over time, for different levels of future constant catch. It is noteworthy that the modeled probabilities of the stock being maintained at levels consistent with the Convention Objective over the next five years are about 60% for a future constant catch of 85,000 t. Higher odds of rebuilding to and maintaining the stock at levels that could produce MSY are associated with lower catches and lower odds of success with higher catches than such constant catch (**BET-Figure 9**). It needs to be noted that projections made by the Committee assume that future constant catches represent the total removals from the stock, and not just the TAC of 85,000 t established by ICCAT [Rec. 09-01]. Catches made by other fleets not affected by [Rec. 09-01] need to be added to the 85,000 t for comparisons with the future constant catch scenarios contemplated in **BET-Table 2**. Furthermore, any future changes in selectivity due to changes in the ratios of relative mortality exerted by the different fleets - such as an increase in the relative mortality of small fish - will change and add to the uncertainty of these projections.

BET-5. Effects of current regulations

During the period 2005-2008 an overall TAC for major countries was set at 90,000 t. The TAC was later lowered [Rec. 09-01] to 85,000 t. Estimates of catch for 2005-2010 **(BET-Table 1)** seem to have been always lower than the corresponding TAC.

Concern over the catch of small bigeye tuna partially led to the establishment of spatial closures to surface fishing gear in the Gulf of Guinea [Recs. 04-01 and 08-01] The Committee examined trends in average bigeye tuna weight as a broad indicator of the effects of such closures. Although there have been significant changes in the average size of bigeye tuna caught since 2004 by certain fleets, such as increases in average size of fish caught by purse seiners operating in free schools and by longliners, it cannot be quantified whether changes are the result of spatial closures. The Committee also analyzed the ICCAT conventional tag database for evidence of an effect of spatial closures. Again, this analysis failed to provide any conclusive evidence in support of the hypothesis that spatial closures led to a reduction in the fishing mortality of juvenile bigeye tuna.

BET-6. Management recommendations

Projections indicate that catches reaching 85,000 t or less will promote stock growth and further reduce the future chances that the stock will not be at a level that is consistent with the convention objectives. The Commission should be aware that if major countries were to take the entire catch limit set under Recommendations 04-01 and 09-01 and other countries were to maintain recent catch levels, then the total catch could well exceed 100,000 t. The Committee recommends that the Commission sets a TAC at a level that would provide a high probability of maintaining at or rebuilding to stock levels consistent with the Convention

objectives. In considering the uncertainty in assessment results, the Committee believes that a future total catch of 85,000 t or less would provide such high probability.

The assessment and subsequent management recommendations are conditional on the reported and estimated history of catch for bigeye tuna in the Atlantic. The Committee reiterates its concern that unreported catches, including those part of the "*faux poisson*" category, from the Atlantic might have been poorly estimated. There is a need to expand current statistical data collection mechanisms to fully investigate any evidence of significant catches that have been unreported.

ATLANTIC BIGEYE TUNA SUMMARY	
Maximum Sustainable Yield	78,700-101,600 t (median 92,000 t) [1,2]
Current (2010) Yield[1]	75,833t [3]
Replacement Yield (2011)	64,900 – 94,000 (median 86,000 t) [1,2]
Relative Biomass (B_{2009}/B_{MSY})	0.72-1.34 (median 1.01) [1,2]
Relative Fishing Mortality F_{2009}/F_{MSY}	0.65-1.55 (median 0.95)[1,2]
Conservation & management measures in effect:	[Rec. 09-01], para. 1 of [Rec. 06-01], [Rec. 04-01], and [Rec. 10-01]. − Total allowable catch for 2010 is set at 85,000 t for Contracting Parties and Cooperating non-Contracting Parties, Entities or Fishing Entities. − Limits on numbers of fishing vessels less than the average of 1991 and 1992. − Specific limits of number of longline boats; China (45), Chinese Taipei (75), Philippines (10), and Korea (16). − Specific limits of number of purse seine boats; Panama (3). − No purse seine and baitboat fishing during November in the area encompassed by 0º-5ºN and 10º W-20ºW.

[1] Production model (Logistic) results represent median and 80% confidence limits based on catch data for (1950-2009) and the joint distribution of bootstraps using each of three alternative combined indices.
[2] 80% confidence limits, MSY and replacement yield rounded to 100 t.
[3] Reports for 2010 reflect most recent data but should be considered provisional. All other quantities in the table were calculated during the 2010 assessment.

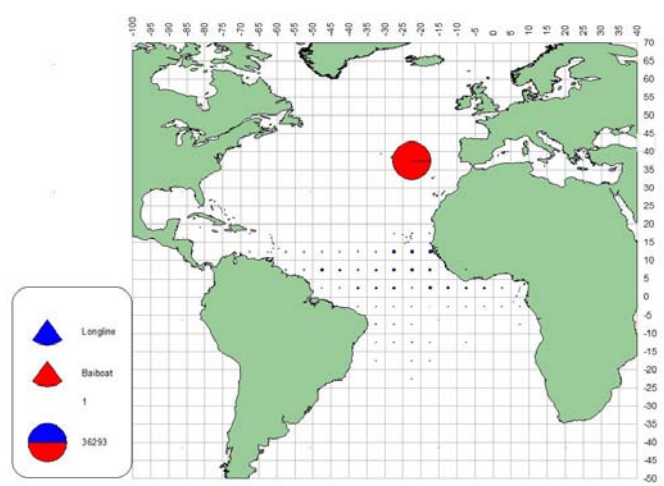
BET-Table 1. Estimated catches (t) of bigeye tuna (Thunnus obesus) by area, gear and flag.

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
TOTAL AT+MED	65447	57141	66148	78376	84901	96074	99374	112572	133630	126778	121689	109289	110438	128304	103651	94291	77225	92106	87054	72348	65888	79664	69342	81813	75833
Bait boat	15618	13458	9710	12672	18280	17750	16248	16467	20361	25576	19059	21037	21377	25867	12634	15842	8756	13569	18940	15007	14671	15432	12359	14940	8968
Longline	39942	35570	47766	58389	56537	61556	62403	62871	78934	74852	74930	68310	71856	76527	71193	55265	46438	54466	48396	38035	34182	46232	41063	43533	42638
Other surf.	550	626	474	644	293	437	607	652	980	567	357	536	434	1377	1226	1628	1138	1340	1301	716	552	447	224	273	457
Purse seine	9336	7487	8198	6671	9791	16331	20116	32582	33355	25782	27343	19406	16771	24533	18599	21556	20894	22731	18417	18590	16483	17553	15696	23067	23769
Angola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	476	75	0	0	0	0	
Argentina	41	72	50	17	78	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Barbados	0	0	0	0	0	0	0	0	0	0	0	24	17	18	18	6	11	16	19	27	18	14	14	7	12
Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	60	70	60	249
Benin	15	6	7	8	10	10	7	8	9	9	9	30	13	11	0	0	0	0	0	0	0	0	0	0	
Brasil	873	756	946	512	591	350	790	1256	601	1935	1707	1237	644	2024	2768	2659	2582	2455	1496	1081	1479	1593	958	1189	1151
Cambodia	0	0	0	0	0	0	0	0	0	0	0	0	0	32	0	0	0	0	0	0	0	0	0	0	
Canada	11	144	95	31	10	26	67	124	111	148	144	166	120	263	327	241	279	182	143	187	196	144	130	111	103
Cape Verde	86	60	117	100	52	151	105	85	209	66	116	10	1	1	2	0	1	1	1	1092	1437	1147	1069	827	1164
China P.R.	0	0	0	0	0	0	0	70	428	476	520	427	1503	7347	6564	7210	5840	7890	6555	6200	7200	7399	5686	4973	5489
Chinese Taipei	1125	1488	1469	940	5755	13850	11546	13426	19680	18023	21850	19242	16314	16837	16795	16429	18483	21563	17717	11984	2965	12116	10418	13252	13189
Congo	19	10	10	14	15	12	12	14	9	9	8	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cuba	171	190	151	87	62	34	56	36	7	7	5	0	0	0	0	0	16	16	0	0	0	0	0	0	
Curaçao	0	0	0	0	0	0	0	0	0	0	1893	2890	2919	3428	2359	2803	1879	2758	3343	0	416	252	1721	2348	2688
Côte D'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	790	576
Dominica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	
EU.España	10884	9702	8475	8263	10355	14705	14656	16782	22096	17849	15393	12513	7110	13739	11250	10133	10572	11120	8365	7618	7454	6675	7494	11966	11272
EU.France	4266	3905	4161	3261	5023	5581	6888	12719	12263	8363	9171	5980	5624	5529	5949	4948	4293	3940	2926	2816	2984	1629	1130	2313	3329
EU.Ireland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	33	0	0	0	0	**0**
EU.Poland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EU.Portugal	7428	5036	2818	5295	6233	5718	5796	5616	3099	9662	5810	5437	6334	3314	1498	1605	2590	1655	3204	4146	5071	5505	3422	5605	3682
EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	32	0
FR.St Pierre et Miquelon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	0	28	6	0	2	3	0	2
Faroe Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	11	8	0	0	0	0	0	0	0	0	0	
Gabon	0	0	0	0	0	0	0	1	87	10	0	0	0	184	150	121	0	0	0	0	0	0	0	0	
Ghana	1720	1178	1214	2158	5031	4090	2866	3577	4738	5517	5805	9829	13370	17764	5910	12042	7106	13557	14901	13917	9141	13267	9269	10554	6769
Grenada	0	0	0	0	0	65	25	20	10	10	0	1	0	0	0	0	0	0	0	0	0	10	31	0	
Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	998	949	836	998	913	1011
Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	50	
Honduras	0	0	0	0	0	0	44	0	0	61	28	59	20	0	0	0	0	0	0	0	0	0	0	0	
Iceland	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**
Japan	23081	18961	32064	39540	35231	30356	34722	35053	38503	35477	33171	26490	24330	21833	24605	18087	15306	19572	18509	14026	15735	17993	16684	16395	15220
Korea Rep.	6084	4438	4919	7896	2690	802	866	377	386	423	1250	796	163	124	43	1	87	143	629	770	2067	2136	2599	2134	2646
Liberia	0	0	0	206	16	13	42	65	53	57	57	57	57	57	57	57	57	57	0	0	0	0	0	0	
Libya	0	0	0	0	0	0	508	1085	500	400	400	400	400	400	400	31	593	593	0	0	4	0	0	0	
Maroc	0	8	0	0	0	0	0	0	0	0	0	0	0	700	770	857	913	889	929	519	887	700	802	795	276
Mexico	0	0	0	0	0	0	0	1	4	0	2	6	8	6	2	2	7	4	5	4	3	3	1	1	3
Mixed flags (FR+ES)	50	339	339	300	384	807	893	1000	690	426	424	357	409	498	688	519	218	361	383	339	386	238	228	381	
NEI (ETRO)	0	85	20	93	959	1221	2138	4594	5034	5137	5839	2746	1685	4011	2285	3027	2248	2504	1387	294	81	0	0	0	
NEI (Flag related)	758	1406	2155	4650	5856	8982	6151	4378	8964	10697	11862	16569	24896	24060	15092	8470	531	0	0	0	0	0	0	0	
NEI (UK.OT)	0	0	0	0	0	0	0	0	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Namibia	0	0	0	0	0	0	0	0	715	29	7	46	16	423	589	640	274	215	177	307	283	41	146	108	181
Norway	0	0	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Panama	5173	5616	3847	3157	5258	7446	9991	10138	13234	9927	4777	2098	1252	580	952	89	63	0	1521	2310	2415	2922	2263	2405	3047
Philippines	0	0	0	0	0	0	0	0	0	0	0	0	1154	2113	975	377	837	855	1854	1743	1816	2368	1874	1880	1399
Russian Federation	0	0	0	0	0	0	0	0	0	0	13	38	4	8	91	0	0	0	0	1	1	26	73	86	**0**
S. Tomé e Príncipe	0	0	5	8	6	3	4	4	3	6	4	5	6	5	4	4	4	4	11	6	4	0	92	94	97
Senegal	0	0	0	0	0	15	5	9	126	237	138	258	730	1473	1131	1308	565	474	561	721	1267	805	926	1042	858
Seychelles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	58	0	162	0	0	0	0	0	0	0	
Sierra Leone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	2	0	0	0	0	0	0	0	0	
South Africa	168	200	561	367	296	72	43	88	79	27	7	10	53	55	249	239	341	113	270	221	84	171	226	159	145
St. Vincent and Grenadines	0	0	0	0	0	0	1	3	0	0	4	2	2	1	1216	506	15	103	18	0	114	567	171	292	396

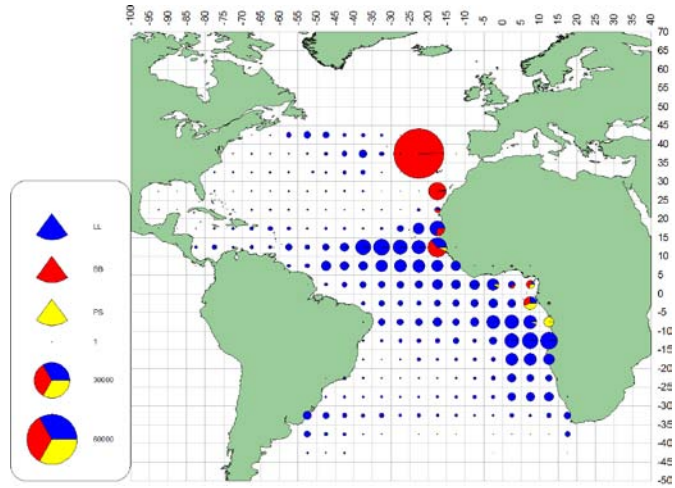
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Sta. Lucia	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	2	2	0	2	0	0	0	0	0
Togo	24	22	7	12	12	6	2	86	23	6	33	33	33	0	0	0	0	0	0	0	0	0	0	0	
Trinidad and Tobago	0	0	1	19	57	263	0	3	29	27	37	36	24	19	5	11	30	6	5	9	12	27	69	56	40
U.S.A.	1085	1074	1127	847	623	975	813	1090	1402	1209	882	1138	929	1263	574	1085	601	482	416	484	991	527	508	515	673
U.S.S.R.	1071	1887	1077	424	95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
UK.Bermuda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0
UK.Sta Helena	0	5	1	1	3	3	10	6	6	10	10	12	17	6	8	5	5	0	0	0	25	18	28	17	11
Uruguay	177	204	120	55	38	20	56	48	37	80	124	69	59	28	25	51	67	59	40	62	83	22	27	201	23
Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	104	109	52	132	91	34	48
Venezuela	1136	349	332	115	161	476	270	809	457	457	189	274	222	140	226	708	629	516	1060	243	261	318	122	229	85

BET-Table 2. Estimated probabilities of the Atlantic bigeye tuna stock being above B_{MSY} and below F_{MSY} in a given year for TAC level ('000 t), based upon the 2010 assessment outcomes.

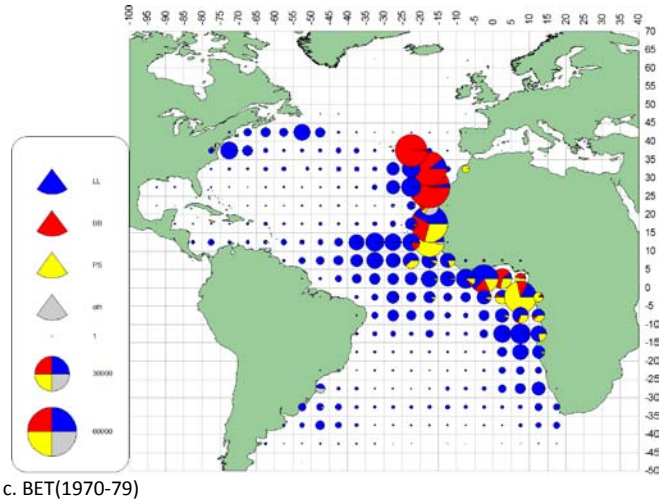
	Year									
TAC	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*
60	54%	63%	71%	75%	79%	82%	84%	85%	86%	87%
70	54%	61%	67%	71%	74%	76%	77%	79%	80%	81%
80	54%	58%	62%	66%	68%	70%	71%	72%	73%	74%
90	54%	57%	58%	60%	61%	62%	62%	63%	63%	64%
100	53%	54%	54%	54%	54%	54%	54%	54%	55%	55%
110	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%



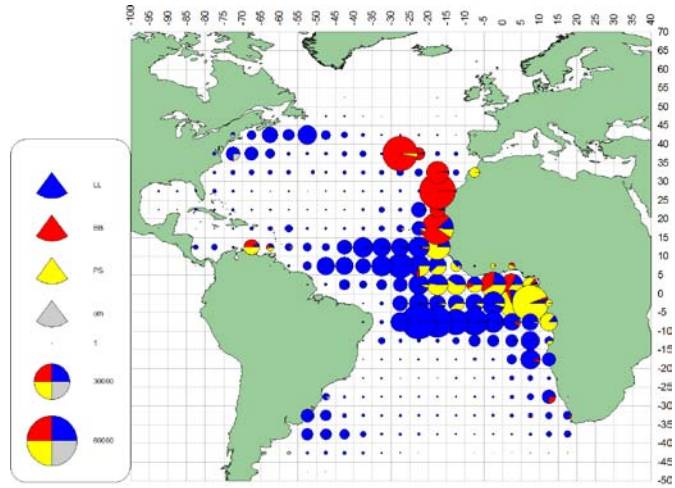
a. BET(1950-59)



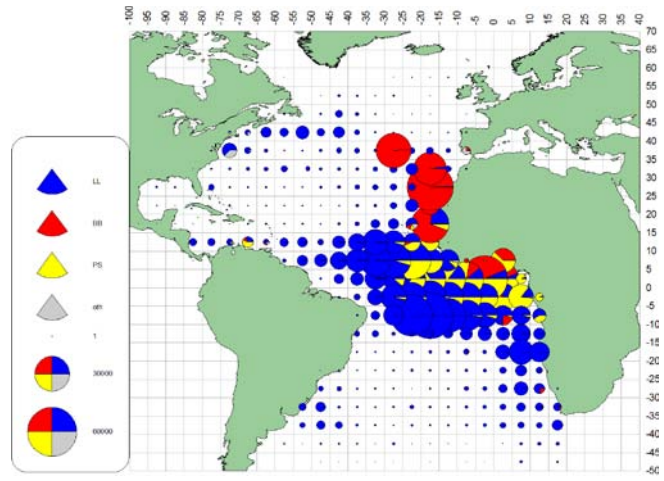
b. BET(1960-69)



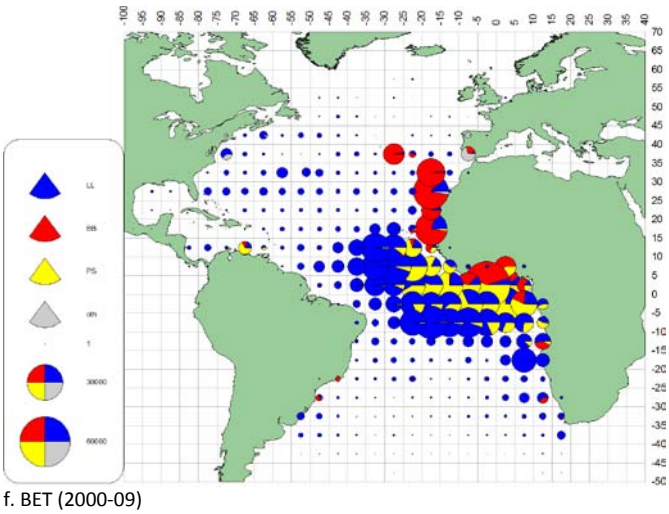
c. BET(1970-79)



d. BET(1980-89)

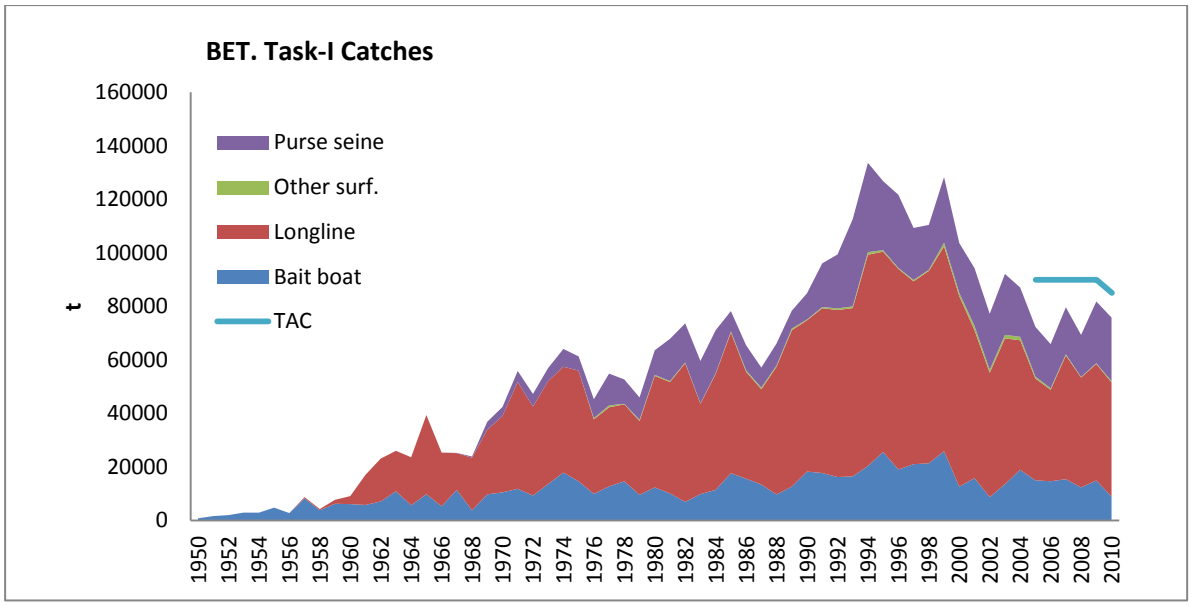


e. BET (1990-99)



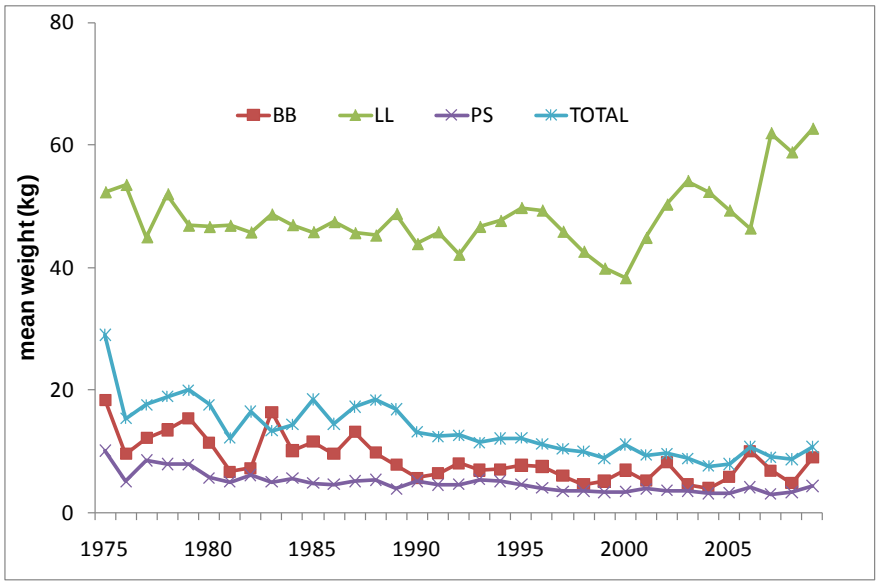
f. BET (2000-09)

BET-Figure 1 [a-e]. Geographical distribution of the bigeye tuna catch by major gears and decade. The symbols for the 1950s information (top left) are scaled to the maximum catch observed during the 1950s, whereas the remaining plots are scaled to the maximum catch observed from 1960 to 2009.

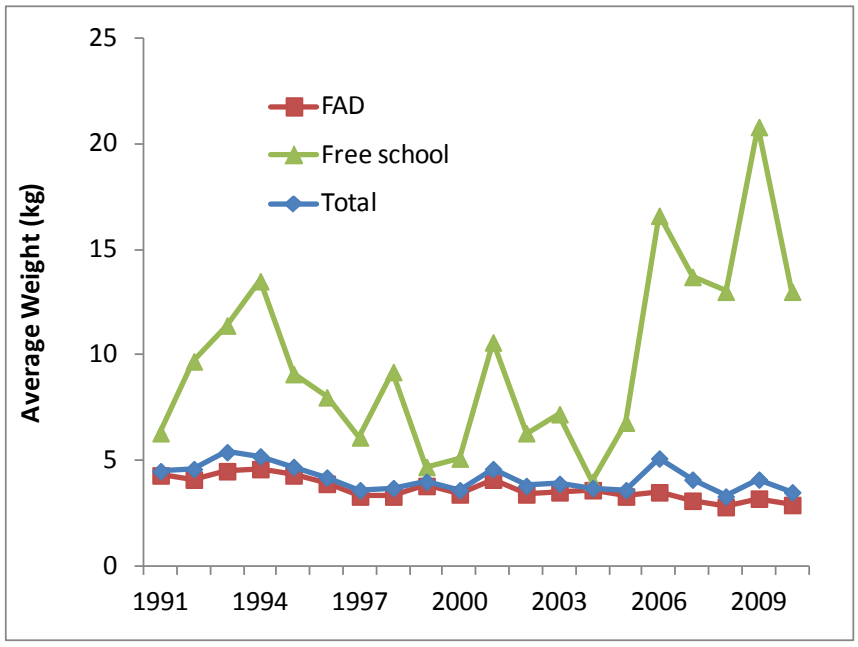


BET-Figure 2. Bigeye Task I catches for all the Atlantic stock, in tonnes. Value for 2010 represents preliminary estimates because some countries have yet to provide data for this year.

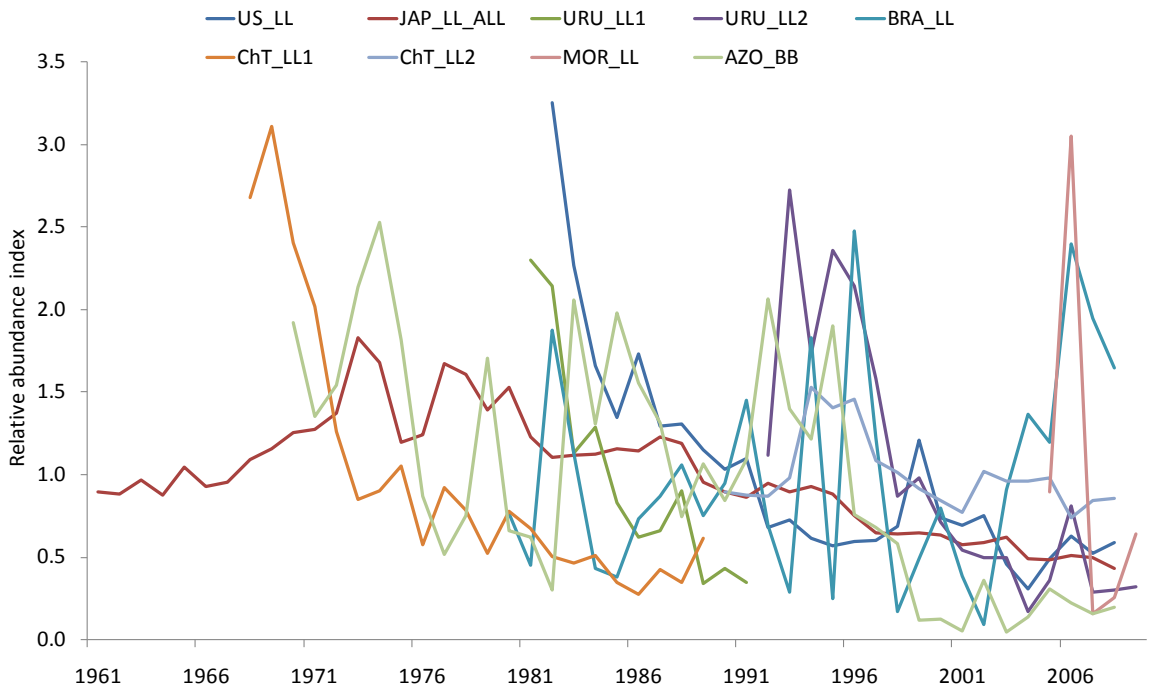
a)



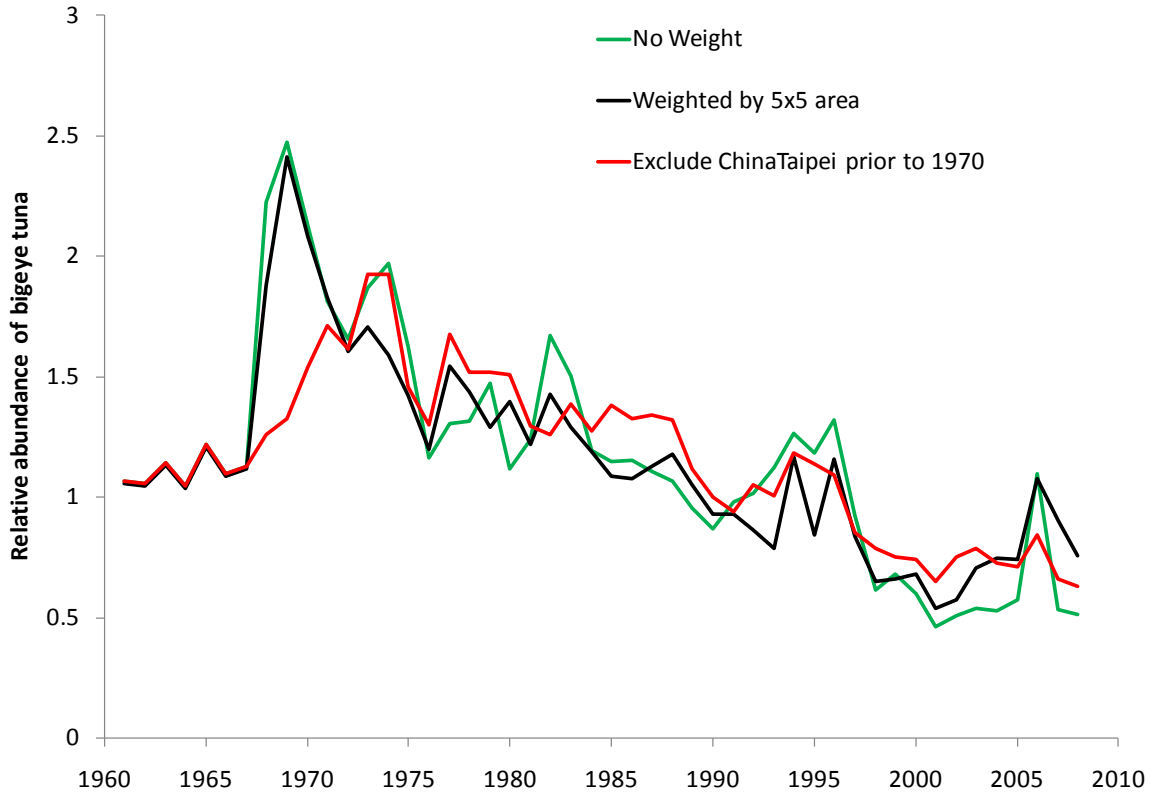
b)



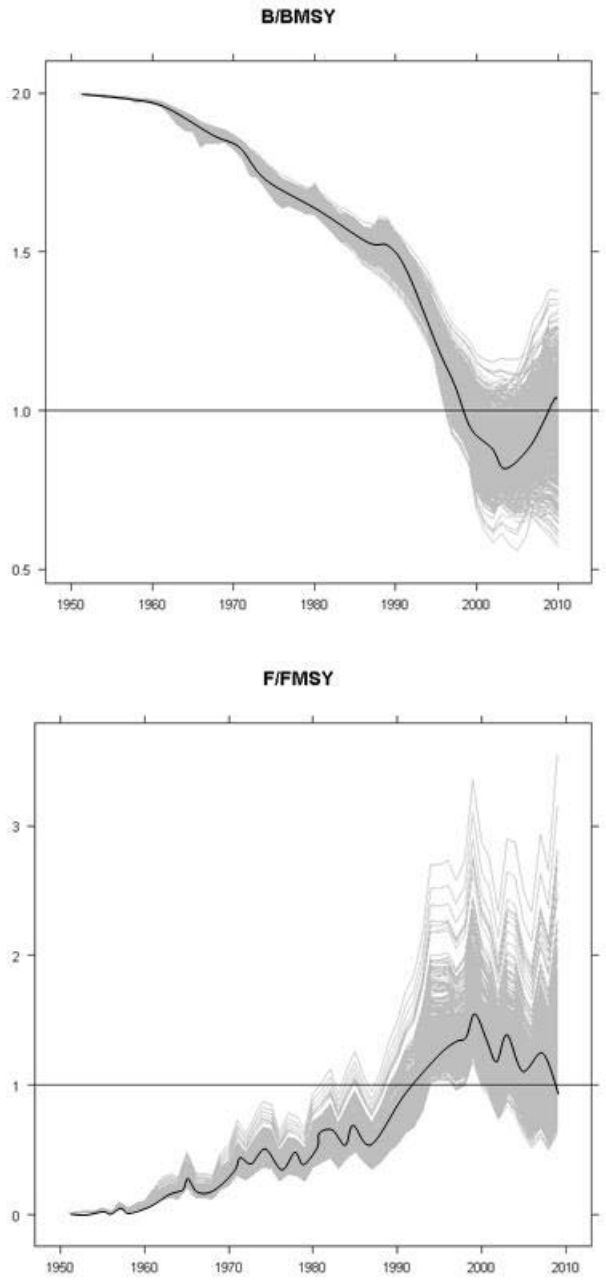
BET-Figure 3. Trend of mean weight for bigeye a) by major fisheries (1975-2009) based on the catch-at-size data, b) for European purse seiners (total) and separated between free schools and FAD associated schools (1991- 2010).



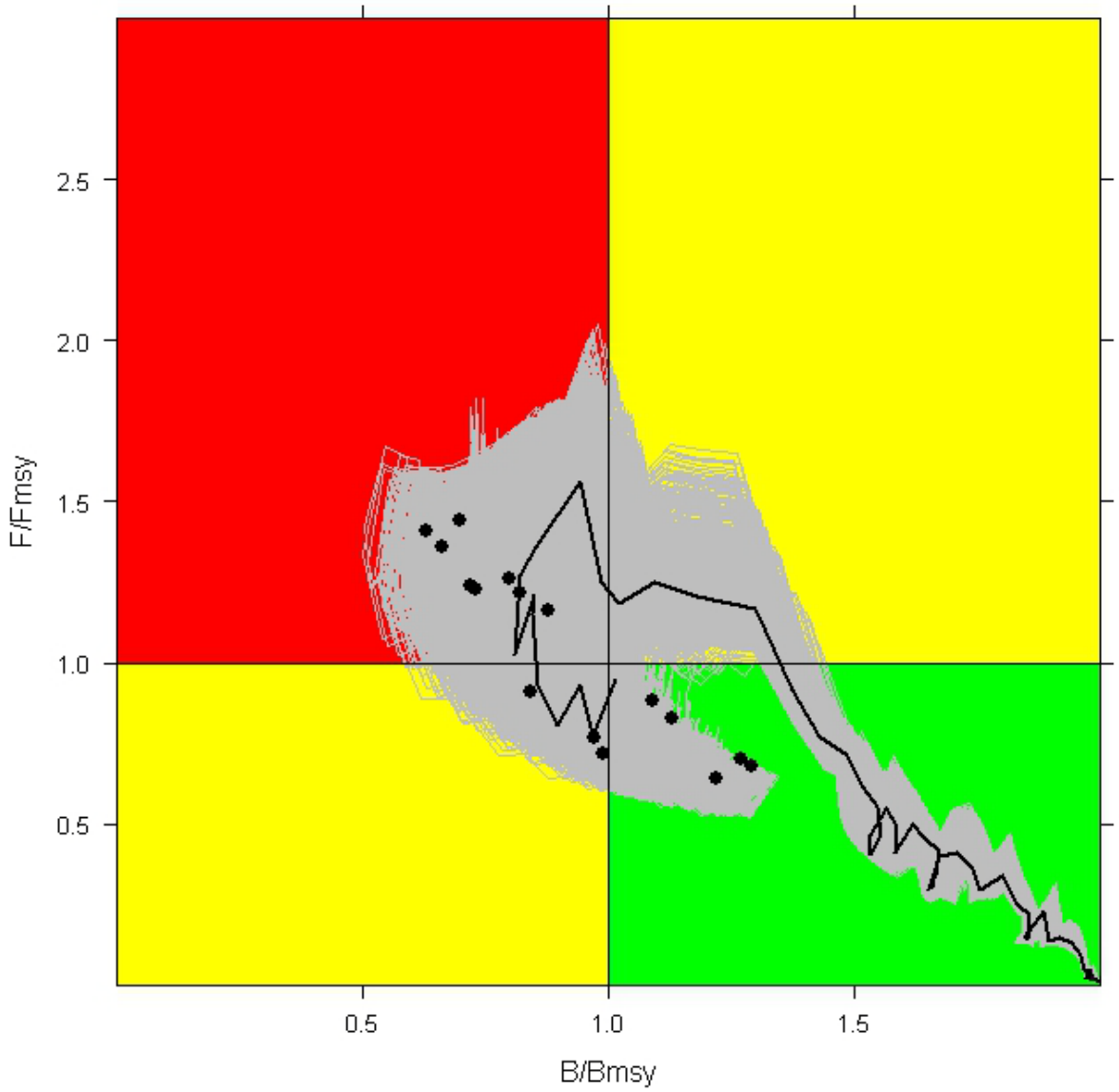
BET-Figure 4. Relative abundance indices for bigeye tuna. AZO_BB Azores Baitboat, BRA_LL, Brazil longline, ChT_LL2, Chinese Taipei longline 1968-1989, ChT_LL2 Chinese Taipei longline 1990-2008, JAP_LL Japanese longline, MOR_LL Morocco longline, UR_LL1 Uruguay longline 1981-1991, UR_LL2 Uruguay longline 1992-2008, US_LL USA longline.



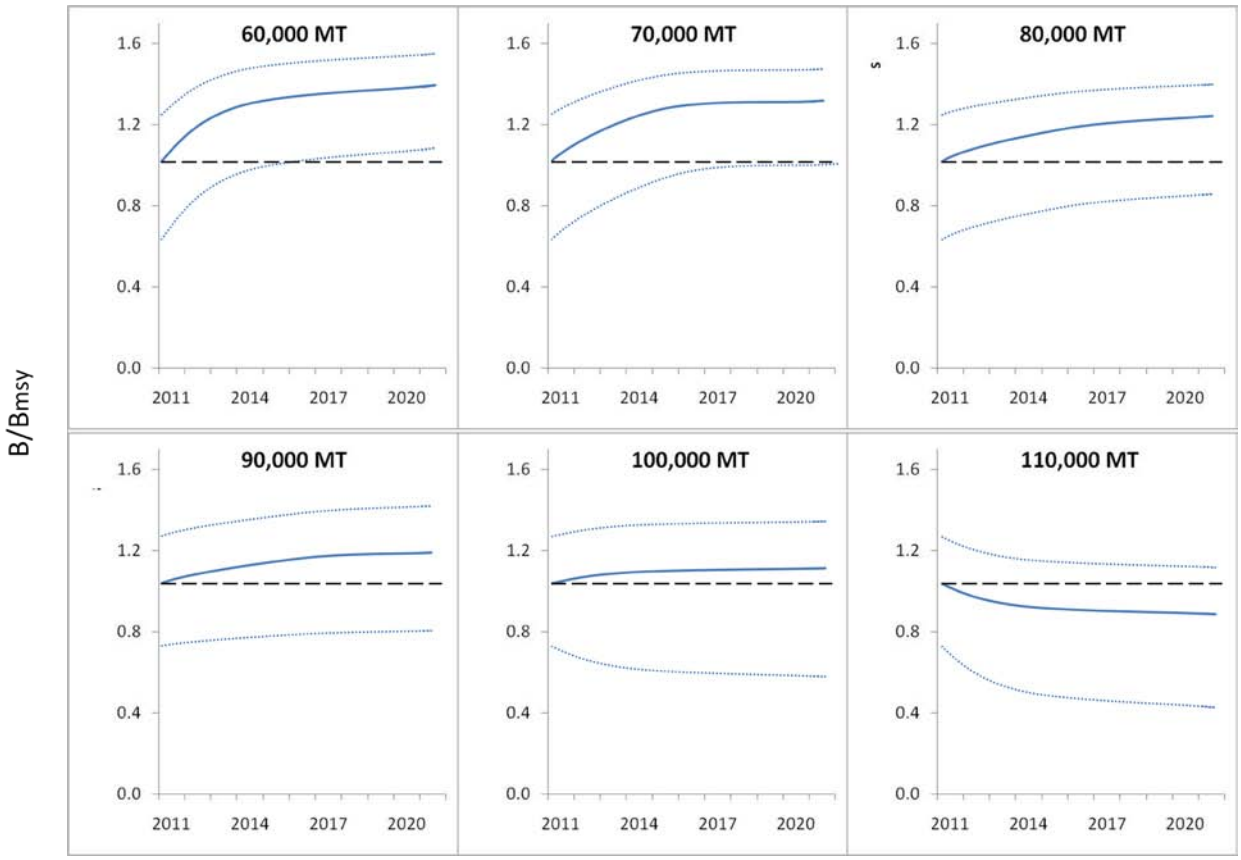
BET-Figure 5. Three alternative combined indices selected for the assessment with logistic non-equilibrium production models.



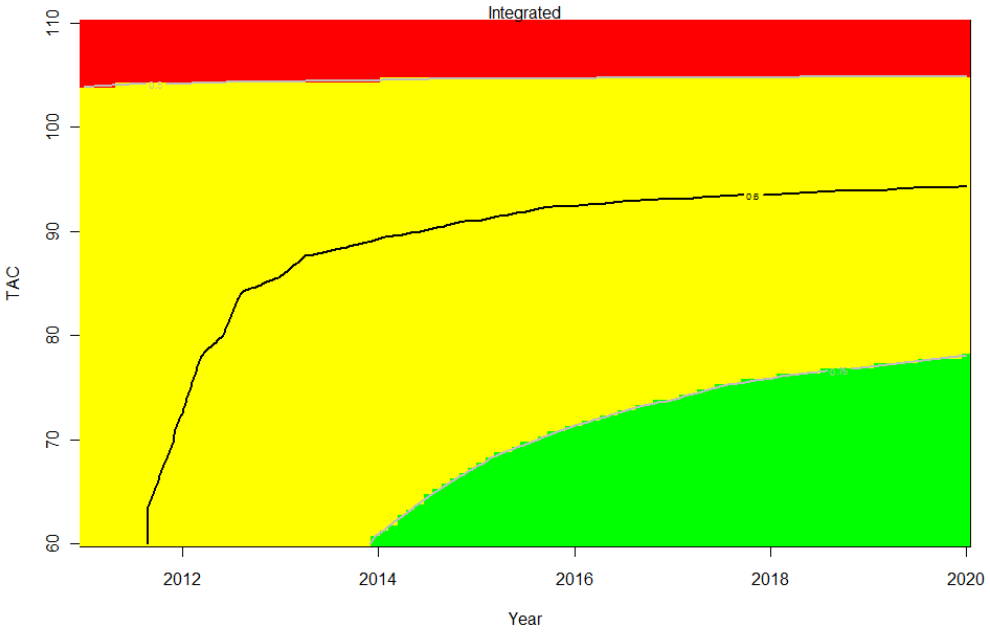
BET-Figure 6. Trajectories of B/B_{MSY} and F/F_{MSY} estimated from the logistic production model. Lines represent the 80% percentile of bootstrap results and thicker line the median.



BET-Figure 7. Kobe plot from combined examinations of assessment models. Shaded lines shown represent the 80% confidence limits for the historical trajectory (1950-2009) and solid line represents the median estimated from the logistic production model. Points depict uncertainty in current status not considered by the bootstrapping of the logistic production model (estimates of F_{2009}/F_{MSY} and B_{2009}/B_{MSY} for each of the sensitivity trials from the other models considered in the assessment).



BET-Figure 8. Biomass projections (B/B_{MSY}) for bigeye tuna for 2011-2021. Each panel corresponds to a different level of future constant catch from 60,000 to 110,000 tons. Thick lines represent median of all combined runs and thinner lines the 10 and 90 percentiles.



BET-Figure 9. Kobe matrix plot showing probabilities of the stock being above B_{MSY} and fishing at levels below F_{MSY} in a given year for a future constant catch (TAC). Projections were calculated from results of the combination of the three logistic production model runs used as the basis of the assessment. The colors represent modeled probabilities: red, <50%, yellow, 50-75% and green, >75%. The 60% probability isopleth is also shown as a black line.

8.3 SKJ – SKIPJACK TUNA

Stock assessments for eastern and western Atlantic skipjack were conducted in 2008 (Anon. 2009a) using available catches to 2006. Skipjack had only been assessed previously in 1998 (Anon. 1999). Consequently, this report includes the most recent information on the state of the stocks on this species.

SKJ-1. Biology

Skipjack tuna is a gregarious species that is found in schools in the tropical and subtropical waters of the three oceans **(SKJ-Figure 1)**. Skipjack is the predominant species under FADs where it is caught in association with juvenile yellowfin tuna, bigeye tuna and with other species of epipelagic fauna. One of the characteristics of skipjack is that from the age of one it spawns opportunistically throughout the year and in vast sectors of the ocean. A recent analysis of tagging data from the eastern Atlantic confirmed that the growth of skipjack varies according to the latitude. However, this difference in the growth rate is not as great as that which had been previously estimated.

The increasing use of fish aggregation devices (FADs) since the early 1990s, have changed the species composition of free swimming schools. It is noted that, in effect, the free schools of mixed species were considerably more common prior to the introduction of FADs. Furthermore, the association with FADs may also have an impact on the biology (food intake, growth rate, plumpness of the fish) and on the ecology (displacement rate, movement orientation) of skipjack and yellowfin (*ecological trap* concept).

SKJ-2. Fisheries indicators

The total catches obtained in 2010 in the entire Atlantic Ocean (including estimates of skipjack in the *faux-poisson* landed in Côte d'Ivoire by the EU-purse seiners) were at least 183,000 t and could reach around 190 to 195,000 t, if the update of catches for Brazil in 2010 confirms the catch average of those taken in recent years **(SKJ-Table 1**, **SKJ-Figure 2)** which represents a great increase compared to the catch average of the last five years. It is possible however, that the catches of a segment of the Ghanaian purse seine fleet, transshipped at sea on carriers, skip the collection process of fishery statistics.

The numerous changes that have occurred in the skipjack fishery since the early 1990s (such as the progressive use of FADs and the increase of the fishing area towards the west) have brought about an increase in skipjack catchability and in the biomass proportion that is exploited. At present, the major fisheries are the purse seine fisheries, particularly those of EU-Spain, Ghana, Panama, EU-France and Curaçao, followed by the baitboat fisheries of Ghana, EU-Spain, EU-Portugal and EU-France. The preliminary estimates of catches made in 2010 in the East Atlantic amounted to 164,000 t, that is, an increase of around 35% compared to the average of 2005-2009 **(SKJ-Figure 3)**. In recent years, the seasonal fishing by European purse seiners on free schools, off Senegal, has decreased sharply **(SKJ-Figure 1)** and consequently, the proportion of the catches on floating objects has continued to increase, reaching slightly more than 90% of the catches **(SKJ-Figure 4)**.

The unreported catches of some purse seine catches were estimated by comparing monitored landings in West African ports and cannery data to catches reported to ICCAT. Estimates of the unreported catches of these purse seine catches are larger and increasing since 2006 and now may exceed 20,000 tons for the three main species of tropical tunas. The committee expressed the need for countries and the involved industry in the region to cooperate to estimate and report these catches correctly to ICCAT. These estimates have not been incorporated into assessments and are not included in the catch estimates presented in this report. The magnitudes of these estimates of IUU catch, however, are likely to influence the assessments and the resulting perception of stock status.

The estimate of the average discard rate of skipjack tuna under FADs from data collected since 2001 by observers on-board Spanish purse seiners operating in the East Atlantic has been confirmed by the two new studies conducted on board French purse seiners (estimated at 42 kg per ton of skipjack landed). Furthermore, this last study showed that the amount of small skipjack (average size 37 cm FL) landed in the local market of Abidjan in Côte d'Ivoire as *faux-poisson* is estimated at 235 kg per ton of skipjack landed (i.e. an average of 6,641 t/year between 1988 and 2007 for the European or associated purse seiners, **SKJ-Figure 5**). However, new estimates, on the specific composition in particular, of *faux-poisson*, carried out during the recent Tropical Tuna Species Group Inter-sessional Meeting on the Ghanaian Statistics Analysis, indicate amounts of around 11,000 t/year between 2005 and 2010 for the overall purse seiners operating in the East Atlantic (3,919 t/year for the European purse seiners) .The Committee regularly integrates these estimates in the reported historical catches for the EU-purse seiners since 1981, as well as in the catch-at-size matrix.

In the West Atlantic, the major fishery is the Brazilian baitboat fishery, followed by the Venezuelan purse seine fleet. Preliminary estimates of catches in 2010 in the West Atlantic amounted to 18,000 t, but the complete submission of Brazil's Task I data should bring this amount towards the average catch observed for recent years **(SKJ-Figure 6)**.

It is difficult to estimate effective fishing effort for skipjack tuna in the East Atlantic. Nominal purse seine effort, expressed in terms of carrying capacity, has decreased regularly since the mid-1990s up to 2006. However, due to acts of piracy in the Indian Ocean, many European Union purse seiners have transferred their effort to the East Atlantic. This new situation, which added to the presence of one new purse seine fleet operating from Tema (Ghana), and whereby catches are probably highly underestimated, has considerably increased the carrying capacity of this fishing gear **(SKJ-Figure 7)**. The number of EU purse seiners in the East Atlantic follows this trend but seems to have stabilized in 2010, according to the preliminary estimates. On the other hand, baitboat nominal effort has remained stable for more than 20 years.

It is considered that the increase in fishing power linked to the introduction of innovation technologies on board the vessels as well as to the development of fishing under floating objects has resulted in an increase in the efficiency of the various fleets, since the early 1980s. In addition to the use of an average 3% annual increase in skipjack catchability to account for these changes, a new analysis has been conducted by fixing MSY and K at levels that agree with estimates made during previous stock assessments. This method provides a range of increase in catchability from 1 to 13% per year. It is unclear, however, whether these estimates reflect technological changes only, or also in the availability of the fish (e.g., resulting from an expansion of the surface exploited over the years; **SKJ-Figure 8**). The recent increase in the area explored successfully which corresponds to the extension of the fishery towards the central West Atlantic and off Angola should also be noted.

The significant increase in the estimates of total mortality (Z) between the early 1980s and the end of the 1990s obtained from different methods, such as the tag-recovery model, the catch curves by size and the average size observed in the yearly catches, supports this hypothesis. The change in the selectivity pattern observed for the purse seine fishery suggests that this fleet is mainly targeting juvenile tunas. The comparison of the size distributions of skipjack for the East Atlantic between the periods prior to, and following the use of FADs, also reinforces this interpretation insofar as an increase is observed in the proportion of small fish in the catches, as shown by the change of the average weight over the years (**SKJ-Figure 9**). Generally, it is noted that the average weight observed in the east Atlantic (close to 2 kg) is much lower than the estimates given in the other oceans (closer to 3 kg).

The regular increase in fishing pressure observed for the other indicators is confirmed up to about 1995, then the decline in apparent Z (a trend also observed for yellowfin) could be a consequence of the moratoria on floating objects which has mainly affected skipjack **(SKJ-Figure 10)**.

With respect to the West Atlantic, the fishing effort of the Brazilian baitboats (*i.e.*, the major skipjack fishery in this region) seems to be stable over the last 20 years.

SKJ-3. State of the stocks

In all the oceans and consequently in all the tuna RFMOs, the traditional stock assessment models have been difficult to apply to skipjack because of their particular biological and fishery characteristics (on the one hand, continuous spawning, areal variation in growth and non-directed effort, and on the other, weak identified cohorts). In order to overcome these difficulties, several different assessment methods which accommodate expert opinion and prior knowledge of the fishery and biological characteristics of skipjack have been carried out on the two stocks of Atlantic skipjack. Several fishery indictors were also analyzed to carry out a follow up of the development in the state of the stock over time.

Although the fisheries operating in the east have extended towards the west beyond 30°W longitude, the Committee decided to maintain the hypothesis in favor of two distinct stock units, based on available scientific studies. However, taking into account the state of current knowledge of skipjack tuna migrations and the geographic distances between the various fishing areas **(SKJ-Figure 1** and **SKJ-Figure 11)**, the use of smaller stock units continues to be the envisaged working hypothesis.

Eastern stock

The Committee analyzed two standardized indices from the EU-purse seine fishery: An index accounts for skipjack caught in free school in the Senegalese area during the second quarter of the year and the second index characterizing small fish captured under FADs in the equatorial area (**SKJ-Figure 12**). In previous meetings of the Tropical Tunas Species Group it was confirmed that the increase in CPUE of the European purse seiners in the late 1990s was due, mainly, to the increase in the catches of positive sets under FADS (**SKJ-Figure 13**). Furthermore, the regular increase in the skipjack yields of the baitboats based in Senegal may only have been the result of an increase in catchability linked to the adoption of the so-called "baitboat associated school" fishing towards the mid-1980s (**SKJ Figure 14**) and/or to seasonal changes of fishing zones as suggested by a recent study on this fishery. Furthermore, no marked trend has been observed for the Canary Islands baitboats as well as for a peripheral fishery such as the Azorean baitboat fishery. The fact that a reduction in abundance for a local segment of the stock would have little repercussion on abundance in other areas, leads to suppose that only a minor proportion of skipjack carry out extensive migrations between areas (**SKJ-Figure 11**; *cf.* notion of stock viscosity). This assumption was reinforced by a recent tagging study on growth variability of skipjack between two eastern Atlantic regions divided by 10°N latitude, which were established on the basis of their low amount of mixing (only 0.9% of the tagged fish crossed this latitudinal limit).

A new Bayesian method, using only catch information (under a Schaefer-type model parameterization), estimated the MSY at 143,000-156,000 t, a result which agrees with the estimate obtained by the modified Grainger and Garcia approach: 149,000 t.

In addition, two non-equilibrium surplus biomass production models (a multi-fleets model and a Schaefer-based model) were applied for 8 time series of CPUEs, and for a combined CPUE index weighted by fishing areas. To account for the average increase in catchability of purse seine fisheries, a correction factor of 3% per year was applied to the CPUE series. As for the Bayesian model application that only uses catches, different working hypothesis were tested on the distribution of the priors of the two surplus production models (i.e., the growth rate, the carrying capacity, the catchability coefficient of each fleet, etc.). In general, the range of plausible MSY values estimated from these models (155,000-170,000 t) were larger than in the bayesian model based on catches. The Committee stated the difficulty to estimate MSY under the continuous increasing conditions of the exploitation plot of this fishery (one-way of the trajectory to substantially weaker effort values) and which as a result, the potential range distribution of some priors needs to be constrained (e.g., for growth rate, or for the shape parameter of the generalized model).

While caution is needed as regards to the generalization of the diagnosis on the stock status of the overall spatial components of this stock in the East Atlantic, due to the moderate mixing rates that seem to occur among the different sectors of this region, it is unlikely that skipjack be exploited in the eastern Atlantic **(SKJ-Figure 15)**.

Western stock

The standardized CPUEs of Brazilian baitboats remain stable while that of Venezuelan purse seiners and USA rod and reel decreased in recent years **(SKJ-Figure 16)**. This decrease, also observed in the CPUE time series for Venezuelan purse seine, could be linked to specific environmental conditions (high surface temperatures, lesser accessibility of prey). The average weight of skipjack caught in the western Atlantic is higher than in the east (3 to 4.5 kg vs. 2 to 2.5 kg), at least for the Brazilian baitboat fishery.

The assessment model from catches estimated MSY at around 30,000 t (similar to the estimate provided by the Grainger and Garcia approach) and the Bayesian surplus model (Schaefer formulation) at 34,000 t.

The Group attempted several sensitivity analyses for values of natural mortality with Multifan-CL. For this stock only the three fisheries mentioned above were considered. The final estimate of MSY converges also at about: 31,000-36,000 t. It must be stressed that all of these analyses correspond to the current geographic coverage of this fishery (*i.e.*, relatively coastal fishing grounds due to the deepening of the thermocline and of the oxycline to the East).

For the western Atlantic stock, in the light of the information provided by the trajectories of B/B_{MSY} and F/F_{MSY}, it is unlikely that the current catch is larger than the current replacement yield **(SKJ-Figure 17)**.

SKJ-4. Effects of current regulations

There is currently no specific regulation in effect for skipjack tuna.

However, with the aim of protecting juvenile bigeye tuna, the French and the Spanish boat owners voluntarily decided to apply a moratorium for fishing under floating objects between November and the end of January for the 1997-1998 and 1998-1999 periods. The Commission implemented a similar moratorium from 1999 to January 2005. This moratorium has had an effect on skipjack catches made with FADs.

On the basis of a comparison of average catches between 1993-1996, prior to the moratoria, and those between the 1998-2002 period, the average skipjack catches between November and January for the purse seine fleets that applied the moratoria, were reduced by 64%. During that period (1998-2002), the average annual skipjack catches by purse seine fleets that applied the moratoria decreased by 41% (42,000 t per year). However, this decrease is possibly a combined result of the decrease in effort and the impact of the moratoria (the average annual catch per boat decreased only 18% between these two periods).

The repealing in 2006 of Recommendation [Rec. 05-01] on the 3.2 kg minimum size limit on yellowfin tuna [Rec. 72-01] (although it remained in force in 2005) and the establishment of a time/area closure of the surface fishery [Rec. 04-01], which replaces the old strata relative to the moratorium on catches under floating objects, are regulatory measures whose effects were analyzed during the Species Group meeting.

Considering that the new closed area is much smaller in time and surface than the previous moratorium time/area, and is located in an area which historically has lower effort anyway, this regulation is likely to be less effective in reducing the overall catches of small bigeye (the species for which the regulation was applied) by the surface fishery. When the fishing effort for the EU purse seine fleet was at its maximum value (period 1994-1996, *i.e.*, before the implementation of the first moratorium), the skipjack catch from this fleet within the time and area limits defined by Rec. 04-01, was only on average at 7,180 t (*i.e.*, 7.5% of the total skipjack catch from the EU purse seiners).

SKJ-5. Management recommendations

Although the Committee makes no management recommendations in this respect, catches should not be allowed to exceed MSY. The Commission should be aware that increasing harvests and fishing effort for skipjack could lead to involuntary consequences for other species that are harvested in combination with skipjack in certain fisheries.

ATLANTIC SKIPJACK TUNA SUMMARY

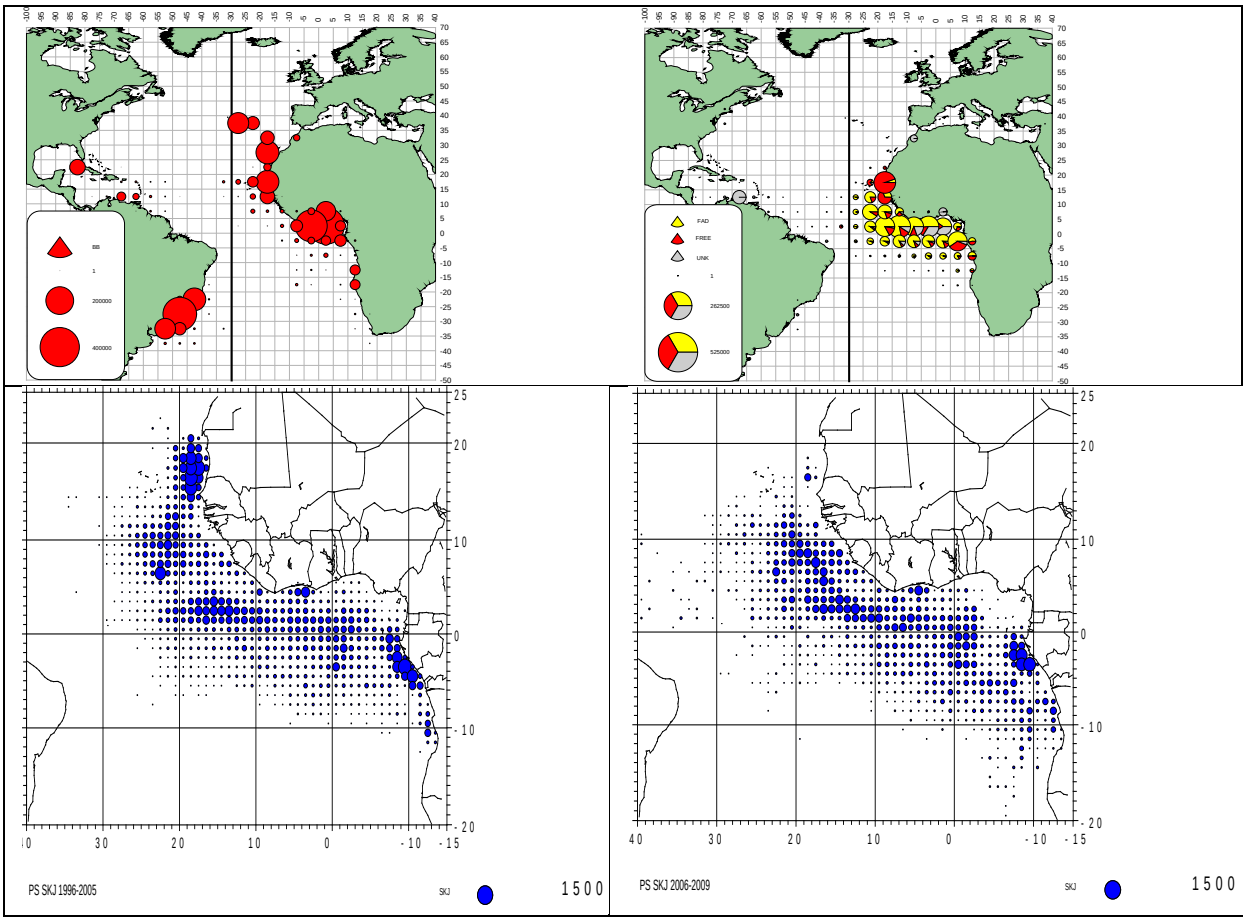
	East Atlantic	**West Atlantic**
Maximum Sustainable Yield (MSY)	Around 143,000-170,000 t	Around 30,000-36,000 t
Current (2010) Yield [1]	164,000 t	18,000 t
Current Replacement Yield	Somewhat higher than 164,000 t	Somewhat higher than 18,000 t
Relative Biomass (B_{2008}/B_{MSY})	Most likely>1	Most likely>1
Relative Fishing Mortality: (F_{2008}/F_{MSY})	Most likely<1	Most likely<1
Management measures in effect	Rec. 04-01 (effective 2005) [2]	None

[1] Reports of catches for 2010 should be considered provisional, particularly for the West Atlantic.
[2] Although this time-area measure was implemented to reduce mortality on bigeye juvenile tuna, a total area closure has the expected effects on all the tropical tuna species.

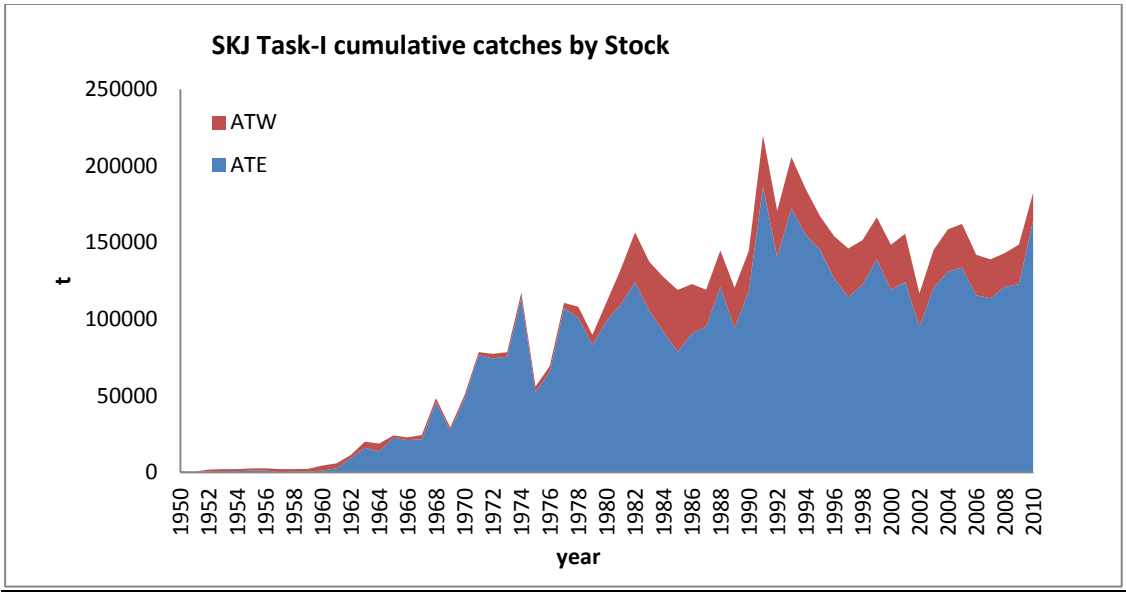
SKJ-Table 1. Estimated catches (t) of skipjack tuna (*Katsuwonus pelamis*) by area, gear and flag.

			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
TOTAL			122865	119229	144796	120419	144471	219733	170708	205685	185014	167381	154127	146082	151699	166488	148605	155767	116781	145293	158707	162240	141973	139127	143114	148653	182429
	ATE		90711	95052	121060	94037	118361	186330	140554	172462	155065	145479	126557	114367	122436	139079	119209	124204	95145	120412	131085	133596	115501	113580	121025	122876	164249
	ATW		32151	24164	23736	26382	26110	33404	30155	33221	29949	21860	27562	31712	29087	27356	29307	31486	21600	24749	27461	28517	26453	25443	22022	25771	18140
	MED		2	13	0	0	0	0	0	2	0	43	9	4	176	53	90	77	37	132	161	127	20	104	67	5	40
Landings	ATE	Bait boat	30009	38803	48015	41000	36922	41611	35660	31656	37817	33691	32047	37293	42045	37696	29974	46281	27591	29847	39539	43603	41175	29720	44106	33580	37157
		Longline	19	6	4	9	0	5	3	2	10	3	7	47	85	42	48	53	56	66	316	458	2958	1599	1154	1556	1050
		Other surf.	1638	1027	1506	1643	1357	2067	1602	1062	501	445	501	304	923	417	2423	764	681	551	816	1897	2402	2172	2763	4879	4719
		Purse seine	59045	55216	71535	51385	80082	142646	103288	139742	116737	111340	94002	76722	79383	100925	86763	77107	66817	89948	90414	87638	68966	80088	73002	82861	121323
	ATW	Bait boat	25278	18675	21057	23292	22246	23972	20852	19697	22645	17744	23741	26797	24724	23881	25754	25142	18737	21990	24082	26028	23749	22865	20617	22770	12902
		Longline	8	6	9	25	23	33	29	20	16	34	19	12	21	58	22	60	349	95	206	207	286	52	49	20	17
		Other surf.	1657	518	355	600	600	872	764	710	1577	2023	452	556	516	481	467	951	398	367	404	316	372	1317	455	950	1086
		Purse seine	5208	4964	2315	2466	3241	8527	8509	12794	5712	2059	3349	4347	3826	2936	3063	5332	2116	2296	2769	1967	2045	1209	901	2032	4136
	MED	Bait boat	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	3	17	21	13	8	39	40	1	14
		Other surf.	2	13	0	0	0	0	0	2	0	43	9	4	176	53	90	77	32	12	40	16	12	28	11	3	17
		Purse seine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	103	101	99	0	38	16	1	8
Discards	ATW	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
Landings	ATE	Angola	56	80	30	85	69	66	41	13	7	3	15	52	2	32	14	14	14	14	10	0	0	0	0	0	
		Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	510
		Benin	11	5	3	7	2	2	2	2	2	2	2	7	3	2	2	0	0	0	0	0	0	0	0	0	
		Canada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Cape Verde	877	2076	1456	971	806	1333	864	860	1007	1314	470	591	684	962	789	794	398	343	1097	7504	7930	6026	6010	4767	6032
		Cayman Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		China P.R.	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	
		Chinese Taipei	0	0	1	3	0	5	3	2	10	3	5	47	73	39	41	24	23	26	16	10	9	14	19	6	7
		Congo	8	8	8	11	12	9	9	10	7	7	6	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Cuba	569	81	206	331	86	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Curaçao	0	0	0	0	0	0	0	0	0	0	7096	8444	8553	9932	10008	13370	5427	10092	8708	0	3042	1587	6436	9143	9179
		Côte D'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1173	259	292	143	559	1259	1565	1817	2328	2840	2840
		EU.Bulgaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.España	41992	33076	47643	35300	47834	79908	53319	63660	50538	51594	38538	38513	36008	44520	37226	30954	25456	44837	38725	28139	22206	23670	35105	36694	41186
		EU.Estonia	0	0	0	0	0	102	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.France	13045	17114	16504	15211	17099	33271	21890	33735	32779	25188	23107	17023	18382	20344	18183	16593	16615	19899	21879	14850	7034	4168	4439	7789	14741
		EU.Germany	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Ireland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	14	14	0	0	8	6
		EU.Latvia	0	0	0	0	0	92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Lithuania	0	0	0	0	0	221	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Portugal	5446	8420	14257	7725	3987	8059	7477	5651	7528	4996	8297	4399	4544	1810	1302	2167	2958	4315	8504	4735	11158	8995	6057	1084	12974
		Gabon	0	0	0	0	0	0	0	1	11	51	26	0	59	76	21	101	0	0	0	0	0	0	0	0	
		Ghana	22268	24347	26597	22751	24251	25052	18967	20225	21258	18607	19602	26336	34183	40216	28974	42489	30499	24597	25727	44671	30236	34572	37387	36064	53813
		Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6389	4959	5546	6319	4036	2951
		Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1224	1224
		Japan	2031	1982	3200	2243	2566	4792	2378	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1
		Korea Rep.	5	6	3	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
		Maroc	1220	1028	428	295	1197	254	559	310	248	4981	675	4509	2481	848	1198	268	280	523	807	1893	3779	1570	1291	2575	2317
		Mixed flags (FR+ES)	692	4663	4660	4125	5280	11101	12273	13750	9492	5862	5831	4905	5621	6845	9461	7137	2995	4959	5262	4666	5313	3275	3128	2969	4163
		NEI (ETRO)	540	791	2994	2263	10869	11335	12409	20291	17418	16235	16211	6161	6748	8893	7127	8087	8550	9688	11137	2873	629	0	0	0	
		Namibia	0	0	0	0	0	0	0	0	2	15	0	1	0	0	0	8	0	0	0	0	0	0	0	71	2
		Norway	0	581	738	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	8312	8719	13027	12978	14853	5855	1300	572	1308	1559	281	342	0	7126	11490	13468	18821	8253	8518	9590
		Rumania	3	0	0	59	142	349	73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Russian Federation	0	0	0	0	0	1175	1110	540	1471	1450	381	1146	2086	1426	374	0	0	0	0	0	392	1130	313	260	**0**
		S. Tomé e Príncipe	20	20	195	196	204	201	178	212	190	180	187	178	169	181	179	179	179	179	117	166	143	0	229	235	241
		Senegal	0	0	0	47	134	652	260	95	59	18	163	455	1963	1631	1506	1271	1053	733	1333	4874	3534	2278	3661	4573	2447
		South Africa	101	88	157	96	17	15	7	6	4	4	1	6	2	1	7	1	1	2	2	1	0	0	4	4	2
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	
		U.S.A.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		U.S.S.R.	1688	547	1822	1915	3635	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		UK.Sta Helena	139	139	158	397	171	24	16	65	55	115	86	294	298	13	64	205	63	63	63	63	88	110	45	15	25
		Venezuela	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	ATW	Argentina	138	90	7	111	106	272	123	50	1	0	1	0	2	0	1	0	0	0	30	0	0	0	0	0	

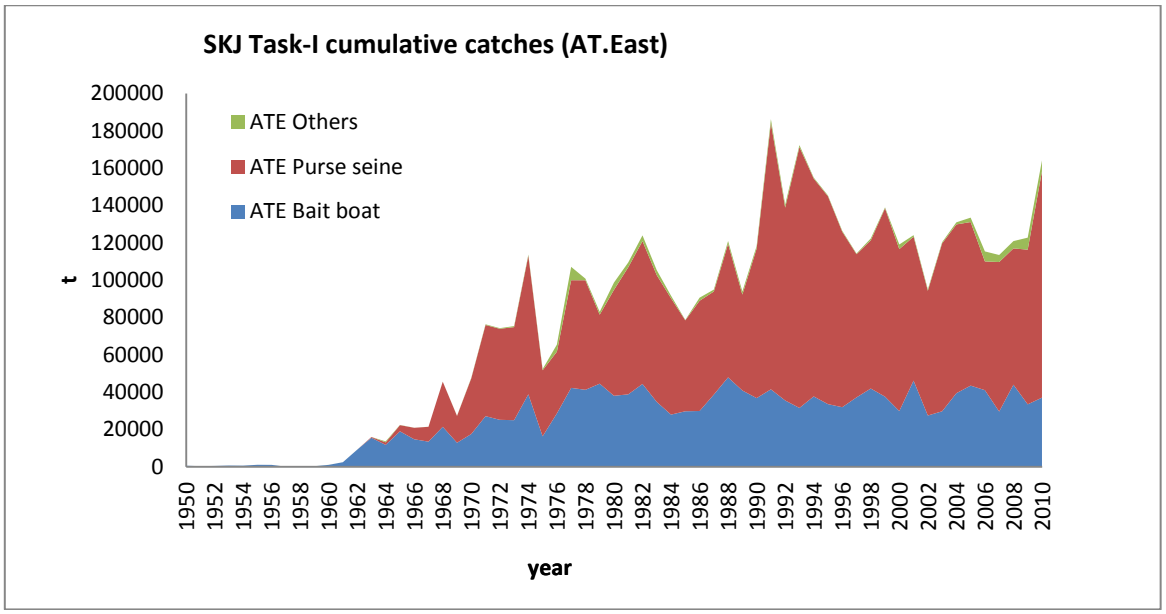
			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		Barbados	33	21	3	9	11	14	5	6	6	6	5	5	10	3	3	0	0	0	0	0	0	0	0	0	
		Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2204
		Brasil	23155	16286	17316	20750	20130	20548	18535	17771	20588	16560	22528	26564	23789	23188	25164	24146	18338	20416	23037	26388	23270	24191	20846	23307	13550
		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
		Chinese Taipei	1	2	7	19	0	32	26	9	7	2	10	1	2	1	0	1	16	14	27	28	29	2	8	0	6
		Colombia	0	0	0	0	0	0	0	2074	789	1583	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Cuba	1277	1101	1631	1449	1443	1596	1638	1017	1268	886	1000	1000	651	651	651	0	0	624	545	514	536	0	0	0	
		Curaçao	40	40	40	40	40	40	40	45	40	35	30	30	30	30	30	0	0	0	0	0	0	0	0	0	
		Dominica	0	0	0	0	60	38	41	24	43	33	33	33	33	85	86	45	55	51	30	20	28	32	45	25	
		Dominican Republic	600	62	63	117	110	156	135	143	257	146	146	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.España	0	0	0	0	0	1592	1120	397	0	0	0	0	0	1	1	0	0	0	0	0	0	5	11	0	0
		EU.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	
		EU.Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	9	0	
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	3	3	5	21	11	0	6	0
		Grenada	9	5	22	11	23	25	30	25	11	12	11	15	23	23	23	15	14	16	21	22	15	26	20	0	
		Jamaica	0	0	0	0	0	0	0	0	0	0	62	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Japan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
		Korea Rep.	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Mexico	11	13	10	14	4	9	8	1	1	0	2	3	6	51	13	54	71	75	9	7	10	7	8	9	7
		NEI (ETRO)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	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	
		St. Vincent and Grenadines	0	0	17	28	29	27	20	66	56	53	37	42	57	37	68	97	357	92	251	251	355	90	83	54	46
		Sta. Lucia	76	60	53	38	37	51	39	53	86	72	38	100	263	153	216	151	106	132	137	159	120	89	168	0	153
		Trinidad and Tobago	0	0	1	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		U.S.A.	1115	734	57	73	304	858	560	367	99	82	85	84	106	152	44	70	88	79	103	30	61	66	67	119	55
		UK.Bermuda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0
		Venezuela	5690	5750	4509	3723	3813	8146	7834	11172	6697	2387	3574	3834	4114	2981	3003	6870	2554	3247	3270	1093	2008	921	757	2250	2119
	MED	Algerie	0	0	0	0	0	0	0	0	0	0	0	0	171	43	89	77	0	0	0	0	0	0	0	0	
		EU.España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	26	10	15	44	12	0	5
		EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	0	0	0	0	0	0	0	8
		EU.Greece	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	102	99	99	0	0	0	0	
		EU.Italy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	29	34	17	0	0	0	0	
		Maroc	2	13	0	0	0	0	0	2	0	43	9	4	5	10	1	0	1	1	2	1	5	22	18	5	26
		Syria Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	36	0	
Discards	ATW	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



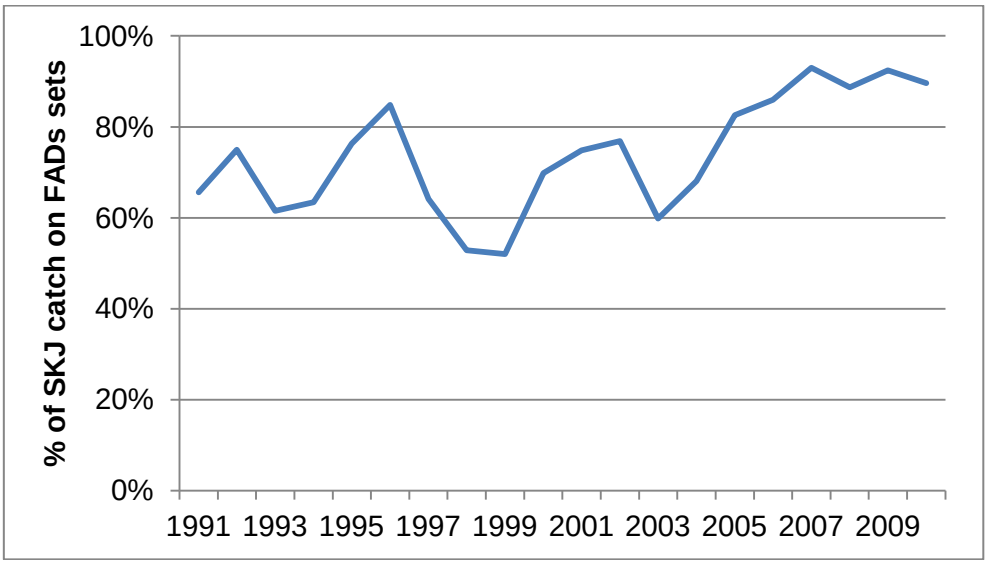
SKJ-Figure 1. (A) Distribution of skipjack catches in the Atlantic for baitboat between 1960 and 2009 (upper left panel) and for purse seiners by fishing mode (free schools vs FADs) between 1991 and 2009. (B) Skipjack catches made by European purse seiners (about 75% of the total catches) 1996-2005 (lower left panel) and 2006-2009 (lower right panel) showing the withdrawal from the Senegal zone due to non-renewal of the fishing agreements.



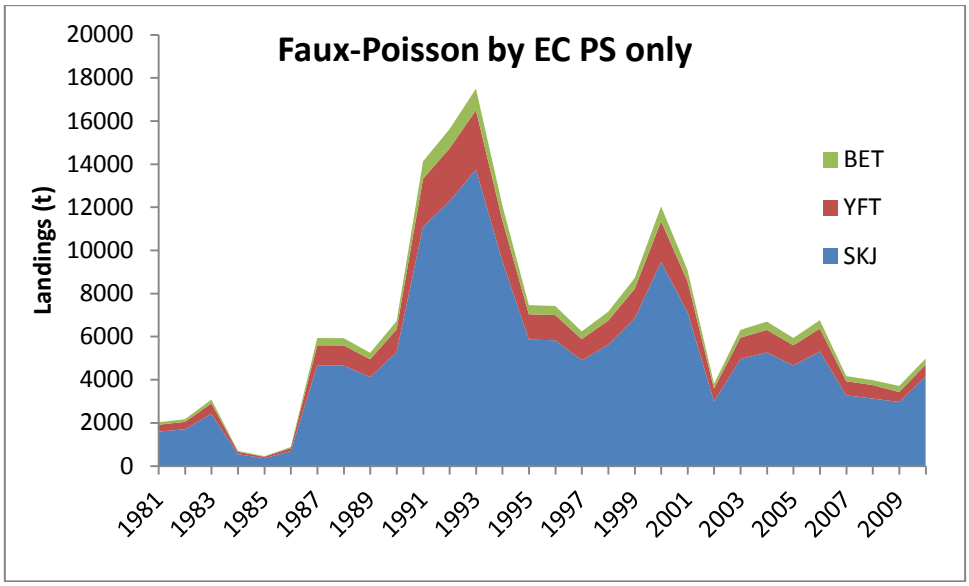
SKJ-Figure 2. Total catch (t) for skipjack tuna in the Atlantic Ocean and by stocks (East and West) between 1950 and 2010. Estimates of skipjack in the "*faux poissons*" landed in Côte d'Ivoire were included in the skipjack trade catches in the eastern Atlantic (only catches to 2006 were considered for the stock assessment). The estimate of total catches in the West Atlantic (and consequently for all the Atlantic), remains preliminary. It is also possible that skipjack catches taken in the eastern Atlantic during recent years were not reported.



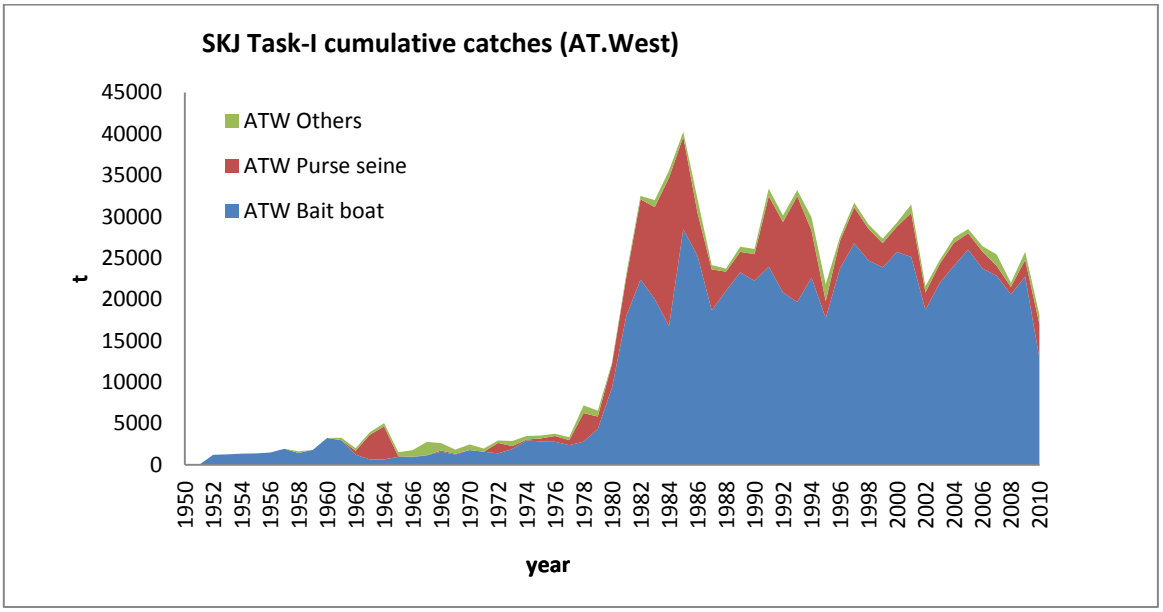
SKJ-Figure 3. Skipjack catches in the eastern Atlantic, by gear (1950-2010). It is possible that skipjack catches taken by purse seiners in the eastern Atlantic during recent years were not reported.



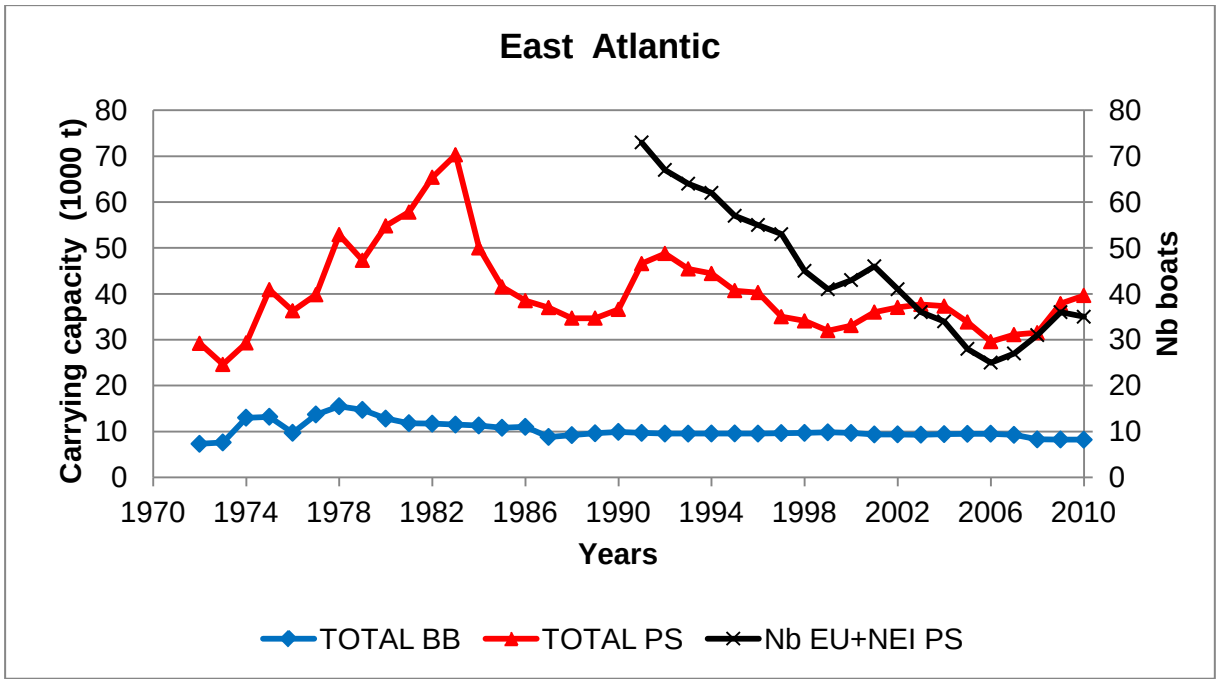
SKJ-Figure 4. Changes in the proportion of skipjack catches made by European purse seiners under FADs (1991-2010).). The increase in the percentage of catches under FADs coincides with the shift from the Senegal area (due to not renewing the fishing agreements); Area known for its seasonal fishing on free schools (see **Figure 1**).



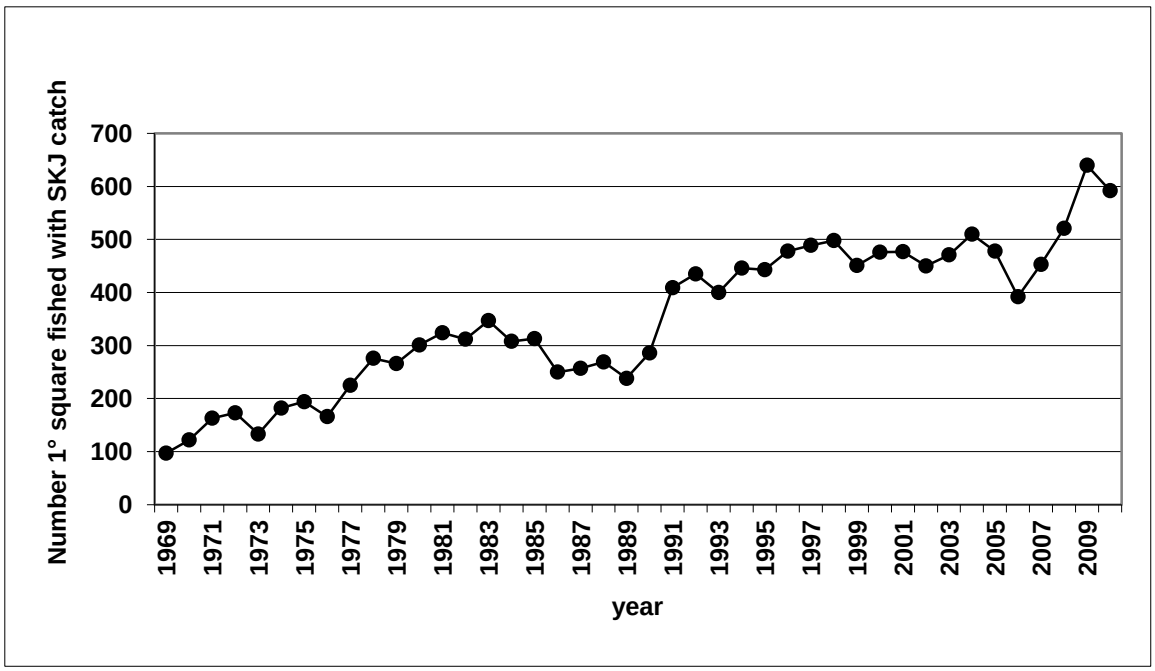
SKJ-Figure 5. Cumulative estimated landings of "*faux poissons*" (1981-2010) for the European or associated purse seiners for the three main species of tropical tunas in the local market of Abidjan (Côte d'Ivoire).



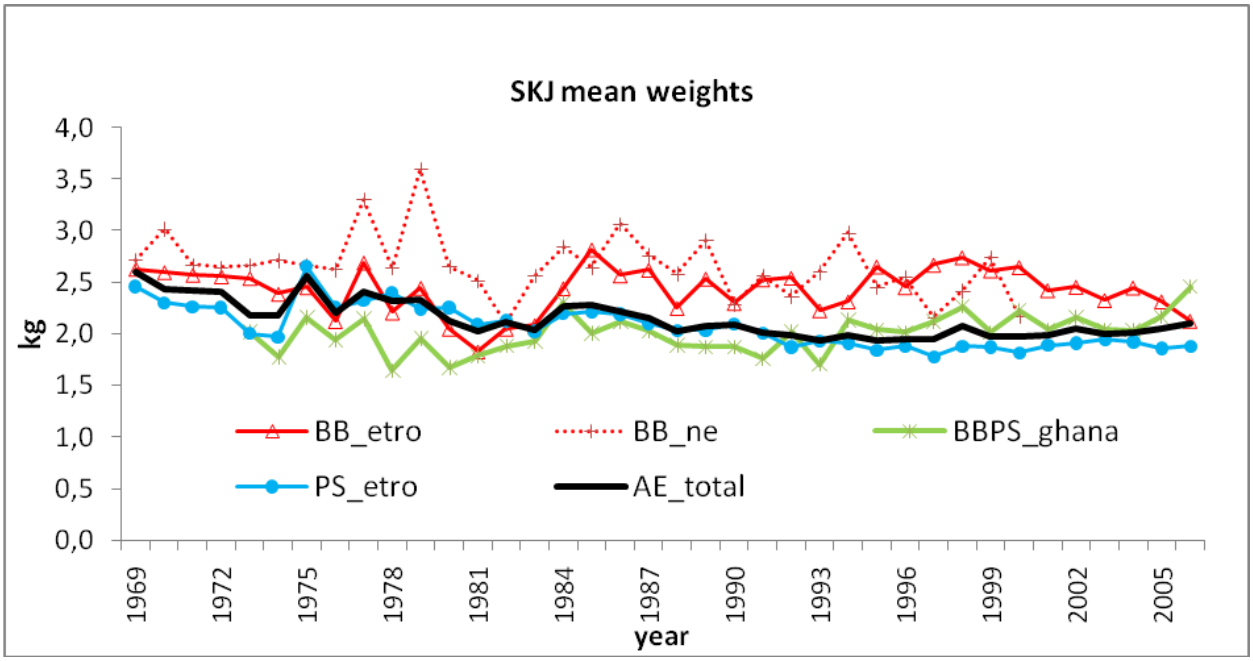
SKJ-Figure 6. Skipjack catches in the western Atlantic, by gear (1950-2010). The estimate for 2010 for baitboat is still preliminary.



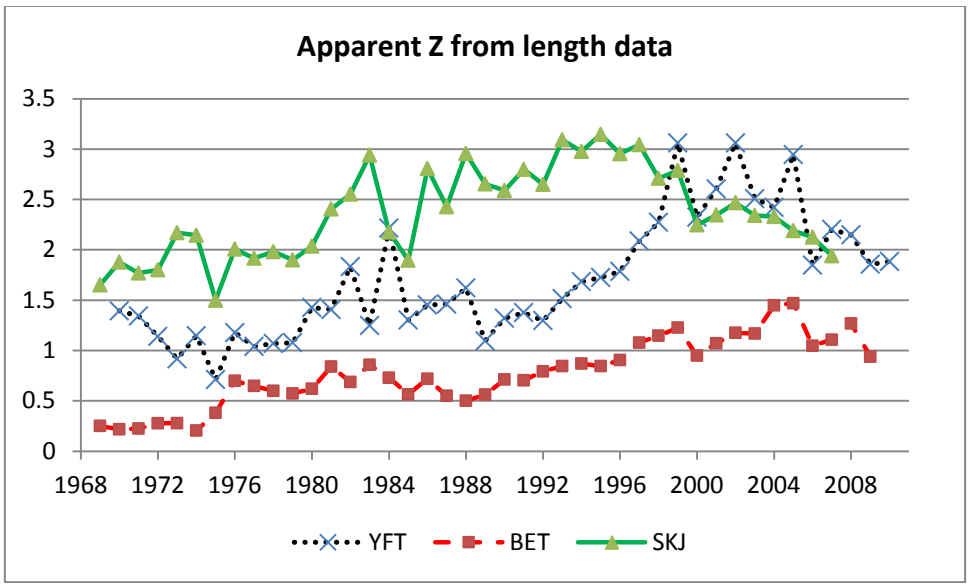
SKJ-Figure 7. Changes over time in the carrying capacity, corrected by time at sea, (left axis) for the overall purse seiners and baitboats operating in the eastern Atlantic (1971-2010) and in number of boats for the European purse seiners (right axis). It is possible that the carrying capacity for some segments of the purse seine fleet was underestimated during recent years.



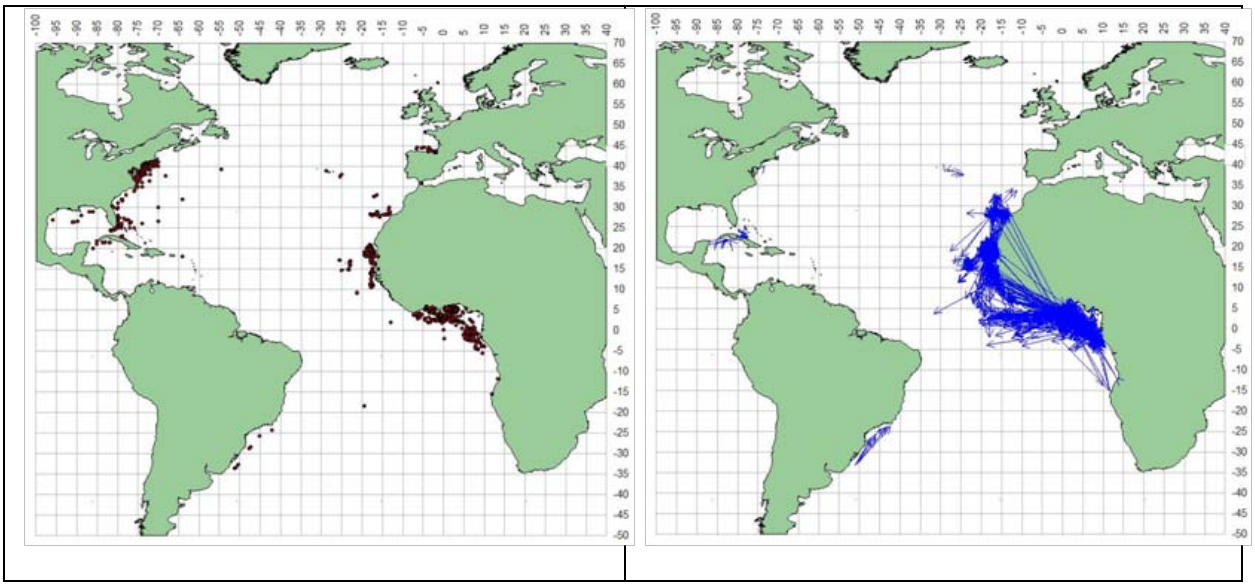
SKJ-Figure 8. Number of 1°x1° squares with catch of skipjack for the purse seiners operating in the eastern Atlantic (1969-2010). The increase observed in 1991 could be due to a modification of the species composition correction procedure of the catches implemented at this date (skipjack catches could have been attributed to squares which were not included until then). On the other hand, the recent increase in the area searched successfully corresponds to the extension of the fishery towards the western central Atlantic and off Angola.



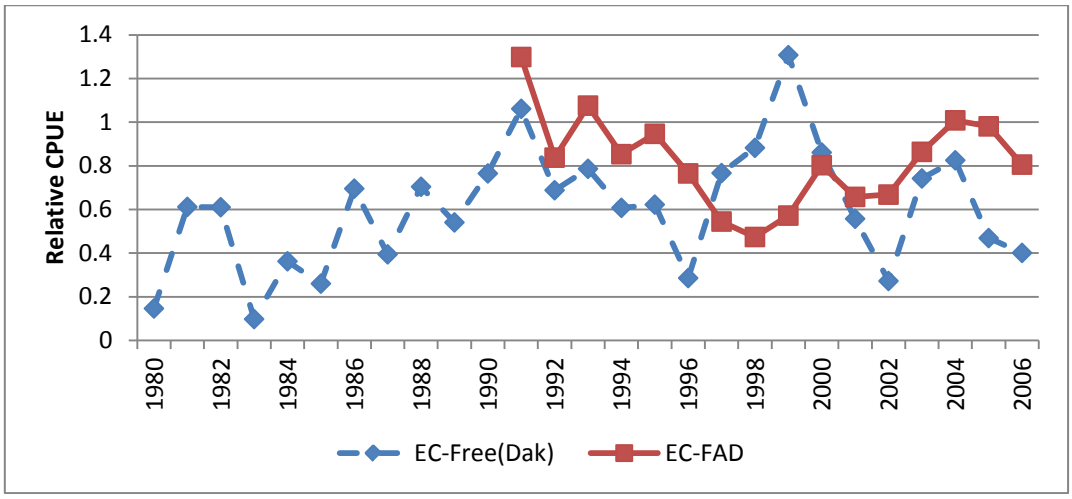
SKJ-Figure 9. Changes in time of the mean weight of the skipjack landed (non standardized) by major fisheries in the eastern Atlantic.



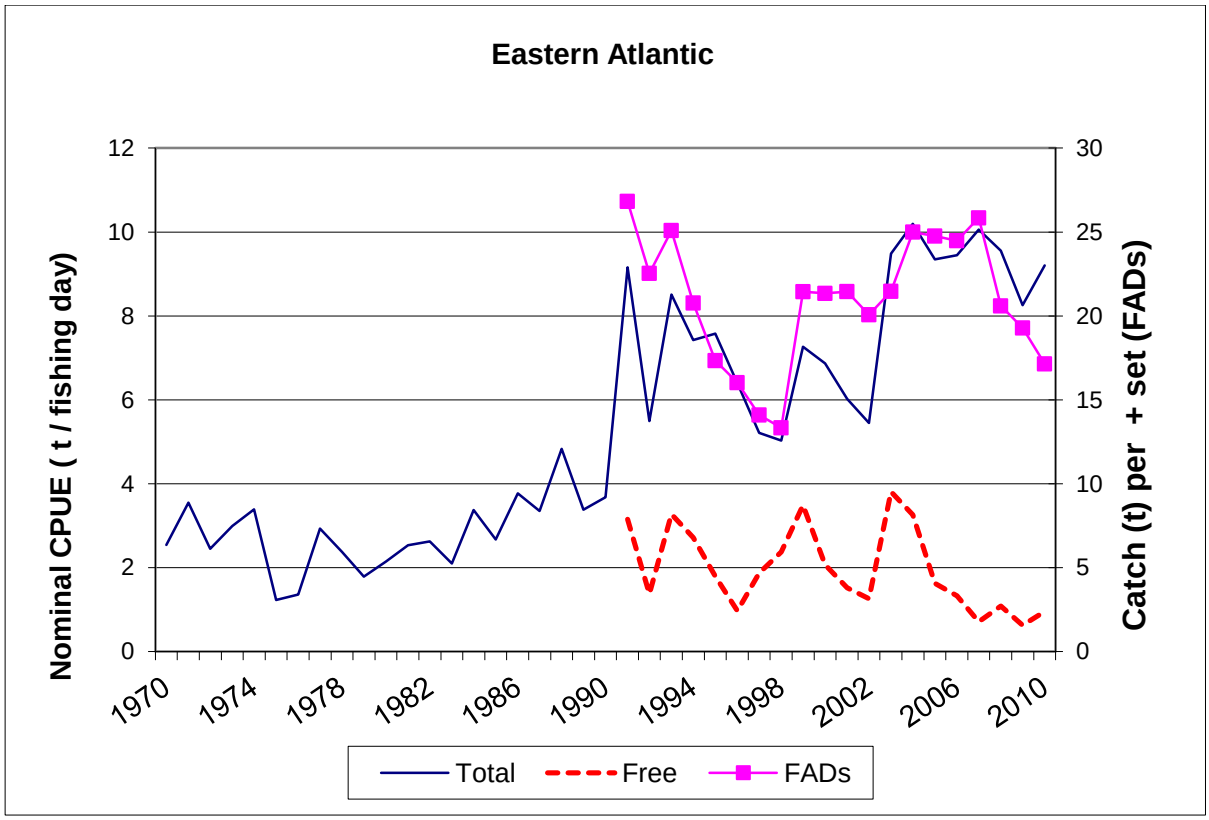
SKJ-Figure 10. Changes over time in the apparent total mortality *Z*, calculated based on Beverton and Holt's equation, for the three main tropical tuna species in the Atlantic Ocean. YFT = yellowfin, BET = bigeye, SKJ = Eastern skipjack. The size at which the fish are fully recruited was fixed at 50 cm (FL).



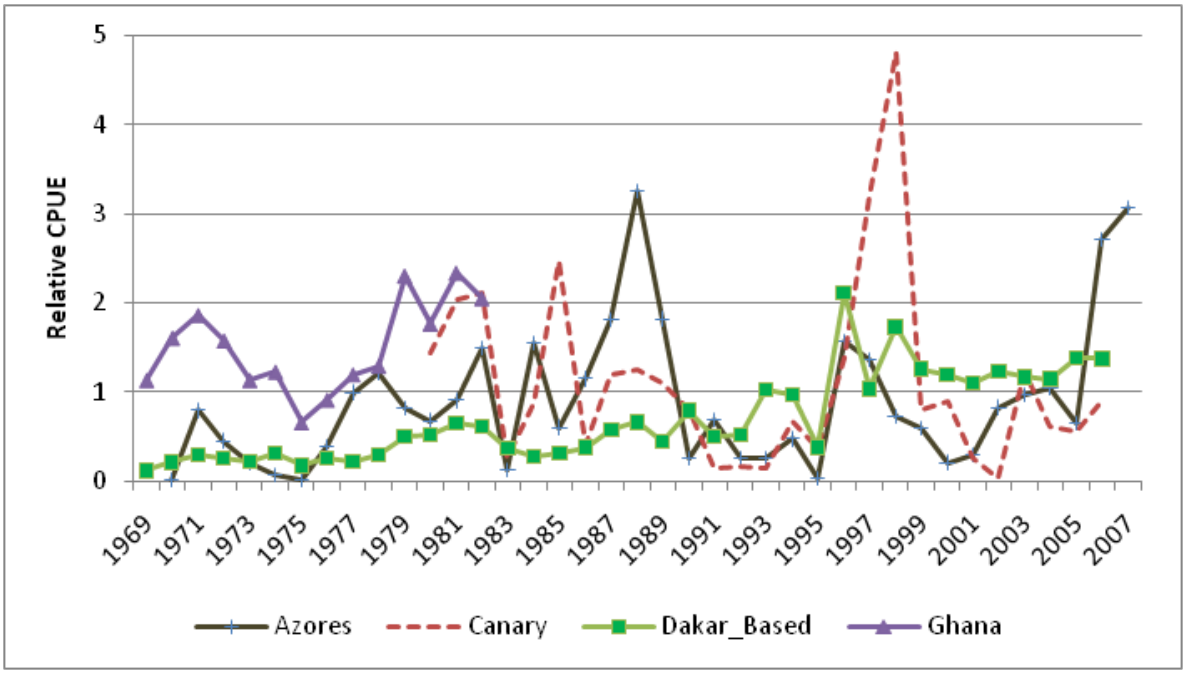
SKJ-Figure 11. Distribution of tagged and released SKJ (left panel) and apparent movements from geographic positions of recaptured fish (right panel).



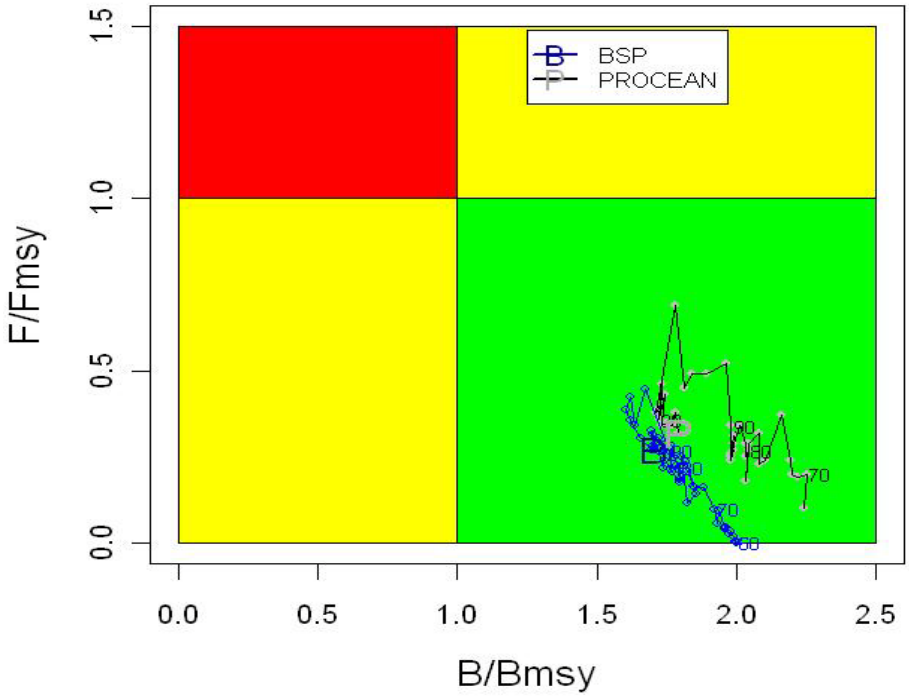
SKJ-Figure 12. Standardized skipjack CPUE for EU purse seiners in the eastern Atlantic Ocean. Free = free school off Senegal; FAD = schools associated with fish aggregating devices in the equatorial areas.



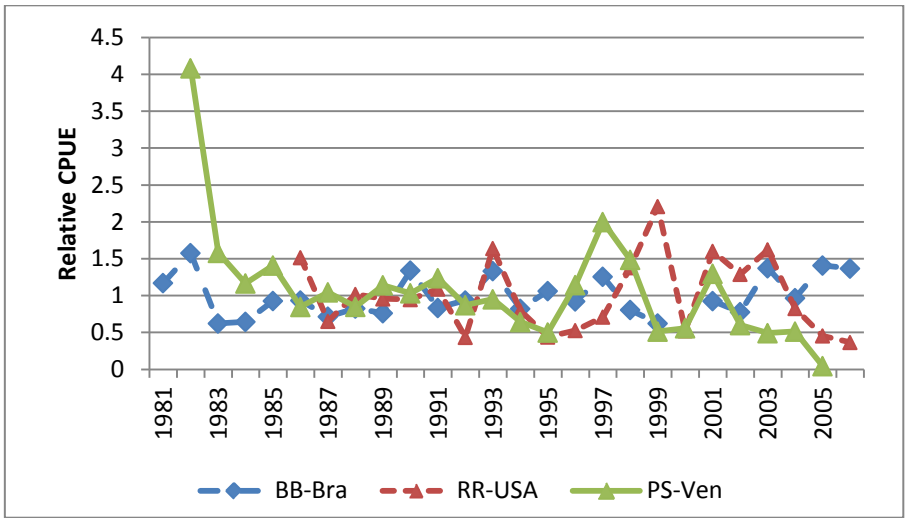
SKJ-Figure 13. Changes in nominal CPUE for the European purse seiners in the eastern Atlantic (1970-2010). Free = free schools (t / f. day) off Senegal; FADs = schools associated with fish aggregating devices (t / successful set) in the equatorial area.



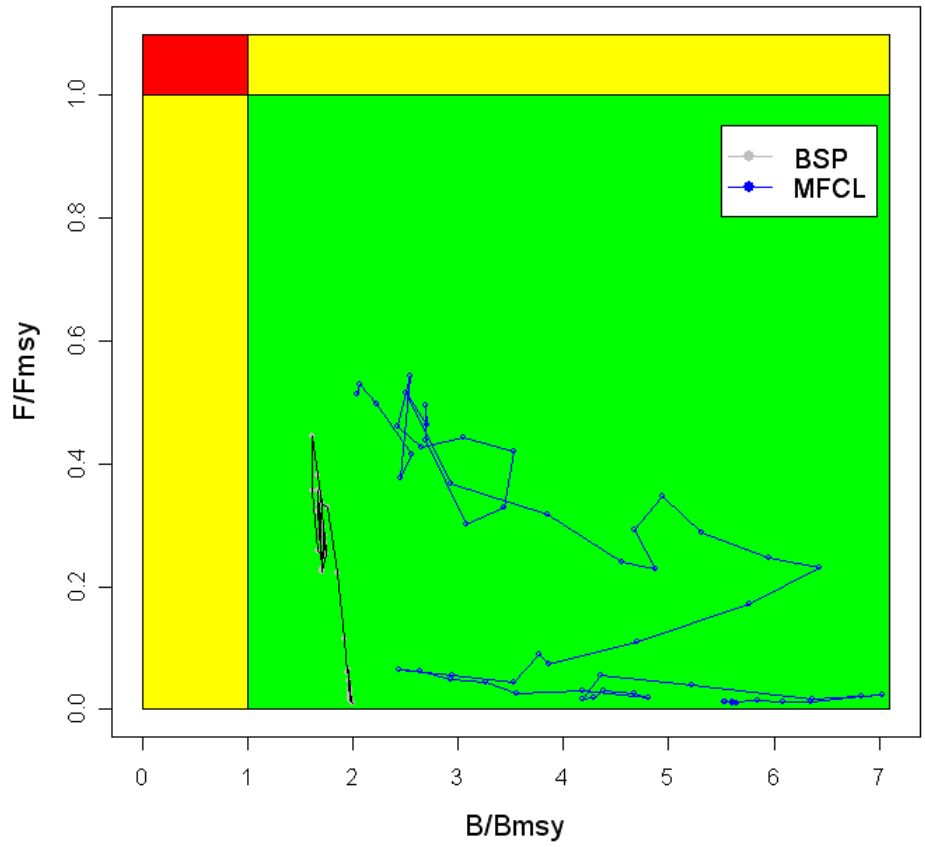
SKJ-Figure 14. Standardized CPUE for the main baitboat fleets operating in the eastern Atlantic Ocean: Azores, Canary islands (non standardized), Dakar and Ghana-based baitboats.



SKJ-Figure 15. Eastern skipjack stock status: trajectories of B/B_{MSY} and F/F_{MSY} from the Bayesian surplus production model (Schaefer type), and from the generalized multi-fleets dynamic model.



SKJ-Figure 16. Standardized CPUEs of Brazilian baitboats, U.S. rod and reel recreational fleets and non-standardized CPUE of the Venezuelan purse seiners in the western Atlantic Ocean.



SKJ-Figure 17. Western skipjack stock status: trajectories of B/B_{MSY} and F/F_{MSY} from the Bayesian surplus production model (Schaefer type) and from Multifan-CL.

8.4 ALB – ALBACORE

The status of the North Atlantic albacore stock is based on the most recent analyses conducted in July 2009 by means of applying statistical modelling to the available data up to 2007. Complete information on the assessment can be found in the Report of the 2009 ICCAT Albacore Stock Assessment Session (Anon. 2010b).

The status of the South Atlantic and Mediterranean albacore stocks is based on the 2011 assessment using available data up to 2009 and 2010, respectively. Complete information is found in the Report of the 2011 ICCAT South Atlantic and Mediterranean Albacore Stock Assessment Session (SCRS/2011/019).

ALB-1. Biology

Albacore is a temperate tuna widely distributed throughout the Atlantic Ocean and Mediterranean Sea. On the basis of the biological information available for assessment purposes, the existence of three stocks is assumed: northern and southern Atlantic stocks (separated at 5ºN) and Mediterranean stock (**ALB-Figure 1)**. However, some studies support the hypothesis that various sub populations of albacore exist in the North Atlantic and Mediterranean. Likewise, there is likely intermingling of Indian Ocean and South Atlantic immature albacore which needs further research.

Scientific studies on albacore stocks, in the North Atlantic, North Pacific and the Mediterranean, suggest that environmental variability may have a serious potential impact on albacore stocks, affecting fisheries by changing the fishing grounds, as well as productivity levels and potential MSY of the stocks. Those unexplored aspects might explain recently observed changes in fisheries, such as the lack of availability of the resource in the Bay of Biscay in recent years, or the apparent decline in the estimated recruitment which are demanding focussed research.

The expected life-span for albacore is around 15 years. While albacore is a temperate species, spawning occurs in tropical waters. Present available knowledge on habitat, distribution, spawning areas and maturity of Atlantic albacore is based on limited studies, mostly from past decades. In the Mediterranean, there is a need to integrate different available studies so as to better characterize growth of Mediterranean albacore. Besides some additional recent studies on maturity, in general, there is poor knowledge about Mediterranean albacore biology and ecology.

More information on albacore biology and ecology is published in the *ICCAT Manual*.

ALB-2. Description of fisheries or fisheries indicators

North Atlantic

The northern stock is exploited by surface fisheries targeting mainly immature and sub-adult fish (50 cm to 90 cm FL) and longline fisheries targeting immature and adult albacore (60 cm to 130 cm FL). The main surface fisheries are carried out by EU fleets (Ireland, France, Portugal and Spain) in the Bay of Biscay, in the adjacent waters of the northeast Atlantic and in the vicinity of the Canary and Azores Islands in summer and autumn. The main longline fleet is the Chinese Taipei fleet which operates in the central and western North Atlantic year round. However, Chinese Taipei fishing effort decreased in late 1980s due to a shift towards targeting on tropical tuna, then continued at this lower level to the present. Over time, the relative contribution of different fleets to the total catch of North Atlantic albacore has changed, which resulted in differential effects on the age structure of the stock.

The historical time series of catch was extended back to 1930 for the troll fishery after revision of data for the assessment. Total reported landings for the North Atlantic generally began to decline after 1986, largely due to a reduction of fishing effort by the traditional surface (troll and baitboat) and longline fisheries (**ALB-Table 1**; **ALB-Figure 2a**). Some stabilization was observed in the 1990s, mainly due to increased effort and catch by new surface fisheries (driftnet and mid-water pair pelagic trawl), with a maximum catch in 2006 at 36,989 t and, since then, a decreasing trend of catch is observed in the North Atlantic.

The total catch in 2010 was 19,649 t, representing an increase of 25% compared to the 2009 yield, which was the lowest recorded in the time series since 1950.

The surface fisheries accounted for the bulk of the total catch with 15,621 t reported in 2010 (81%) **(ALB-Table 1)**. The reported catch for EU-France in 2010 was 1,298 t, similar to 2009. The reported catch for EU-Spain in 2010 was 12,989 t, mainly from the troll fleet and baitboat fleets. This represents a 34% increase from the 2009 catch to a level similar to that in 2008. In contrast, EU-Ireland 2010 reported catches had decreased by 60% compared to 2009, reaching similar levels to those in the early 2000s.

Standardized catch rates of the Spanish troll fleet were updated to 2009. Albacore age 1 showed an increasing trend peaking in 2005 and 2006, fluctuating since then and a decrease in 2009. Age 2 albacore showed an increasing trend over the last years with a recent peak in 2008 and a decreasing trend in 2009. In the case of age 3, there is a continued upward trend from 2007 to 2009. Catch rates of the Irish mid-water pelagic trawl fleet showed a steep decline in 2007 compared to the higher estimates for 2005 and 2006.

In total, the 2010 longline catches increased compared to the last three years. The Chinese Taipei preliminary catch in 2010 was 1,587 t, an increase as compared to that of 2009, which was a low catch year stemming mainly from a reduction in fishing effort. Japan takes albacore as by-catch with longline gear. The Japanese longline preliminary catch reached 515 t in 2010, which represented an increase from 2009 in spite of the reducing fishing effort during the last decades. The catch fluctuated from around 300 t to 1,300 t in the last decade. Recent catch rates from the Chinese Taipei longline fishery in 2008 showed the same level as in 2007.

The trend in mean weight for all surface fleets (baitboat, troll, mid-water, pair pelagic and other surface) from 1975 to 2007 showed a stable trend with an average of 7 kg (range:4-10). For longline fleets from 1975 to 2005 the mean weight was also relatively stable with an average of 18.8 kg (range: 13.4-25.7 kg) (**ALB-Figure 3a)**.

South Atlantic

The recent total annual South Atlantic albacore landings were largely attributed to four fisheries, namely the surface baitboat fleets of South Africa and Namibia, and the longline fleets of Brazil and Chinese Taipei (**ALB-Table 1**; **ALB-Figure 2b**). The surface fleets are entirely albacore directed and mainly catch juvenile and sub-adult fish (70 cm to 90 cm FL). These surface fisheries operate seasonally, from October to May, when albacore are available in coastal waters. Brazilian longliners target albacore during the first and fourth quarters of the year, when an important concentration of adult fish (> 90 cm) is observed off the northeast coast off Brazil, between 5ºS and 20ºS, being likely related to favorable environmental conditions for spawning, particularly of sea surface temperature. The longline Chinese Taipei fleet operates over a larger area and throughout the year, and consists of vessels that target albacore and vessels that take albacore as by-catch, in bigeye directed fishing operations. On average, the longline vessels catch larger albacore (60 cm to 120 cm FL) than the surface fleets.

Total reported albacore landings for 2010 were 18,900 t, a decrease of about 19% from 2009 catch. The Chinese Taipei preliminary catch in 2010 was 10,975 t, an increase of 2,297 t as compared to that of 2009. However, the Chinese Taipei catch in the last years has decreased mainly due to a decrease in fishing effort targeting albacore. Chinese Taipei longliners (including boats flagged in Belize and St. Vincent and the Grenadines) stopped fishing for Brazil in 2003, which resulted in albacore only being caught as by-catch in tropical tuna-directed longline fisheries. Albacore is only caught as by-catch in Brazilian tropical tuna-directed longline and baitboat fisheries. In 2010, the catch of the Brazilian fishery was 271 t, showing an increase of about 35% compared to 2009. The average catch of about 4,287 t during the period 2000-2003 was obtained by the Brazilian longline fleet when albacore was a target species. In 2009, Uruguay reported 685 t, which represent an extremely high increase from previous reported years. Reported catch in 2010 (24 t) was, however, on the order of magnitude of earlier years.

In 2010, the estimated South African catch was 4,147 t (mainly baitboat), which represented a decrease of about 18% from 2009. In addition, in 2010 the Namibian total reported catch was 1,320 t (mainly baitboat), a decrease of 74% from 2009. Japan takes albacore as by-catch using longline gear. In 2010, the Japanese longline preliminary catch was 1,007 t, an increase of 9% from 2009. The relatively large increase from 238 t in 2007 was due to an increase in fishing effort in the waters off southern Africa (20-40˚S).

The trend in mean weight from the 1975 to 2009 period is shown in **ALB-Figure 3b.** Surface fleets showed a stable trend from 1981 onwards with an average of 12.7 kg and a maximum and minimum weight of 16.5 kg and 10 kg, respectively. While the trend in mean weight for longline fisheries showed an increase after 1996.

Mediterranean

The catch series was revisited and compared to additional sources of information. This allowed identifying some catches that were not included in the ICCAT database, which requires further revisions. In 2010, the reported

landings were 2,123 t, a 47% decrease from 4,021 t taken in 2009 (**ALB-Table 1** and **ALB-Figure 2c**). The majority of the catch came from longline fisheries. EU-Italy is the main producer of Mediterranean albacore and in 2010 the Italian catch was 1,109 t, a 60% reduction from its 2009 catch.

ALB-3. State of stocks

North Atlantic

A thorough revision of North Atlantic Task I and Task II data was conducted and a more robust method for catch-at-size analyses was implemented for the 2009 assessment session similar to that used in the 2007 assessment. In addition, catch rate analyses were improved and updated with new information for the northern albacore fisheries and substantial effort was undertaken to implement assessment methods which do not assume that catch-at-age is perfectly known. The analyses were also conducted to incorporate longer time-series of catch, effort and size information into the assessment to guide the evaluation. The approach provided the opportunity to evaluate a range of hypothesis about how the fisheries operated over time and their impact on the population. The results of these efforts are reflected in the following summaries of stock status that analyzed data through 2007.

The CPUE trends for the various surface fleets, based upon the most recent available 2007 data showed somewhat different patterns from each other. This was also the case for the different longline fleets (**ALB-Figure 4**). The Spanish age two troll CPUE series showed evidence of a relatively strong 2003 year class entering the fishery. For the Spanish age three troll CPUE series, the age signal is not as strong, leading to uncertainty about the possibility of a good year class. For the longline fleets, the general trend in CPUE indices is a decline over time, with varying rates. Given the variability associated with these catch rate estimates, definitive conclusions about recent trends could not be reached just by examining the CPUE trends alone which represent different parts of the population.

The data sets used for the analyses from 1930 to 2007 were compiled during the July 2009 stock assessment meeting. The data was classified into 10 fishery units using the same definitions as those used in the 2007 stock assessment. The basic input data, catch, effort and catch-at-size were revised due to updates in the ICCAT Task I (**Table 1**) and Task II database. Model specification for the base case was identical to the 2007 assessment. However, the model was run using the latest version of the software. Different hypothesis on the dynamics of the northern albacore stock were tested and those with clearly unrealistic outputs were discarded.

Based on the present assessment which considers catch and effort since the 1930s and size frequency since 1959, the view of the northern albacore resource status is that spawning stock size has declined and in 2007 was about one third of the peak levels estimated for the late-1940s. Estimates of recruitment to the fishery, although variable, have shown generally higher levels in the 1960s and earlier periods with a declining trend thereafter until 2007. The most recent recruitment is estimated to be the lowest for all the years of the evaluation although the magnitude of this year-class is highly uncertain in the latest year (**ALB-Figure 5**). The 2009 current assessment indicated that the stock has remained below B_{MSY} (current SSB_{2007} is approximately 62% of SSB at MSY) (**ALB-Figure 5**) since the late 1960. Corresponding fishing mortality rates have been above F_{MSY} (current F_{2007}/F_{MSY} ratio is 1.05 which is only slightly higher than $F_{MSY,}$ **ALB-Figure 6**).

The trajectory of fishing mortality and spawning stock biomass relative to MSY reference points, from the assessment model is shown in **ALB-Figure 6**. As the majority of the time series is in the top left quadrant (F/F_{MSY} >1 and, SSB/SSB_{MSY} <1) this could indicate the northern albacore stock has been overfished (SSB/SSB_{MSY} <1) since the mid-1980s. Uncertainty around the estimates of current F_{2007}/F_{MSY} and SSB_{2007}/SSB_{MSY} is shown in **ALB-Figure 7**.

South Atlantic

In 2011, a stock assessment of South Atlantic albacore was conducted including catch, effort and size data up until 2009, and considering a broader range of methods than in the previous assessment.

The southern standardized CPUE trends are mainly for longline fisheries, which harvest mostly mature albacore. The longest time series (those of Japan and Chinese Taipei), showed a strong declining trend in the early part of the time series, and less steep decline over the past decade. However, the Brazilian and Uruguayan longline CPUE series showed significant decreases in the late 1990s. The CPUE from the recent South African baitboat fishery, harvesting mostly juvenile albacore, shows no apparent trend (**ALB-Figure 8**).

In the 2011 assessment, eight scenarios were considered. Stock status results varied significantly among them (**ALB-Figure 9**). In general, two different production model forms were considered. One showed more optimistic results than the other. However, the Committee lacked enough objective information to identify the most plausible scenarios. Considering the whole range of scenarios, the median MSY value was 27,964 t (ranging between 23,296 t and 98,371 t), the median estimate of current B/B_{MSY} was 0.88 (ranging between 0.55 and 1.59) and the median estimate of current F/F_{MSY} was 1.07 (ranging between 0.44 and 1.95). The wide confidence intervals reflect the large uncertainty around the estimates of stock status. Considering all scenarios, there is 54% probability for the stock to be both overfished and experiencing overfishing, 10% probability for the stock to be either overfished or experiencing overfishing, and 36% probability that biomass is above and fishing mortality is below the Convention objectives.

Mediterranean

In 2011, the first stock assessment for Mediterranean albacore was conducted, using data up until 2010. The methods used were adapted to the "data poor" category of this stock. The more data-demanding methods applied, such as a production model, gave unrealistic results.

Some CPUE series for Mediterranean fisheries became available (**ALB-Figure 10**). However, these series were discontinuous and highly variable, with no clear trend over the last couple of decades. Since they are mostly very short, and there is little overlap between time series, they may or may not accurately characterize biomass dynamics in Mediterranean albacore.

The results of the 2011 assessment, based on the limited information available and in simple analyses, point to a relatively stable pattern for albacore biomass in the recent past. Recent fishing mortality levels appear to have been reduced from those of the early 2000s, which were likely in excess of F_{MSY}, and might now be at about or lower that level (**ALB-Figure 11**).

ALB-4. Outlook

North Atlantic

Using the reference points calculated by the current base case assessment model done in 2009, projections indicate that constant catches above 28,000 t will not result in stock rebuilding to Convention standards by 2020 (**ALB-Figure 12**). Since 2008 catches have been lower than 28,000 t.

South Atlantic

The projection results differ between the base case scenarios. Since there is not objective information with which to select which scenario is more plausible, the group considered the entire range of scenarios, thus characterizing the range of possible responses, for part of the stock, to the distinct catch levels projected, depending on the scenario. Projections showed that harvesting at the current TAC level (29,900 t) would further decline the stock. However, if catches continue at the level of those experienced in the last few years, there is more than 50% probability to recover the stock in 5 years, and more than a 60% probability to do so in 10 years (**ALB-Figure 13**).

Mediterranean

Due to the fact that the management advice for the Mediterranean stock was based on catch curve analysis and due to the limited quantitative information available to the SCRS, projections for this stock were not conducted. As a result, future stock status in response to management actions could not be simulated. The outlook for this stock is thus unknown.

ALB-5. Effects of current regulations

North Atlantic

In 2009, the Commission established a new TAC for 2010 and 2011 of 28,000 t [Rec. 09-05], but included several provisions that allow the catch to exceed this level.

Furthermore, a 1998 recommendation that limits fishing capacity to the average of 1993-1995, remains in force. The Committee noted that, since 2008, the reported catches were below the recommended TACs **(ALB-Table 1)**.

South Atlantic

In 2007 the Commission established a new TAC from 2008 to 2011 of 29,900 t [Rec. 07-03]. The Committee noted that reported catches in 2009 and 2010 were well below the TAC **(ALB-Table 1)**.

Mediterranean

There are no ICCAT regulations directly aimed at managing the Mediterranean albacore stock.

ALB-6. Management recommendations

North Atlantic

In 2007, the Commission implemented [Rec. 07-02], intended to reduce the TAC to 30,200 t in 2008 and 2009 and allow the rebuilding of the northern albacore stock from the overfished condition. However, it was reiterated that the fishing opportunities provided in [Rec. 07-02] allow the potential catch to exceed the TAC (**ALB-Figure 2a**). In view of the 2009 assessment, in order to achieve the Commission management objective by 2020, a level of catch of no more than 28,000 t will be required. The Commission recommended the establishment of a Total Allowable Catch (TAC) of 28,000 t for 2010 and 2011 [Rec. 09-05].

South Atlantic

There is considerable uncertainty about the current stock status, as well as on the effect of alternative catch limits on the rebuilding probabilities of the southern stock. Results indicate that, most probably, the South Atlantic albacore stock is both overfished and experiencing overfishing. Projections showed that harvesting at the current TAC level (29,900 t) would further decline the stock. However, if catches continue at the level of those experienced in the last few years (around 20,000 t), there is more than 50% probability to recover the stock in 5 years, and more than a 60% probability to do so in 10 years. Further reductions in catches would increase the probability of recovery in those timeframes. And likewise, increases would reduce rebuilding probabilities and extend the timeframes. Catches over 24,000 t will not permit the rebuilding of the stock with at least 50% probability over the projection timeframe (**ALB-Table 2**).

Mediterranean

The available information on Mediterranean albacore stock status indicates a relatively stable pattern for albacore biomass over the recent past. Unfortunately, very little quantitative information is available to SCRS for use in conducting a robust quantitative characterization on biomass status relative to Convention objectives. While additional data to address this issue might exist at CPC levels, our ability to provide quantitative management advice will be seriously impeded until such data become available either through recovery of historical data or institution of adequate fishery monitoring data collection programs. Recent fishing mortality levels appear to have been reduced from those of the early 2000s, which were likely in excess of F_{MSY}, and might now be at about or lower than that level. However, there is considerable uncertainty about this and for this reason, the Commission should institute management measures designed to limit increases in catch and effort directed at Mediterranean albacore.

ATLANTIC AND MEDITERRANEAN ALBACORE SUMMARY

	North Atlantic	**South Atlantic**	**Mediterranean**
Current (2010) Yield	19,649 t	18,900 t	2,123 t
Maximum Sustainable Yield	29,000 t	27,964 (23,296-98,371) t[1]	Unknown
Replacement Yield (2009)	Not estimated	Not estimated	Not estimated
SSB_{2007}/SSB_{MSY} [2]	0.62 (0.45-0.79)[2]		Not estimated
SSB_{2009}/SSB_{MSY} [1]		0.88 (0.55-1.59)[1]	
Relative Fishing Mortality			
F_{2007}/F_{MSY} [2]	1.045 (0.85-1.23) [2]		<=1 [3]
F_{2009}/F_{MSY} [1]		1.07 (0.44-1.95)[1]	
Management measures in effect	[Rec. 98-08]: Limit	[Rec. 07-03]: Limit	None
	No. of vessels to 1993-1995 average TAC: 28,000 t [Rec. 09-05] for 2010 and 2011.	Catches to 29,900 t until 2011	

[1] Reference points estimates based on 2011 assessment. Median range and 80% CI calculated for the whole range of the 8 base cases.
[2] Reference points estimates based on 2009 assessment. 95% CI around the reference points were based on estimated 2007 standard errors in the North stock.
[3] Estimated with length converted catch curve analysis, taking M as a proxy for F_{MSY}.

ALB-Table 1. Estimated catches (t) of albacore (*Thunnus alalunga*) by area, gear and flag.

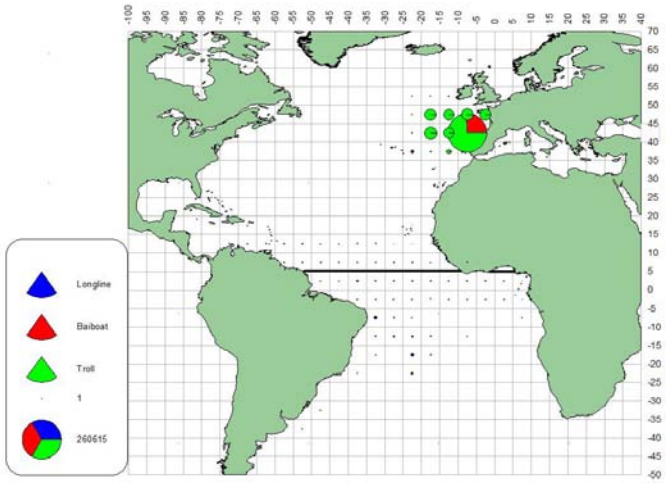
			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
TOTAL			88568	82778	67295	63342	67492	56344	69627	73086	71812	67517	60379	59585	59039	67058	71165	69916	60094	61539	53378	57728	67389	48827	42310	42235	40673
	ATN		47568	38153	33059	32071	36882	27949	30863	38135	35163	38377	28803	29023	25746	34551	34200	26254	22741	25644	25960	35318	36989	21991	20483	15386	19649
	ATS		37288	40630	30173	27212	28714	26016	36562	32813	35300	27552	28426	28022	30595	27656	31387	38796	31746	28002	22543	18881	24453	20269	18857	22828	18900
	MED		3712	3996	4063	4060	1896	2379	2202	2138	1349	1587	3150	2541	2698	4851	5577	4866	5608	7893	4874	3529	5947	6566	2970	4021	2123
	ATN	Bait boat	15217	18794	15933	15374	18625	8985	12448	15646	11967	16411	11338	9821	7562	8780	12148	6104	6638	7918	8128	10458	14273	8497	7932	4994	6026
		Longline	21232	7296	3013	2239	2683	5315	3152	7093	7309	4859	4641	4051	4035	6710	7321	7372	6180	7699	6917	6911	5223	3237	2647	2625	4028
		Other surf.	213	343	994	1652	3865	3999	5173	7279	7506	3555	3337	4378	6846	6817	5971	2828	422	551	697	624	625	525	274	427	325
		Purse seine	60	1	97	12	1	222	139	229	292	278	263	26	91	56	191	264	118	211	348	99	188	198	70	89	99
		Trawl	0	262	1693	2240	1033	469	2603	1779	2131	3049	2571	2877	1318	5343	3547	5374	5376	3846	2369	7001	6385	3429	4321	2811	2026
		Troll	10847	11457	11329	10554	10675	8959	7348	6109	5959	10226	6652	7870	5894	6845	5023	4312	4007	5419	7501	10224	10296	6105	5239	4440	7146
	ATS	Bait boat	6829	8181	7696	7393	5981	3454	6490	7379	8947	7091	6960	8110	10353	6709	6873	10355	9712	6973	7475	5084	5876	3374	4346	9777	5271
		Longline	29815	30964	21894	19407	21590	22008	27162	23947	24806	20040	21000	19547	19799	20640	24398	28039	21671	20626	14735	12977	17740	15087	13218	12695	13392
		Other surf.	400	537	398	411	1139	137	393	39	483	10	209	127	0	73	58	377	323	82	299	288	395	1762	1219	211	122
		Purse seine	244	948	185	0	4	416	2517	1448	1064	412	257	117	434	183	58	25	39	309	16	533	441	45	75	145	114
		Trawl	0	0	0	0	0	0	0	0	0	0	0	120	9	52	0	0	0	12	18	0	0	0	0	0	
	MED	Bait boat	0	0	0	0	83	499	171	231	81	163	205	0	33	96	88	77	29	0	0	0	0	0	0	0	
		Longline	324	164	168	165	624	524	442	410	350	87	391	348	194	417	2800	2597	3706	4248	2345	2012	3010	4119	2695	1580	1717
		Other surf.	3068	3782	3879	3879	1098	1198	1533	879	766	1031	2435	1991	2426	4265	2689	2193	1755	3166	2176	1200	134	1401	250	2414	406
		Purse seine	10	50	16	16	91	110	6	559	23	0	0	0	0	0	0	0	1	478	353	317	2803	1046	24	25	
		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	
		Troll	310	0	0	0	0	48	50	59	129	306	119	202	45	73	0	0	117	0	0	0	0	0	0	1	0
	ATN	Barbados	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	2	5	8	10	13	9	7	7	4	6
		Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	26	39	416
		Brasil	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**
		Canada	1	21	47	22	6	5	1	9	32	12	24	31	23	38	122	51	113	56	27	52	27	25	33	11	14
		Cape Verde	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**
		China P.R.	0	0	0	0	0	0	0	0	14	8	20	0	0	21	16	57	196	155	32	112	202	59	24	27	142
		Chinese Taipei	19646	6636	2117	1294	3005	4318	2209	6300	6409	3977	3905	3330	3098	5785	5299	4399	4330	4557	4278	2540	2357	1297	1107	863	1587
		Cuba	31	15	4	1	2	0	0	0	0	0	0	0	0	0	0	0	1	322	435	424	527	0	0	0	
		Côte D'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	53
		Dominican Republic	0	0	0	0	0	0	0	0	0	0	0	323	121	73	95	0	0	0	0	0	0	0	0	0	
		EU.España	24387	28206	26738	25424	25792	17233	18175	18380	16998	20197	16324	17295	13285	15363	16000	9177	8952	12530	15379	20447	24538	14582	12725	9617	12989
		EU.France	1200	1921	2805	4050	3625	4123	6924	6293	5934	5304	4694	4618	3711	6888	5718	6006	4345	3456	2448	7266	6585	3179	3009	1122	1298
		EU.Ireland	0	0	0	0	40	60	451	1946	2534	918	874	1913	3750	4858	3464	2093	1100	755	175	306	521	596	1517	1997	788
		EU.Portugal	498	433	184	169	3185	709	1638	3385	974	6470	1634	395	91	324	278	1175	1953	553	513	556	119	184	614	108	202
		EU.United Kingdom	0	0	0	0	0	0	59	499	613	196	49	33	117	343	15	0	0	0	0	6	19	30	50	67	118
		FR.St Pierre et Miquelon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	7	2	0	3	0	0	0
		Grenada	0	0	0	0	0	0	0	0	0	2	1	6	7	6	12	21	23	46	25	29	19	20	15	18	18
		Iceland	0	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	470	494	723	764	737	691	466	485	505	386	466	414	446	425	688	1126	711	680	893	1336	781	288	402	288	515
		Korea Rep.	373	18	16	53	34	1	0	8	0	2	2	1	0	0	0	0	0	0	0	59	45	12	59	82	201
		Maroc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	55	81	120	178	98	96	99	130	**0**
		Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		NEI (Flag related)	0	0	0	0	0	11	19	13	10	8	11	3	8	12	0	0	0	0	0	0	0	0	0	0	
		Panama	525	44	0	0	0	0	29	60	117	73	11	5	0	0	0	0	0	0	0	0	96	298	113	51	154
		Philippines	0	0	0	0	0	0	0	0	0	0	0	0	151	4	0	0	0	0	0	9	0	8	19	54	22
		Sierra Leone	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	91	0	0	0	0	0	0	0	0	
		St. Vincent and Grenadines	0	0	0	0	0	0	0	2	0	0	0	0	0	1	704	1370	300	1555	89	802	76	263	130	135	177
		Sta. Lucia	0	0	0	0	0	0	1	1	0	1	1	0	0	0	1	3	2	10	0	2	2	2	2	0	130
		Trinidad and Tobago	0	0	0	0	4	0	247	0	0	0	0	2	1	1	2	11	9	12	12	9	12	18	32	17	17
		U.S.A.	251	301	288	243	357	479	438	509	741	545	472	577	829	315	406	322	480	444	646	488	400	532	257	189	329
		U.S.S.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		UK.Bermuda	0	0	0	0	0	0	0	0	0	0	0	1	0	2	2	2	0	0	1	1	0	0	0	0	0
		Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	414	507	235	95	20	140	185
		Venezuela	187	64	137	41	95	319	205	246	282	279	315	75	107	91	1375	349	162	424	457	175	321	375	222	398	288
	ATS	Argentina	356	469	344	354	151	60	306	0	2	0	0	120	9	52	0	0	0	12	18	0	0	0	0	0	
		Belize	0	0	0	0	0	0	0	0	0	2	0	0	0	8	2	0	0	0	0	0	54	32	31	213	303
		Brasil	520	395	421	435	514	1113	2710	3613	1227	923	819	652	3418	1872	4411	6862	3228	2647	522	556	361	535	487	202	271

		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
	Cambodia	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	
	China P.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	39	89	26	30	26	112	95	100	35	25	89	97
	Chinese Taipei	27592	28790	20746	18386	21369	19883	23063	19400	22573	18351	18956	18165	16106	17377	17221	15833	17321	17351	13288	10730	12293	13146	9966	8678	10975
	Cuba	24	10	2	1	2	17	5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Curaçao	0	0	0	0	0	0	0	0	0	0	0	9	192	0	2	0	0	0	0	0	0	0	0	21	4
	Côte D'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47	43
	EU.España	200	807	185	0	0	280	1943	783	831	457	184	256	193	1027	288	573	836	376	81	285	367	758	933	1061	266
	EU.France	35	100	0	0	0	50	449	564	129	82	190	38	40	13	23	11	18	63	16	478	347	12	50	60	109
	EU.Portugal	1029	899	1153	557	732	81	184	483	1185	655	494	256	124	232	486	41	433	415	9	43	8	13	49	254	84
	EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
	Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0	0	0	
	Honduras	0	0	0	0	0	0	29	0	0	2	0	7	1	6	0	0	0	0	0	0	0	0	0	0	
	Japan	739	357	405	450	587	654	583	467	651	389	435	424	418	601	554	341	231	322	509	312	316	238	1370	921	1007
	Korea Rep.	321	383	180	54	19	31	5	20	3	3	18	4	7	14	18	1	0	5	37	42	66	56	88	374	39
	Maroc	0	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	NEI (ETRO)	0	0	0	0	4	8	122	68	55	63	41	5	27	0	0	10	14	53	0	15	46	15	0	0	
	NEI (Flag related)	0	0	0	0	0	149	262	146	123	102	169	47	42	38	0	0	0	0	0	0	0	0	0	0	
	Namibia	0	0	0	0	0	0	0	0	1111	950	982	1199	1429	1162	2418	3419	2962	3152	3328	2344	5100	1196	1958	4936	1320
	Panama	280	924	0	0	0	240	482	318	458	228	380	53	60	14	0	0	0	0	0	17	0	87	5	0	1
	Philippines	0	0	0	0	0	0	0	0	0	0	0	0	5	4	0	0	0	0	0	52	0	13	79	45	73
	Seychelles	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 Africa	5930	7275	6636	6890	5280	3410	6360	6881	6931	5214	5634	6708	8412	5101	3610	7236	6507	3469	4502	3198	3735	3797	3468	5043	4147
	St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2116	4292	44	0	0	0	65	160	71	51	31
	U.S.A.	0	0	0	0	0	0	0	0	0	0	1	5	1	1	1	2	8	2	1	0	0	0	0	0	0
	U.S.S.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	UK.Sta Helena	0	2	1	1	1	5	28	38	5	82	47	18	1	1	58	12	2	0	0	0	62	46	94	81	3
	Uruguay	262	178	100	83	55	34	31	28	16	49	75	56	110	90	90	135	111	108	120	32	93	34	53	685	24
	Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	684	1400	96	131	64	104
MED	Croatia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	EU.Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	12	30	255	425	507	712	209	223	206
	EU.España	0	3	3	0	84	548	227	298	218	475	429	380	126	284	152	200	209	1	138	189	382	516	238	204	277
	EU.France	20	60	31	31	121	140	11	64	23	3	0	5	5	0	0	0	1	0	0	0	0	2	1	0	0
	EU.Greece	484	500	500	500	500	500	500	1	1	0	952	741	1152	2005	1786	1840	1352	950	773	623	402	448	191	116	125
	EU.Italy	3208	3433	3529	3529	1191	1191	1464	1275	1107	1109	1769	1414	1414	2561	3630	2826	4032	6912	3671	2248	4584	4017	2104	2724	1109
	EU.Malta	0	0	0	0	0	0	0	0	0	0	0	1	1	1	4	0	2	0	10	15	0	1	5	1	2
	EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	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**
	Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	120	**0**
	NEI (MED)	0	0	0	0	0	0	0	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Syria Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	14	0	
	Turkey	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27	30	73	852	208	631	402
	Yugoslavia Fed.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

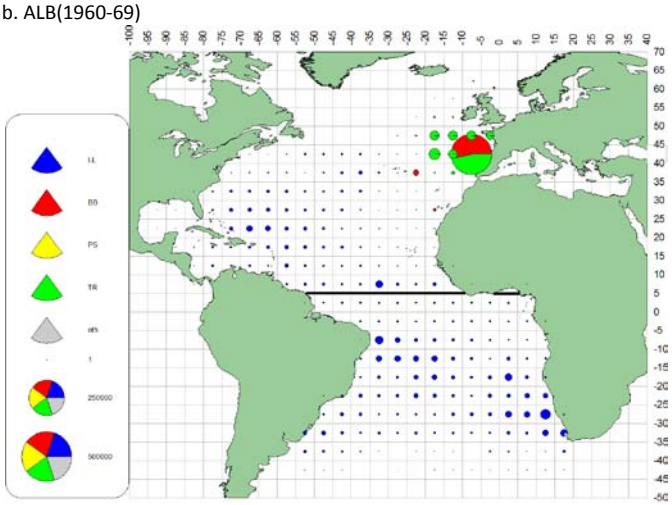
ALB-Table 2. South Atlantic albacore estimated probabilities (in%) that the South Atlantic albacore stock is above B_{MSY} and below F_{MSY} in a specific year for various TAC levels, based on the results of the 2011 assessment.

	TAC				
Year	*15000*	*20000*	*25000*	*30000*	*35000*
2010	37	37	37	37	37
2011	38	38	38	38	38
2012	42	41	38	27	17
2013	49	45	39	25	16
2014	55	48	40	24	15
2015	60	51	41	23	14
2016	64	54	41	22	14
2017	68	56	42	21	13
2018	70	58	42	20	13
2019	72	60	42	19	12
2020	74	62	43	19	12
2021	76	63	43	18	12
2022	77	64	43	18	12
2023	78	65	43	17	11

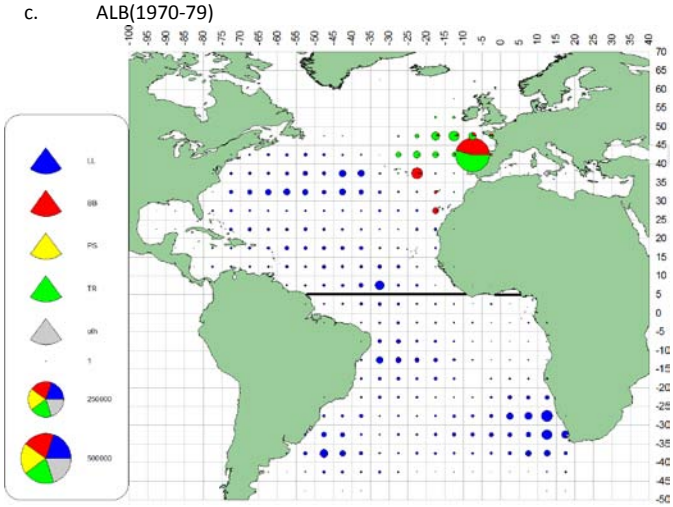
a. ALB(1950-59)



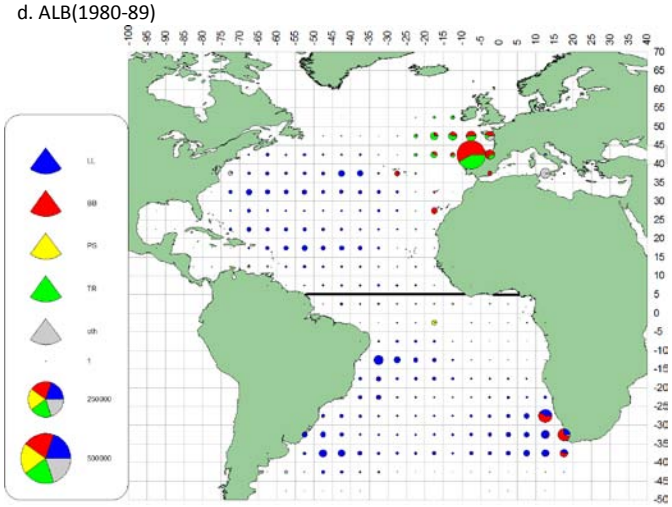
b. ALB(1960-69)



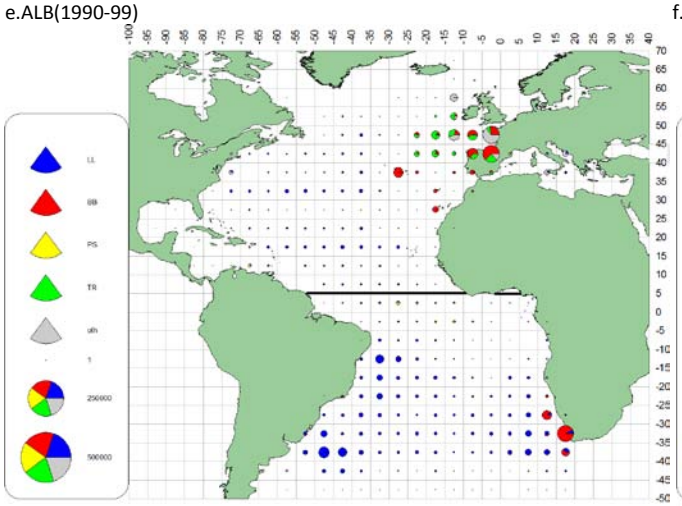
c. ALB(1970-79)



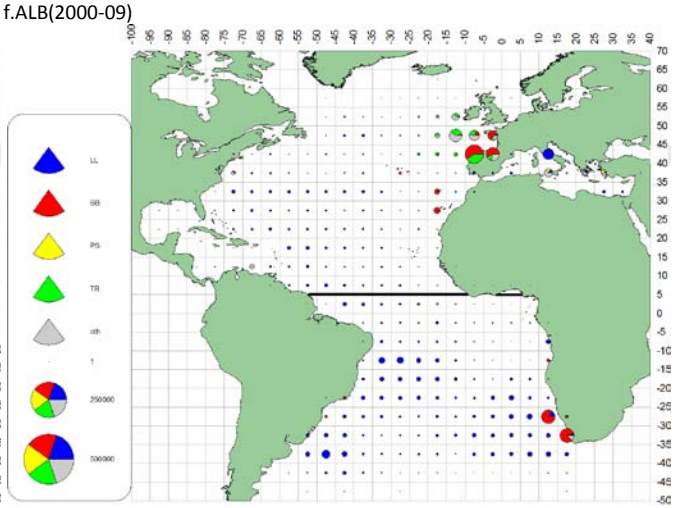
d. ALB(1980-89)



e.ALB(1990-99)

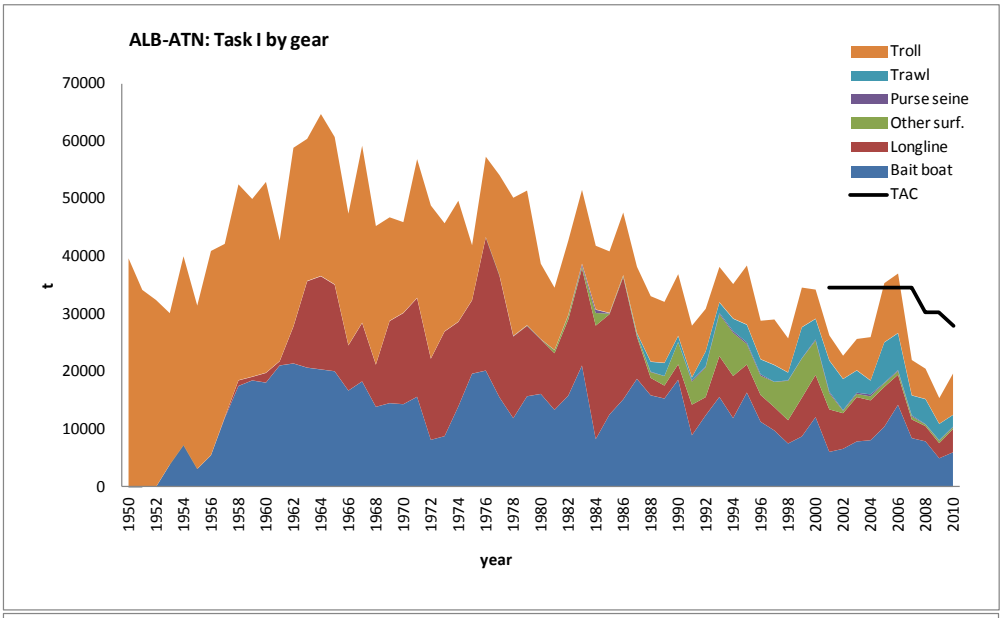


f.ALB(2000-09)

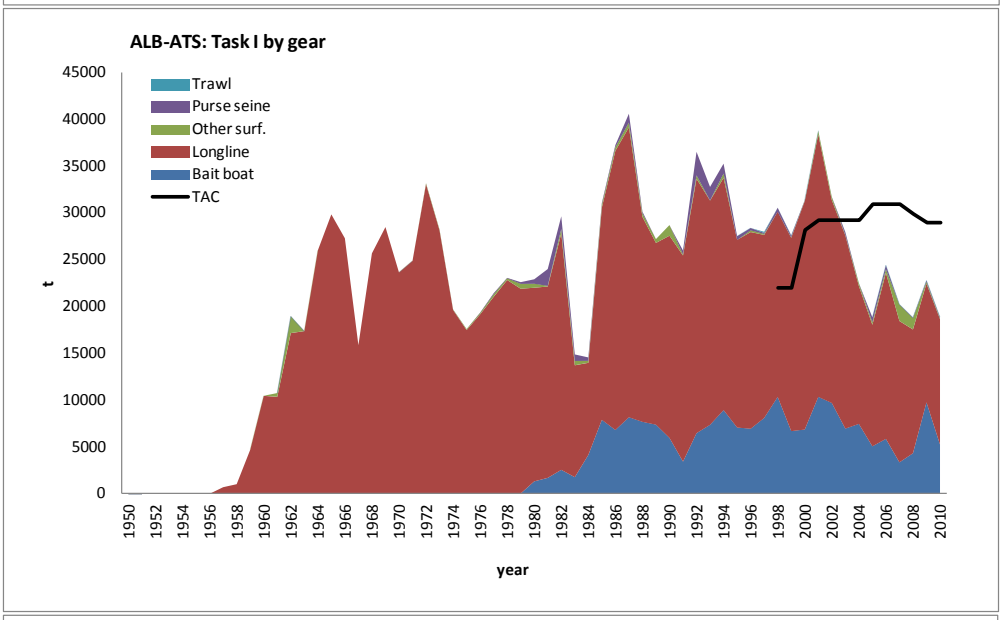


ALB-Figure 1. Geographic distribution of albacore accumulated catch by major gears and decade (1960-2009). Baitboat and troll catches are aggregated by 5ºx5º degrees in the Bay of Biscay thus the spatial representation of catch is concentrated on this area. (See Figures 2a,b and c for total catch values by gear). The symbols for the 1950s information (top left) are scaled to the maximum catch observed during the 1950s, whereas the remaining plots are scaled to the maximum catch observed from 1960 to 2009.

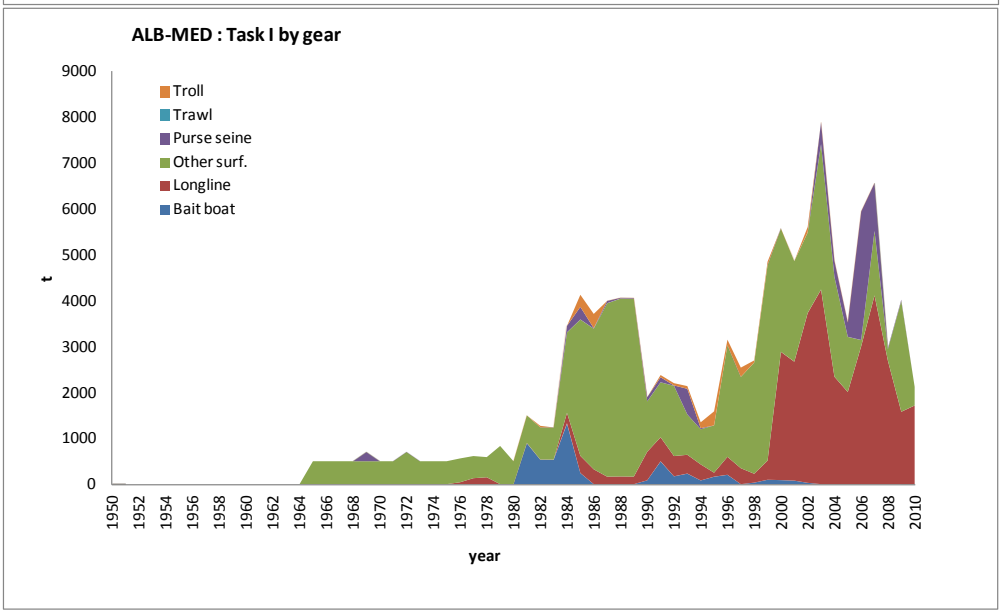
a)



b)

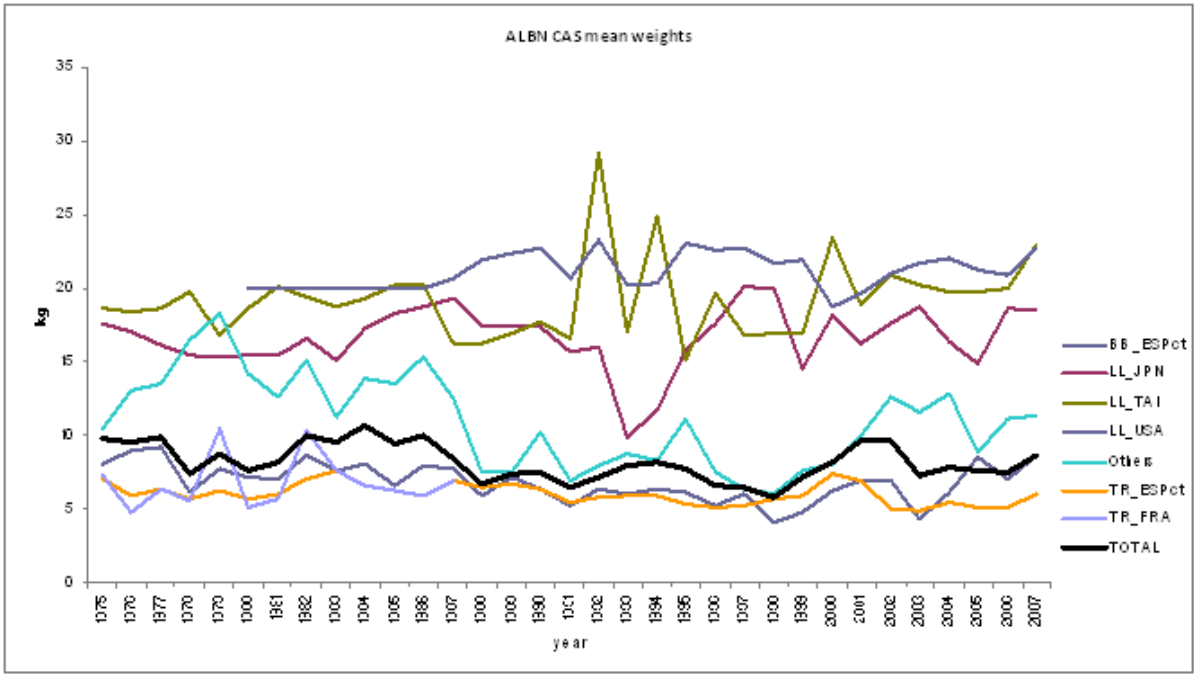


c)

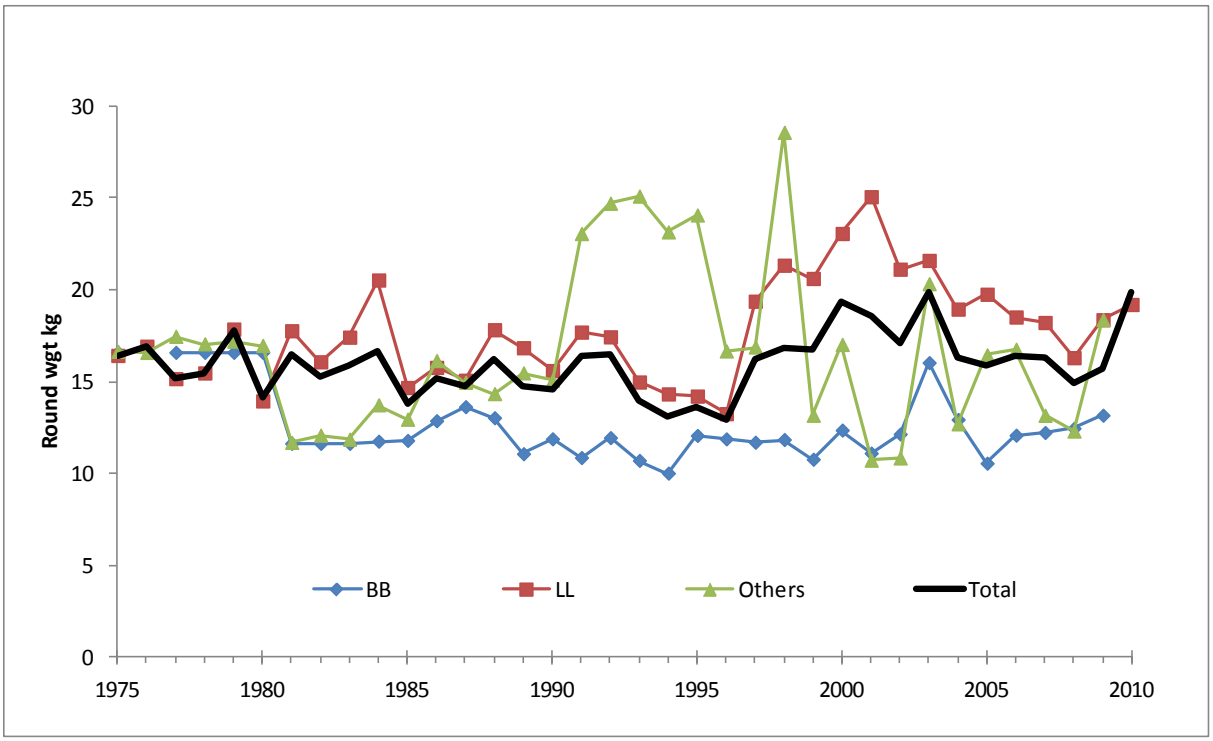


ALB-Figure 2a, b, c. Total albacore catches reported to ICCAT (Task I) by gear for the northern, southern Atlantic stocks including TAC, and the Mediterranean stock.

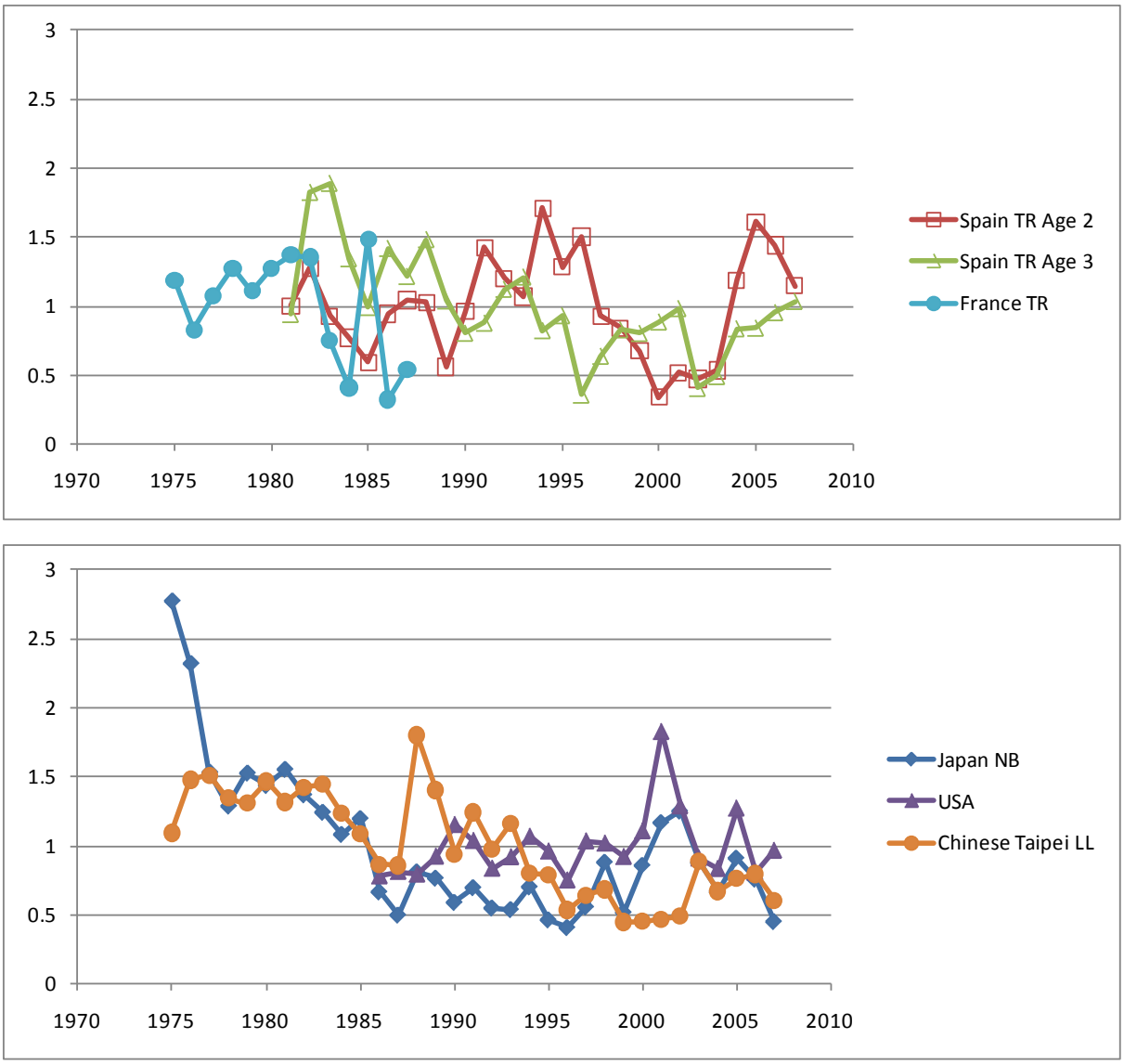
a)



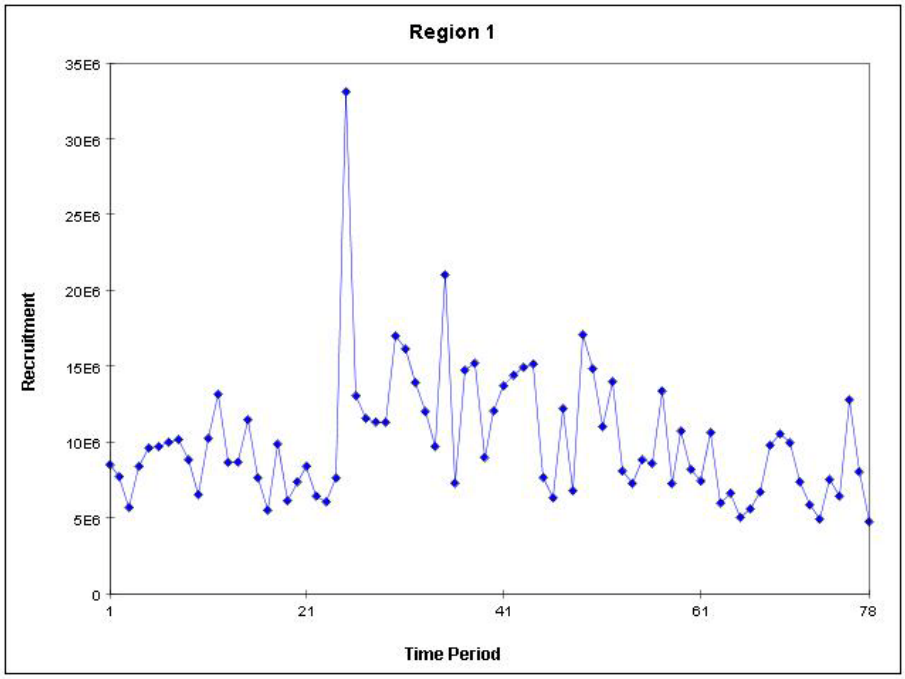
b)

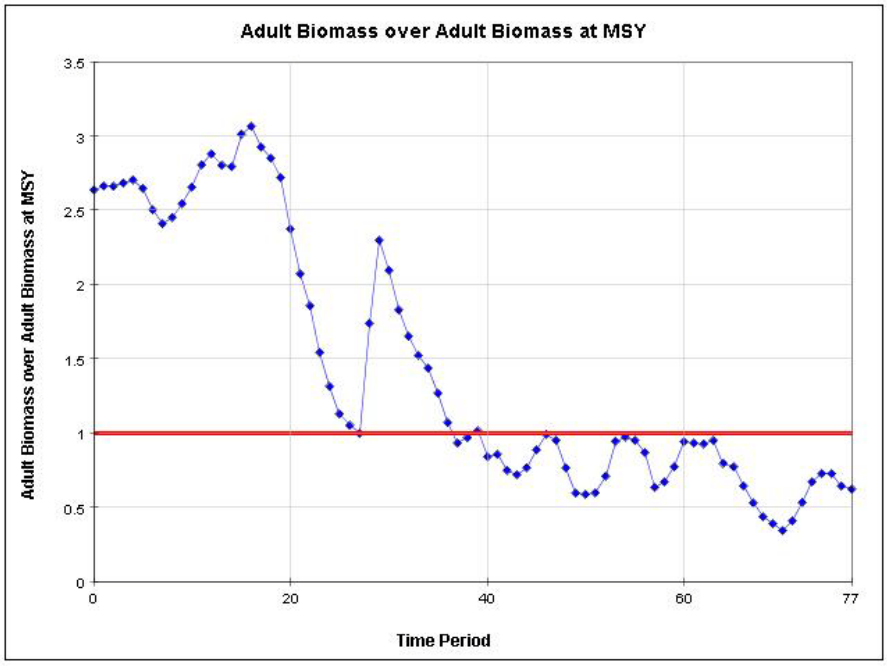


ALB-Figure 3a, b. North Atlantic and South Atlantic albacore. Mean weight trend by surface and longline fisheries in North Atlantic (a) and South Atlantic (b) stocks.

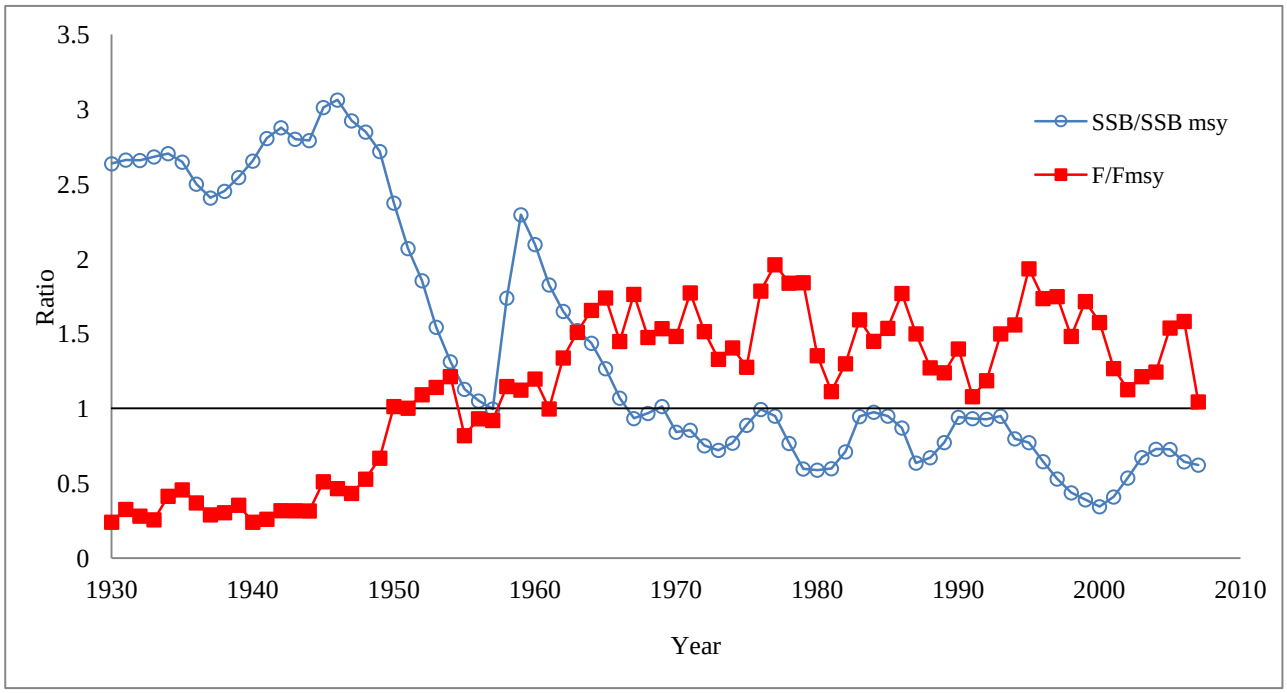


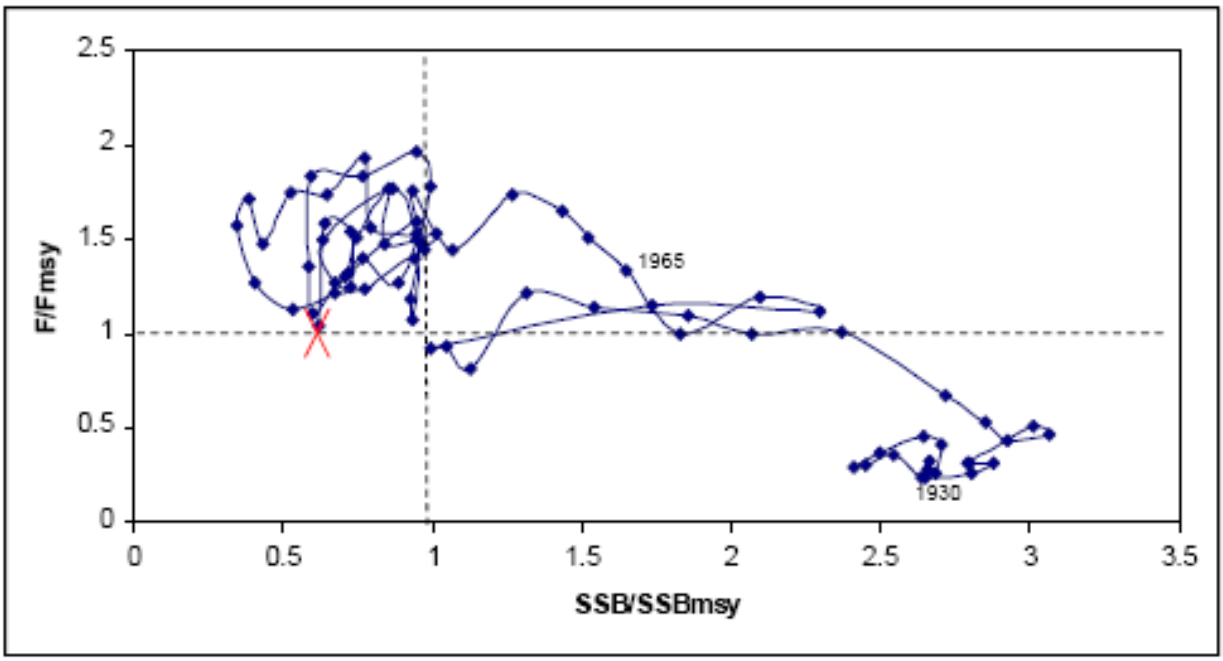
ALB-Figure 4. North Atlantic albacore. Standardized catch rate indices used in the 2009 northern albacore stock assessment from the surface fisheries (upper panel), which take mostly juvenile fish, and from the longline fisheries (lower panel), which take mostly adult fish.



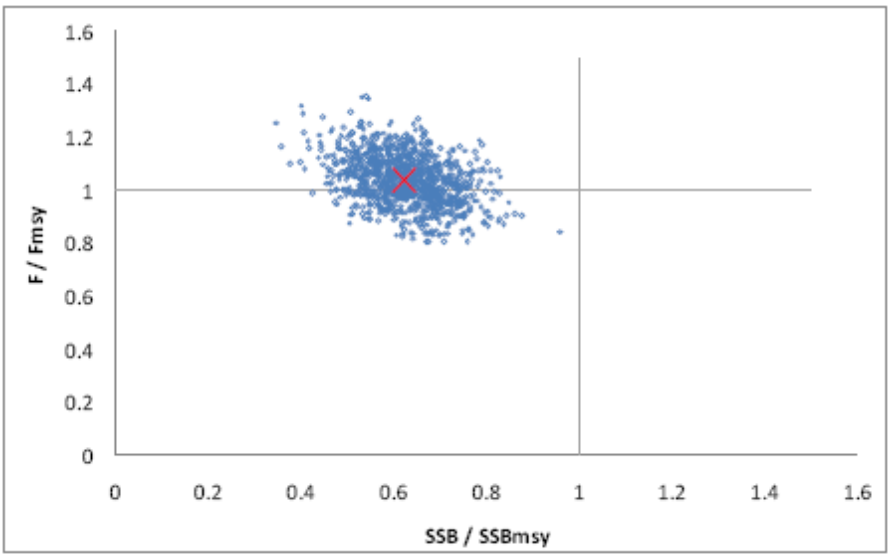


ALB-Figure 5. North Atlantic albacore. Estimates of northern Atlantic albacore recruitment (age 1) and spawning stock size from 1930-2007 from Multifan-CL model assessment. Uncertainty in the estimates has not been characterized, but the uncertainty in recent recruitment levels is considered to be higher than in the past.

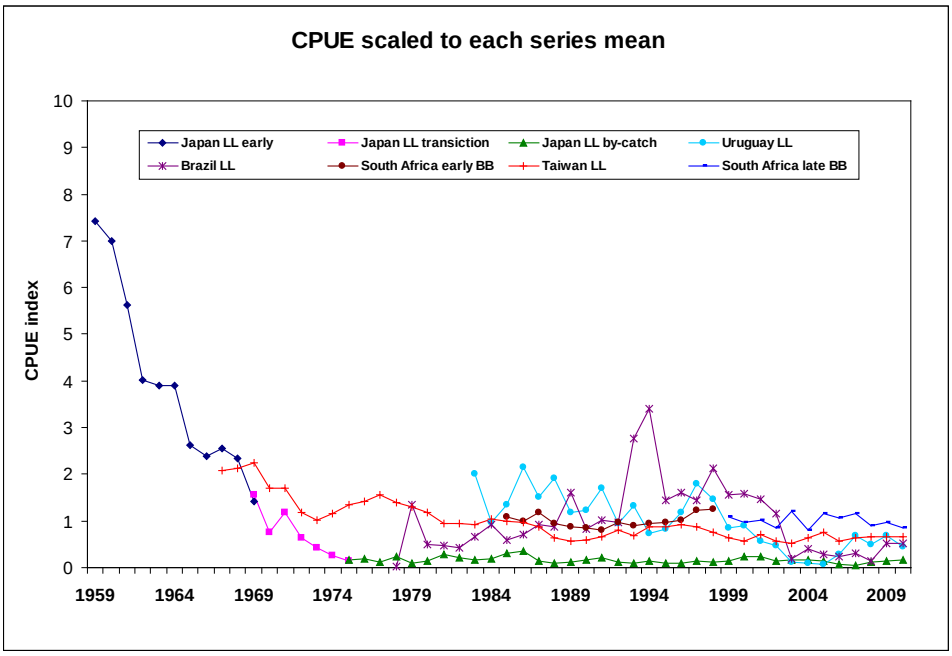




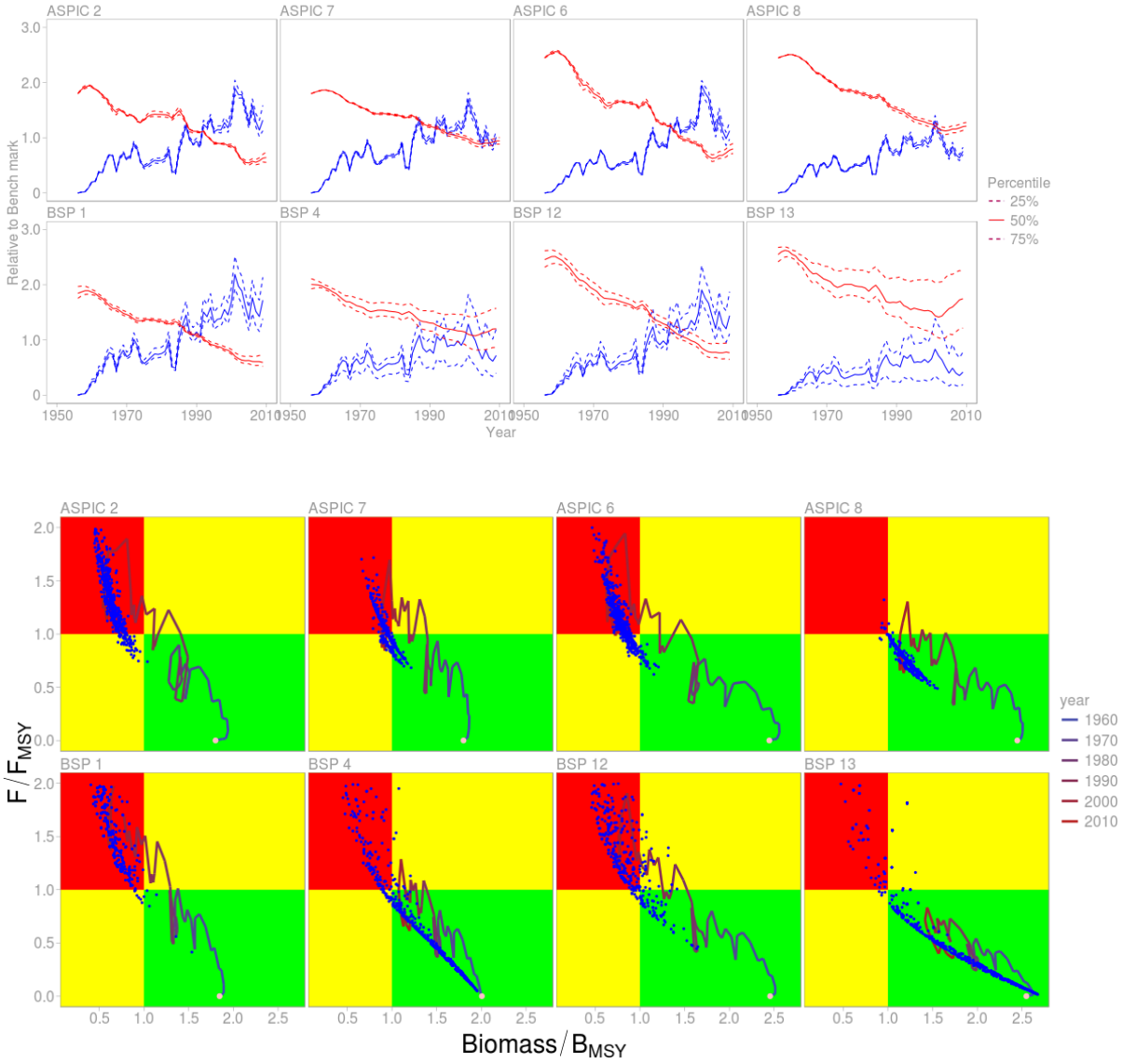
ALB-Figure 6. North Atlantic albacore. Stock status of northern albacore, estimated with Multifan-CL. Top: Relative biomass (SSB/SSB_{MSY}) and relative fishing mortality (F/F_{MSY}) trajectories over time. Bottom: joint trajectories of SSB/SSB_{MSY} and F/F_{MSY}. The red X cross in the lower panel represents the stock status in 2007.



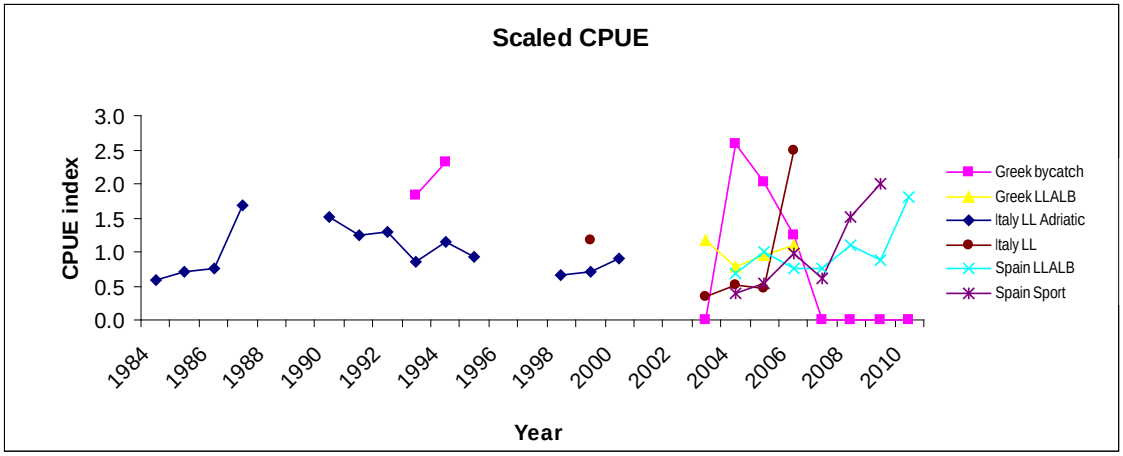
ALB-Figure 7. North Atlantic albacore. Uncertainty in current stock status for northern albacore, as estimated from the Multifan base case model. The X represents the current (2007) estimates of fishing mortality and spawning biomass ratios, and the scatter of points depicts uncertainty in that estimate.



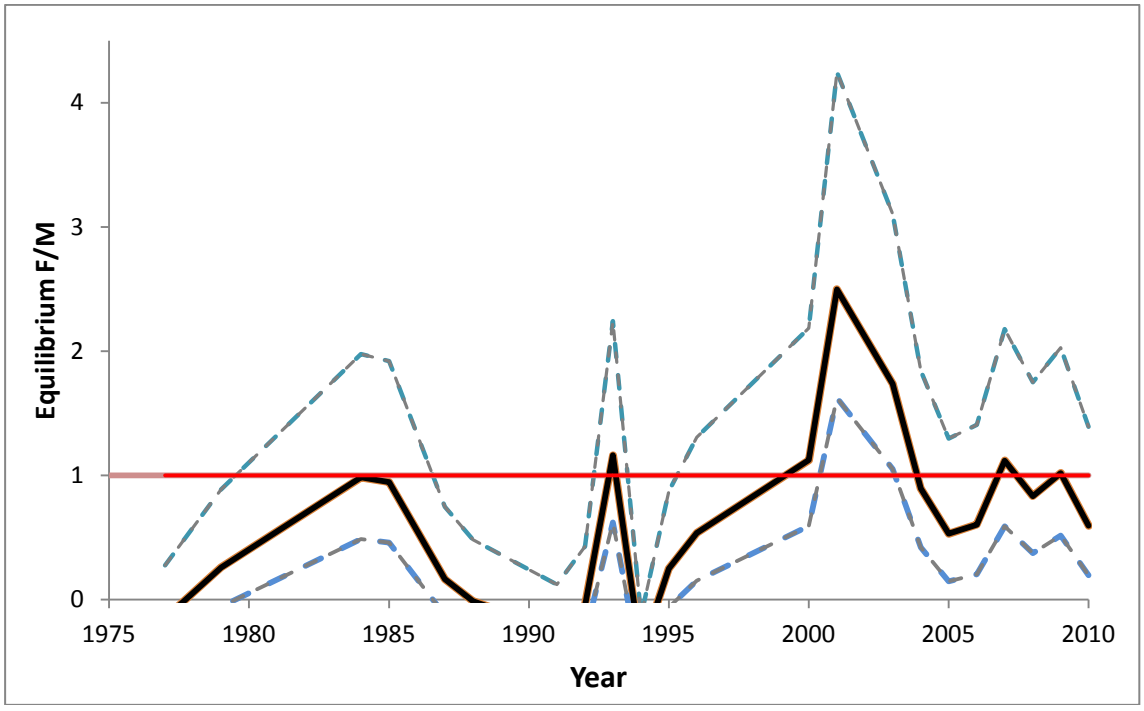
ALB-Figure 8. South Atlantic albacore. Standardized catch rates indices used in the 2011 southern albacore stock assessment from the longline fisheries, which take mostly mature fish, and from the surface fisheries (South African baitboat), which take mostly juvenile fish.



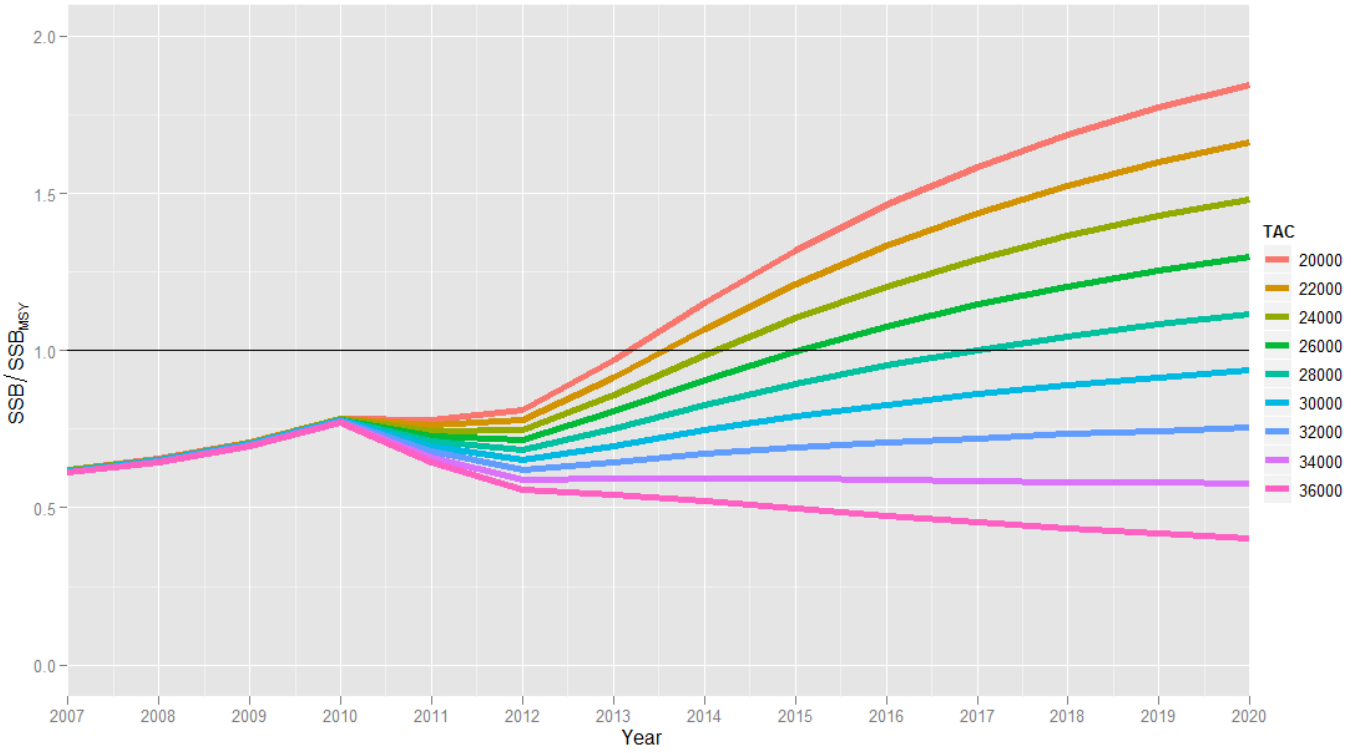
ALB-Figure 9. South Atlantic albacore. **Upper panel**: Median biomass and fishing mortality rates relative to MSY levels, with 50% credibility intervals, from the 4 base case Bayesian Surplus Production (BSP) models and the point estimate biomass and 50% credibility intervals for the 4 base case ASPIC Production models**. Lower panel**: Stock status trajectories of B/B_{MSY} and F/F_{MSY}, as well as uncertainty around the current estimate (Kobe plots) for the base case ASPIC models (Runs 2, 6, 7 and 8) alongside those from the base case BSP runs (1, 4, 12 and 13).



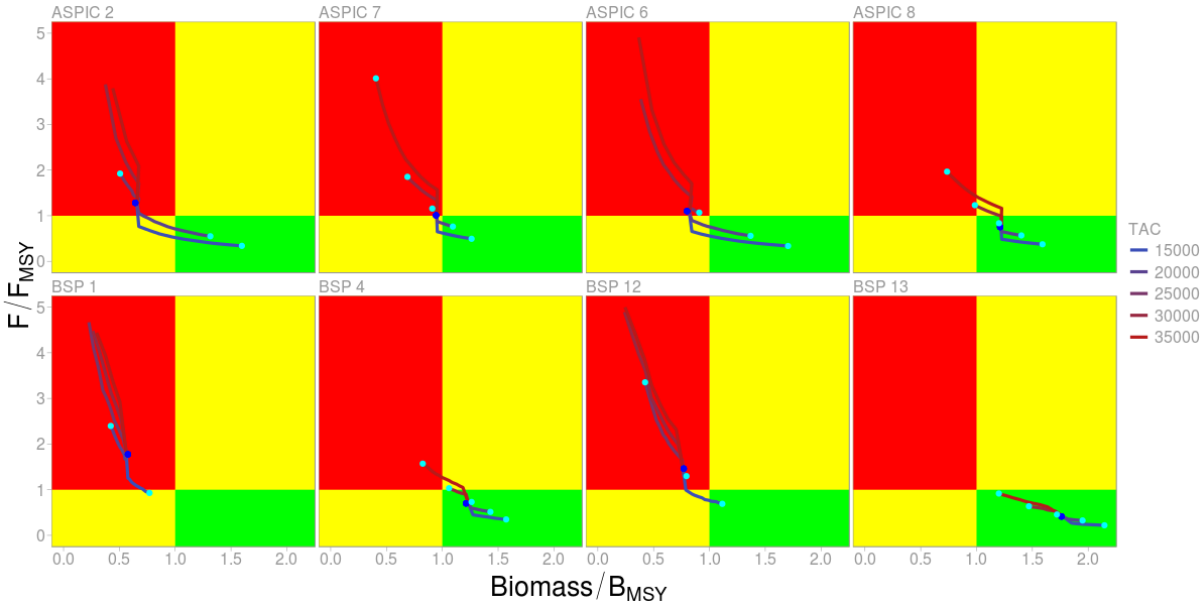
ALB-Figure 10. Mediterranean albacore. Set of standardized and nominal CPUEs used in the assessment of the Mediterranean albacore stock. The "Greek by-catch" indicates the probability of albacore by-catch in the swordfish fishery, practically null in some years. This series is the only one that is not included in the base case Bayesian production model.

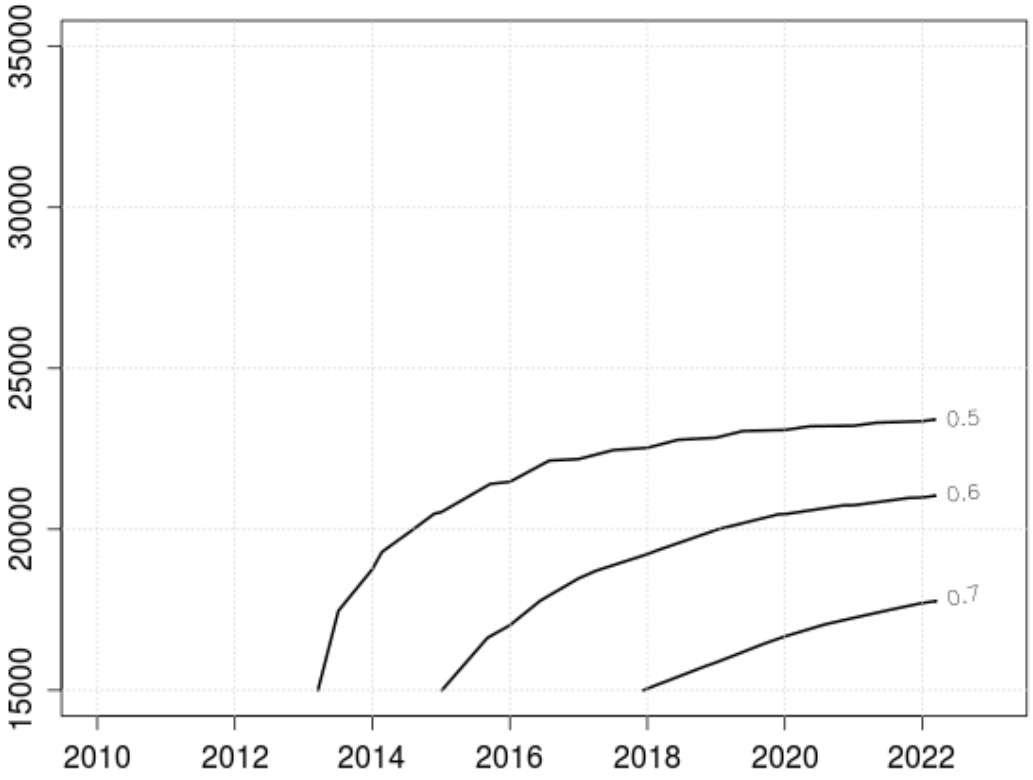


ALB-Figure 11. Mediterranean albacore. Estimates of equilibrium fishing mortality rate relative to M (as a proxy for $F_{MSY)}$ based on length-converted catch curve analysis. The central solid line represents an M assumption of 0.3 with patterns resulting from an assumed M of 0.4 (lower dashed) and 0.2 (upper dashed) also depicted.



ALB-Figure 12. North Atlantic albacore. Estimated projections of relative SSB (SSB/SSB_{MSY}) for different scenarios of constant catch (20,000-36,000 t) assuming average recent year-class strengths for the North Atlantic albacore stock. Projections assumed a catch of 30,200 t in 2008 and 2009.





ALB-Figure 13. South Atlantic albacore. **Upper panel:** "Kobe plots" by Run for TAC projections; lines are the median stock trajectories. Quadrants are defined for the stock biomass and fishing mortality relative to B_{MSY} and F_{MSY}; i.e. red if SSB<B_{MSY} and F>F_{MSY}, green if SSB≥B_{MSY} and F≤F_{MSY}, and yellow otherwise. **Lower panel:** Kobe strategy matrix (K2SM) advice plot. Contours correspond to the probability of being in the Kobe quadrant corresponding to SSB≥B_{MSY} and F≤F_{MSY} by year for each of the TAC levels, integrated over all runs with equal probability.

8.5 BFT – ATLANTIC BLUEFIN TUNA

The SCRS conducted a comprehensive assessment of bluefin tuna in the Atlantic and the Mediterranean in 2010 (Anon. 2011c). In the assessment, the available data included catch, effort and size statistics through 2009. As previously discussed, there are considerable data limitations for the eastern stock up to 2007. While data reporting for the eastern and Mediterranean fisheries have substantially improved since 2008 and some historical statistical data have been recovered, nonetheless, most of the data limitations that have plagued previous assessments remain and will require new approaches in order to improve the scientific advice the Committee can offer.

The Atlantic-wide Research Programme on Bluefin Tuna (GBYP) research plan outlined the research necessary for improving the scientific advice that the Committee provides to the Commission. This plan was presented to and approved by the Commission and the GBYP was started in 2010. The Committee continues to strongly and unanimously support the GBYP, and welcomes the Commission's continued commitment to the Program. In the absence of such a significant and sustained effort, it remains highly unlikely that the Committee will improve its scientific diagnosis and management advice in the foreseeable future.

In 2011, the SCRS updated the fisheries statistics and some CPUE indices up to 2010 and reviewed new information on the biology, spatial dynamics and various approaches to survey the catch. The SCRS also discussed progress done by the GBYP and the BFT US research program about the aerial survey, tagging, data mining, biological sampling, stock mixing and new modeling approaches. These new documents are summarized in SCRS/2011/203.

BFT-1. Biology

Atlantic bluefin tuna (BFT) mainly live in the pelagic ecosystem of the entire North Atlantic and its adjacent seas, primarily the Mediterranean Sea. Bluefin tuna have a wide geographical distribution living mostly in temperate Atlantic waters and adjacent seas (**BFT-Figure 1**). Archival tagging and tracking information confirmed that bluefin tuna can sustain cold as well as warm temperatures while maintaining stable internal body temperature. Until recently, it was assumed that bluefin tuna preferentially occupy the surface and subsurface waters of the coastal and open-sea areas, but archival tagging and ultrasonic telemetry data indicate that bluefin tuna frequently dive to depths of 500m to 1,000m. Bluefin tuna is also a highly migratory species that seems to display a homing behavior and spawning site fidelity in both the Mediterranean Sea and Gulf of Mexico, which constitute the two main spawning areas being clearly identified today. Less is known about feeding migrations within the Mediterranean and the North Atlantic, but results from electronic tagging indicated that bluefin tuna movement patterns vary considerably between individuals, years and areas. The appearance and disappearance of important past fisheries further suggest that important changes in the spatial dynamics of bluefin tuna may also have resulted from interactions between biological factors, environmental variations and fishing. Although the Atlantic bluefin tuna population is managed as two stocks, conventionally separated by the 45°W meridian, its population structure remains poorly understood and needs to be further investigated. Recent genetic and microchemistry studies as well as work based on historical fisheries tend to indicate that the bluefin tuna population structure is complex.

Currently, bluefin tuna is assumed to mature at approximately 25 kg (age 4) in the Mediterranean and at approximately 145 kg (age 9) in the Gulf of Mexico. Juvenile and adult bluefin tuna are opportunistic feeders (as are most predators). However, in general, juveniles feed on crustaceans, fish and cephalopods, while adults primarily feed on fish such as herring, anchovy, sand lance, sardine, sprat, bluefish and mackerel. Juvenile growth is rapid for a teleost fish (about 30cm/year), but slower than other tuna and billfish species. Fish born in June attain a length of about 30-40 cm long and a weight of about 1 kg by October. After one year, fish reach about 4 kg and 60 cm long. Growth in length tends to be lower for adults than juveniles, but growth in weight increases. At 10 years old, a bluefin tuna is about 200 cm and 170 kg and reaches about 270 cm and 400 kg at 20 years. Bluefin tuna is a long lived species, with a lifespan of about 40 years, as indicated by recent studies from radiocarbon deposition.

The information on natal origin derived from otolith microchemistry received by the SCRS indicated that there is, based on samples covering a limited number of years, a greater contribution of eastern origin fish to the western fisheries with decreasing average size of the fish in the catch (i.e. up to 62% for fish in the 69-119 cm size class). In contrast, other western fisheries supported by the largest size classes had minimal or no eastern component in the catch. However, there remains considerable uncertainty and therefore additional samples are

needed to improve our understanding of the relative contribution of the two stocks to the different fisheries over time --an issue that can hardly be resolved without better understanding of Atlantic bluefin tuna population structure.

The SCRS had extensive discussions concerning the choice of maturity schedules for both the eastern and western stocks. Uncertainty in age at maturity remained a significant issue for the stock assessment, and obliged the Group to consider alternative scenarios during their modeling work. Improving current understanding of the maturity schedules for bluefin tuna should be a priority area for research within the GBYP and other collaborative research programs with the SCRS.

The SCRS implemented a new growth curve for western stock that was derived from advanced analytical techniques. The adoption of the new growth curve that is nearly identical to that for the eastern stock has resulted in significant changes to some of the benchmark for the western stock and consequently management advice. For the eastern Atlantic and Mediterranean stock, new information indicated that for farming operations, when applying the weight gain rates adopted by SCRS in 2009, the back calculated fish weights at initial capture seemed to show unrealistic size distributions, in that more fish of a smaller size are calculated as having been caught than would be expected given existing controls. In 2011, the SCRS had extensive discussion about the growth curve for the eastern stock and concluded that the considerable amount of new information on hard parts from national programs and the GBYP will help in reducing uncertainties in catch-at-age matrix in the near future.

The SCRS also received several contributions related to electronic tagging within the Eastern Atlantic and Mediterranean stock. While most of the new studies are reporting work in progress, the new information appears to indicate a greater level of complexity in the migratory patterns of the eastern fish than was previously understood, as a significant fraction of the eastern fish (juveniles and spawners) seem to stay within the Mediterranean all year long.

BLUEFIN TUNA – EAST

BFTE-2. Fishery trends and indicators – East Atlantic and Mediterranean

It is very well known that introduction of fattening and farming activities into the Mediterranean in 1997 and good market conditions resulted in rapid changes in the Mediterranean fisheries for bluefin tuna mainly due to increasing purse seine catches. In the last few years, nearly all of the declared Mediterranean bluefin fishery production was exported overseas. Declared catches in the East Atlantic and Mediterranean reached a peak of over 50,000 t in 1996 and, then decreased substantially, stabilizing around TAC levels established by ICCAT for the most recent period **(BFT-Table 1** and **BFTE-Figure 1)**. Both the increase and the subsequent decrease in declared production occurred mainly for the Mediterranean **(BFTE-Figure 1)**. For 2006-2010, declared catch was, at the time of the meeting, 30,689 t, 34,516 t, 23,849 t, 19,701 t and 11,294 t for the East Atlantic and Mediterranean, of which 23,154 t, 26,479 t, 16,205 t, 13,016 t and 6,949 t were declared for the Mediterranean for those same years **(BFT-Table 1)**.

Information available has demonstrated that catches of bluefin tuna from the East Atlantic and Mediterranean were seriously under-reported between the mid-1990s through 2007. The Committee views this lack of compliance with TAC and underreporting of the catch as having undermined conservation of the stock. The Committee has estimated that realized catches during this period could have been on the order of 50,000 t to 61,000 t per year based on the number of vessels operating in the Mediterranean Sea and their respective catch rates. Estimates for 2008 and 2009 using updated vessel capacity and performance statistics from the various reports submitted to ICCAT under [Rec. 08-05] results in estimates that are significantly lower than the corresponding reported Task I data (see Report of the Bluefin Tuna Data Preparatory Meeting) (Anon. 2011d). Although care is needed considering estimates of catch using these capacity measures, the Committee's interpretation is that a substantial decrease in the catch occurred in the eastern Atlantic and Mediterranean Sea in 2008 and 2009. Declared catches in 2010 were significantly below the 2010 TAC of 13500 t. However, some CPCs did not report their 2010 catch. To complete this lacking information, the SCRS used the information from the BCD that were still largely incomplete at the time of the meeting.

Available indicators from small fish fisheries in the Bay of Biscay did not show any clear trend since the mid-1970s (**BFTE-Figure 2**). This result is not particularly surprising because of strong inter-annual variation in year class strength. However, aerial survey results conducted in 2009 indicated a higher abundance or higher

concentration of small bluefin in the northwestern Mediterranean than found in surveys conducted in 2000-2003. Indicators from Japanese longliners and Spanish and Moroccan traps targeting large fish (spawners) in the East Atlantic and the Mediterranean Sea displayed a recent increase after a general decline since the mid-1970s (**BFTE-Figure 2**)**.** Indicators from longliners targeting medium to large fish in the northeast Atlantic were available since 1990 and showed an increasing trend in the recent years (**BFTE Figure 2**). This index becomes more valuable since the major part of Japanese catch come from this fishing ground in recent years**,** while the activities of longliners in the East Atlantic (south of 40N) and Mediterranean Sea were reduced**.** The preliminary updates of the CPUE indices and aerial surveys until 2010 confirm these positive trends in recent years.Two historical indicators before 1980 in the Bay of Biscay were also available. The SCRS recognized that the recent compliance to the regulatory measures affect significantly the CPUE values (e.g. Spanish baitboat and Japanese longline indices) through the change of operational pattern and target sizes. Recent tendency in indicators are likely to reflect positive outcomes from recent management measures. However, the Committee found it difficult to derive any clear conclusion from fisheries indicators over such a short period after the implementation of new regulations and in the absence of more precise information about the catch composition, effort and spatial distribution of the purse seine fisheries. Fisheries-independent indicators (scientific surveys) and a large scale tagging program are needed to provide more reliable stock status indicators. The Committee reaffirmed the importance of pursuing these research elements under the now-funded GBYP.

BFTE-3. State of the stock

In spite of improvements in the data quantity and quality for the past few years, there remain considerable data limitations for the 2010 assessment of the stock. These included poor temporal and spatial coverage for detailed size and catch-effort statistics for many fisheries, especially in the Mediterranean. Substantial under-reporting of total catches was also evident, especially during the years 1998-2007. Nevertheless, the Committee assessed the stock in 2010 as requested by the Commission mainly applying the methodologies and hypotheses adopted by the Committee in previous assessments and further tried alternative approaches. The Committee believes that while substantial improvements can be made for in catch and effort statistics into the future, it appears unlikely that such substantial improvements can be made regarding historical fishery performance. Because of this, the Committee believes that assessment methodologies applied in the past must be modified to better accommodate the substantial uncertainties in the historical total catch, catch-at-age and effort data from the main fleets harvesting bluefin. This process has been initiated, but will require at least 3 years to complete in terms of robustness testing of the methodologies envisioned. The Commission should take this into account in establishing management controls. Furthermore, any change in exploitation or management will take several years to have a detectable effect on the biomass because bluefin tuna is a long lived species and our ability to quantify recent management impacts on stock status are limited due to variability in stock status indicators in the most recent years.

The assessment results upon which the Committee's main advice is provided indicated that the spawning stock biomass (SSB) had been mostly declining since the 1970s. The recent SSB tendency has shown signs of increase/stabilization in some runs while it continues to decline for others, depending on the models specifications and data used (see Bluefin Tuna Detailed Report, **BFTE-Figure 3)**. Trend in fishing mortality (F) displayed a continuous increase over the time period for the younger ages (ages 2-5) while for oldest fish (ages 10+) it had been decreasing during the first 2 decades and then rapidly increased during the 1990s. Fishing mortalities have declined on the oldest fish in recent years, but these for younger (ages 2-5) are more uncertain and display higher variability (**BFTE-Figure 3**). General trends in F or N were not strongly affected by the historical catches assumptions (i.e. reported *versus* inflated), except in recent years. These analyses indicated that recent (2007-2009) SSB is about 57% of the highest estimated SSB levels (1957-1959). Recent recruitment levels remain very uncertain due to the lack of information about incoming year class strength and high variability in the indicators used to track recruitment and the low recent catches of fish less than the minimum size. The absolute values estimated for F and SSB remained sensitive to the assumptions of the analysis and could lead to a different perception in the whole trend in SSB. However, it is noteworthy that the historical Fs for older fish were consistent between different types of models which made use of different assumptions. For the period 1995-2007, Fs for older fish are also consistent with a shift in targeting towards larger individuals destined for fattening and/or farming.

Estimates of current stock status relative to MSY benchmarks are uncertain, but lead to the conclusion that although the recent Fs have probably declined, these values remain too high and recent SSB too low to be consistent with the Convention objectives. Depending on different assumed levels of resource productivity current F show signs of decline reflecting recent catch reductions, but remained larger than that which would

result in MSY and SSB remained most likely to be about 35% (from 19% to 51% depending on the recruitment levels) than the level needed to support MSY **(BFTE-Figure 4)**.

BFTE- 4. Outlook

During the last decade, there has been an overall shift in targeting towards large bluefin tuna, mostly in the Mediterranean. As the majority of these fish are destined for fattening and/or farming operations, it is crucial to get precise information about the total catch, the size composition, the area and flag of capture. Progress has been made over the last years, but current information that consists in individual weight after fattening remain too uncertain to be used within stock assessment models. Therefore, real size samples at time of the catch are still required. Pilot studies using dual camera systems have been presented at the SCRS in 2011 (see SCRS/2011/173 and SCRS/2011/191). The results are encouraging and the SCRS strongly encourages the CPCs to finalize these studies, so that stereoscopic camera systems became operational as soon as possible.

The shift towards larger fish should result in improved yield-per-recruit levels in the long-term if *F* were reduced to $F_{0.1}$. However, such changes would take several years to translate into gains in yield due to the longevity of the species. Realization of higher long-term yields would further depend on future recruitment levels.

Even considering uncertainties in the analyses, the outlook derived from the 2010 assessment has improved in comparison to previous assessments, as F for older fish seem to have significantly declined during the last two years. However, estimates in the last years are known to be more uncertain and this decline (as the Fs for younger ages which remains more variable) needs to be confirmed in future analyses. Nonetheless, F_{2009} still remains largely above the reference target $F_{0.1}$ (a reference point more robust to uncertainties than F_{MAX}, as used in the past) while SSB is only about 35% of the biomass that is expected under a MSY strategy (**BFTE-Figure 4)**.

The Committee also evaluated the potential effects of [Rec. 09-06]. Acknowledging that there is insufficient scientific information to determine precisely the productivity of the stock (i.e. the steepness of the stock-recruitment relationship), the Committee agreed to perform the projections with three recruitment levels while taking into account for year-to-year variations. These levels correspond to the 'low' and 'high' scenarios as defined in the 2008 assessment plus a 'Medium' scenario that corresponds to the geometric mean of the recruitment over the 1950-2006 years. For the projections, the group investigated 24 scenarios (see the 2010 Bluefin Tuna Stock Assessment Report) (Anon. 2011c). The results indicated that the stock is increasing in all the cases, but the probability to achieve $SSB_{F0.1}$ (i.e. the equilibrium SSB resulting in fishing at $F_{0.1}$) by the end of 2022 depend on the scenarios (run 13 leads to slower rebuilding than run 15 while the recruitment levels affect both the speed of rebuilding and the level of depletion, see Bluefin Tuna Detailed Report). Overall, the SSB would be equal or greater than $SSB_{F0.1}$ by the end of 2022 for a catch = 0 to 13,500 t, but not when the catch is greater than 14,000 t (**BFTE-Table 1, BFTE-Figure 5**). It is finally worth noting that a $F_{0.1}$ strategy would not allow the rebuilding of the stock to $SSB_{F0.1}$ by 2022, but later on.

Projections are known to be impaired by various sources of uncertainties that have not yet been quantified. Although the situation has improved regarding recent catch, there are still uncertainties about stock status in 2009, population structure and migratory rates as well as a lack of knowledge about the level of IUU catch and key modeling parameters on bluefin tuna productivity. Acknowledging these limitations, the overall evaluation of [Rec. 09-06] indicated that the rebuilding of eastern bluefin tuna at $SSB_{F0.1}$ level with a probability of at least 60% could be achieved by 2019 with zero catch and by 2022 with catch equal to current TAC (i.e. 13,500 t). However, this 60% probability level is unlikely to be attained by the end of 2022 with a catch greater than 14,000 t. Finally, it should be noted that the incorporation of additional uncertainties into the overall analysis could change the estimates of rebuilding probability.

BFTE-5. Effect of current regulations

Catch limits have been in place for the eastern Atlantic and Mediterranean management unit since 1998. In 2002, the Commission fixed the Total Allowable Catch (TAC) for the East Atlantic and Mediterranean bluefin tuna at 32,000 t for the years 2003 to 2006 [Rec. 02-08] and at 29,500 t and 28,500 t for 2007 and 2008, respectively [Rec. 06-05]. Subsequently, [Rec. 08-05] established TACs for 2009, 2010, and 2011 at 22,000 t, 19,950 t, and 18,500 t, respectively. However, the 2010 TAC was revised to 13,500 t by [Rec. 09-06] which also established a framework to set future (2011 and beyond) TAC at levels sufficient to rebuild the stock to B_{MSY} by 2022 with at least 60% probability. The 2011 TAC was set at 12,900 t by [Rec 10.04].

The reported catches for 2003, 2004 and 2006 were about TAC levels, but those for 2005 (35,845 t) and 2007 (34,516 t) were notably higher than TAC. However, the Committee strongly believes, based on the knowledge of the fisheries and trade statistics, that substantial under-reporting was occurring and that actual catches up to 2007 were well above TAC. The SCRS estimates since the late-1990s, catches were close to the levels reported in the mid-1990s, but for 2007, the estimates were higher *i.e.* about 61,000 t in 2007 for both the East Atlantic and Mediterranean Sea. As noted, reported catch levels for 2008 (24,057 t), 2009 (20,228 t) and 2010 (11,294 t) appear to largely reflect the removals from the stock when comparing estimates of catch using vessel capacity measures, although the utility of this method has diminished for estimating catch. The reported catches for 2008, 2009 and 2010 are 10,000 t to 25,000 t lower than the 2003-2007 reported catches (**BFT-Table 1, BFTE-Figure 1**). Although care is needed considering estimates of catch using capacity measures, the Committee's interpretation is that a substantial decrease in the catch occurred in the eastern Atlantic and Mediterranean Sea through implementation of the rebuilding plan and through monitoring and enforcement controls. While current controls appear sufficient to constrain the fleet to harvests at or below TAC, the Committee remains concerned about substantial excess capacity remains which could easily harvest catch volumes well in excess of the rebuilding strategy adopted by the Commission.

Recent analyses from the reported catch-at-size and catch-at-age displayed important changes in selectivity patterns over the last three years for several fleets operating in the Mediterranean Sea or the East Atlantic. This partly results from the enforcement of minimum size regulations under Rec.[06.05] which led to much lower reported catch of younger fish and subsequently a steep increase in the annual mean-weight in the catch-at-size since 2007 (**BFTE-Figure 5**). Additionally, higher abundance or higher concentration of small bluefin tuna in the northwestern Mediterranean detected from aerial surveys could also reflect positive outcomes from increase minimum size regulation.

While several fishery indicators have shown some positive tendency in the most recent fishing seasons, the available catch effort statistics are not yet sufficient to permit the Committee to quantify the extent of impact of the recent regulations on the overall stock with precision. The Committee's view is that it will take additional years under constrained fishing before to measure it more precisely.

BFTE-6. Management Recommendations

In [Rec. 09-06] the Commission established a total allowable catch for eastern Atlantic and Mediterranean bluefin tuna at 13,500 t in 2010. Additionally, in [Rec. 09-06] the Commission required that the SCRS provide the scientific basis for the Commission to establish a three-year recovery plan for 2011-2013 with the goal of achieving B_{MSY} through 2022 with at least 60% of probability.

A Kobe II strategy matrix reflecting recovery scenarios of eastern Atlantic and Mediterranean bluefin tuna in accordance with the multiannual recovery plan is given in **BFTE-Table 1** and **BFTE-Figure 6.**

The implementation of recent regulations through [Rec. 09-06, and previous recommendations] has clearly resulted in reductions in catch and fishing mortality rates. But, since the fishery is currently adapting to these new management measures, the Committee is unable to fully understand the implications of the measures on the stock. However, the Committee notes that maintaining catches at the current TAC (13,500 t) under the current management scheme, for 2011-2013, will likely allow the stock to increase during that period and is consistent with the goal of achieving F_{MSY} and B_{MSY} through 2022 with at least 60% of probability, given the quantified uncertainties. The 2010 SCRS suggested that the commission might consider more precautionary approach considering the unquantified uncertainties. In 2010, the commission set a TAC at 12,900 t for 2011 and thereafter. Not having completed an updated assessment in 2011 and not having detected any evidence of collapse, the SCRS has no basis to change the 2010 management advice.

EAST ATLANTIC AND MEDITERRANEAN BLUEFIN TUNA SUMMARY	
Current (2010) Yield	Reported: 11,294 t
Short-term sustainable yield according to Rec.[09-06]	13,500 t or less
Long-term potential yield[1]	about 50,000 t
$SSB_{2009}/SSB_{F0.1}$[2] (SSB_{2009}/ SSB_{FMAX})[3]	
Medium recruitment scenario (1950-2006)	0.35 (0.62)
Low recruitment scenario (1970s)	0.51 (0.88)
High recruitment scenario (1990s)	0.19 (0.33)
$F_{2009}/F_{0.1}$[4]	
Reported and inflated catches	2.9 (1.53)
TAC (2009 - 2011)	19,950 t - 13,500 t – 12, 900 t

[1] Approximated as the average of long-term yield at $F_{0.1}$ that was calculated over a broad range of scenarios including contrasting recruitment levels and different selectivity patterns (estimates from these scenarios ranged between 29,000 t and 91,000 t).
[2] The Committee decided, on the basis of current published literature, to adopt $F_{0.1}$ as the proxy for F_{MSY} instead of F_{MAX}. $F_{0.1}$ has been indeed shown to be more robust to uncertainty about the true dynamics of the stock and observation errors than F_{MAX}.
[3] References to F_{MAX} are given for the same ratios in parentheses for comparison purposes.
[4] The recruitment levels do not impact $F_{2009}/F_{0.1}$.

BLUEFIN TUNA - WEST

BFTW-2. Fishery indicators

The total catch for the West Atlantic peaked at 18,671 t in 1964, mostly due to the Japanese longline fishery for large fish off Brazil and the U.S. purse seine fishery for juvenile fish **(BFT-Table 1, BFTW-Figure1)**. Catches dropped sharply thereafter with the collapse of the bluefin tuna by-catch longline fishery off Brazil in 1967 and decline in purse seine catches, but increased again to average over 5,000 t in the 1970s due to the expansion of the Japanese longline fleet into the northwest Atlantic and Gulf of Mexico and an increase in purse seine effort targeting larger fish for the sashimi market. The total catch for the West Atlantic including discards has generally been relatively stable since 1982 due to the imposition of quotas. However, since a total catch level of 3,319 t in 2002 (the highest since 1981, with all three major fishing nations indicating higher catches), total catch in the West Atlantic declined steadily to a low of 1,638 t in 2007 and then increased in 2008 and 2009 to 2,000 t and 1,980 t, respectively. The catch in 2010 was 1,830 t **(BFTW-Figure 1).** The decline through 2007 was primarily due to considerable reductions in catch levels for U.S. fisheries. Since 2002, the Canadian annual catches have been relatively stable at about 500-600 t (733 t in 2006); the 2006 catch was the highest recorded since 1977. The 2010 Canadian catch (including dead discards) was 530 t. Japanese catches have generally fluctuated between 300-500 t, with the exception of 2003 (57 t), which was low for regulatory reasons, and 2009 (162 t). Japanese landings for 2010 were 353 t.

The average weight of bluefin tuna taken by the combined fisheries in the West Atlantic were historically low during the 1960s and 1970s **(BFTW-Figure 2)**, for instance showing an average weight of only 33 kg during the 1965-1975 period. However, since 1980 they have been showing a quite stable trend and at a quite high average weight of 93 kg.

The overall number of Japanese vessels engaged in bluefin fishing has declined from more than 100 vessels to currently less than 10 vessels in the West Atlantic. After reaching 2,014 t in 2002 (the highest level since 1979), the catches (landings and discards) of U.S. vessels fishing in the northwest Atlantic (including the Gulf of Mexico) declined precipitously during 2003-2007. The United States did not catch its quota in 2004-2008 with catches of 1,066, 848, 615, 858 and 922 t, respectively. However, in 2009 the United States fully realized its base quota with total catches (landings including dead discards) of 1,272 t and in 2010 the U.S. catches totaled 925 t and were only slightly below the quota partly owing to a reduction in dead discards.

The indices of abundance used in last year's assessment were updated through 2010 **(BFTW-Figure 3)**. The catch rates of juvenile bluefin tuna in the U.S. rod and reel fishery fluctuate with little apparent long-term trend, but exhibit a pattern that is consistent with the strong year-class estimated for 2003 and show small increases in 2010. The catch rates of adults in the U.S. rod and reel fishery remain low, but increased in 2010 to the highest level since 2002. The catch rates of the Japanese longline fishery north of 30^{o}N increased markedly in 2007, decreased in 2008 back to the levels observed in 2005 and 2006 and increased once again in 2009 (the index does not cover 2010 because effort shifted south of 30^{o}N, but preliminary nominal catch rates in 2010 were similar to 2008) The catch rates from the U.S. Gulf of Mexico longline fishery showed a gradual increasing trend through 2009 (the index has not yet been updated to include 2010 as careful consideration must be given to how to account for the major reductions in effort during that year). The Gulf of Mexico larval survey continues to fluctuate around the low levels observed since the 1980s. The catch rates in the Gulf of St. Lawrence have increased rapidly since 2004 and the catch rates in 2010 were the highest in the time series. The catch rates in southwest Nova Scotia have continued to follow a slightly increasing trend since 2000, with catch rates in 2010 being amongst the highest since the early 1990s.

BFTW-3. State of the stock

The most recent assessment was conducted in 2010 and included information through 2009 (Anon. 2011c). The most influential change since the 2008 assessment was the use of a new growth curve that assigns fish above 120 cm to older ages than did the previous growth curve. As a result, the base model estimates lower fishing mortality rates and higher biomasses for spawners, but also less potential in terms of the maximum sustainable yield. The trends estimated during the 2010 assessment are consistent with previous analyses in that spawning stock biomass (SSB) declined steadily from 1970 to 1992 and has since fluctuated between 21% and 29% of the 1970 level (**BFTW-Figure 4**). In recent years, however, there appears to have been a gradual increase in SSB from the low of 21% in 2003 to an estimated 29% in 2009. The stock has experienced different levels of fishing mortality (F) over time, depending on the size of fish targeted by various fleets (**BFTW-Figure 4**). Fishing mortality on spawners (ages 9 and older) declined markedly after 2003.

Estimates of recruitment were very high in the early 1970s (**BFTW-Figure 4**), and additional analyses involving longer catch and index series suggest that recruitment was also high during the 1960s. Since 1977, recruitment has varied from year to year without trend with the exception of a strong year-class in 2003. The 2003 year-class is estimated to be the largest since 1974, but not quite as large as those prior to 1974. The 2003 year class is expected to begin to contribute to an increase in spawning biomass after several years. The Committee expressed concern that the year-class estimates subsequent to 2003 while less reliable, are the lowest on record.

A key factor in estimating MSY-related benchmarks is the highest level of recruitment that can be achieved in the long term. Assuming that average recruitment cannot reach the high levels from the early 1970s, recent F (2006-2008) is 70% of the MSY level and SSB_{2009} is about 10% higher than the MSY level (**BFTW-Figure 5**). Estimates of stock status are more pessimistic if a high recruitment scenario is considered (F/F_{MSY}=1.9, B/B_{MSY}=0.15).

One important factor in the recent decline of fishing mortality on large bluefin is that the TAC had not been taken during this time period until 2009, due primarily to a shortfall by the United States fisheries (until 2009). Two plausible explanations for the shortfall were put forward previously by the Committee: (1) that availability of fish to the United States fishery has been abnormally low, and/or (2) the overall size of the population in the Western Atlantic declined substantially from the level of recent years. While there is no overwhelming evidence to favor either explanation over the other, the 2010 base case assessment implicitly favors the first hypothesis (regional changes in availability) by virtue of the estimated increase in SSB. The increase indicated by the U.S. catch rate of large fish is matched by an increase in several other large fish indices (**BFTW-Figure 3**). Nevertheless, the Committee notes that there remains substantial uncertainty on this issue and more research needs to be done.

The SCRS cautions that the conclusions of the 2010 assessment do not capture the full degree of uncertainty in the assessments and projections. An important factor contributing to uncertainty is mixing between fish of eastern and western origin. Limited analyses were conducted of the two stocks with mixing in 2008, but little new information was available in 2010. Based on earlier work, the estimates of stock status can be expected to vary considerably depending on the type of data used to estimate mixing (conventional tagging or isotope signature samples) and modeling assumptions made. More research needs to be done before mixing models can be used operationally for management advice. Another important source of uncertainty is recruitment, both in terms of recent levels (which are estimated with low precision in the assessment), and potential future levels (the "low" vs. "high" recruitment hypotheses which affect management benchmarks). Improved knowledge of maturity at age will also affect the perception of changes in stock size. Finally, the lack of representative samples of otoliths requires determining the catch at age from length samples, which is imprecise for larger bluefin tuna.

BFTW-4. Outlook

A medium-term (10-year) outlook evaluation of changes in spawning stock size and yield over the remaining rebuilding period under various management options was conducted in 2010. Future recruitment was assumed to fluctuate around two alternative scenarios: (i) average levels observed for 1976-2006 (85,000 recruits, the low recruitment scenario) and (ii) levels that increase as the stock rebuilds (MSY level of 270,000 recruits, the high recruitment scenario). The Committee has no strong evidence to favor either scenario over the other and notes that both are reasonable (but not extreme) lower and upper bounds on rebuilding potential.

The outlook for bluefin tuna in the West Atlantic with the low recruitment scenario (**BFTW-Figure 6**) is more optimistic with respect to current stock status than that from the 2008 assessment (owing to the use of improved information on the growth of bluefin tuna). A total catch of 2,500 t is predicted to have at least a 50% chance of achieving the convention objectives of preventing overfishing and maintaining the stock above the MSY level. The outlook under the high recruitment scenario (**BFTW-Figure 6**) is more pessimistic than the low recruitment scenario since the rebuilding target would be higher; a total catch of less than 1,250 t is predicted to maintain F below F_{MSY}, but the stock would not be expected to rebuild by 2019 even with no fishing.

BFTW-Table 1 summarizes the estimated chance that various constant catch policies will allow rebuilding under the high and low recruitment scenarios for the base-case. The low recruitment scenario suggests the stock is above the MSY level with greater than 60% probability and catches of 2,500 t or lower will maintain it above the MSY level. If the high recruitment scenario is correct, then the western stock will not rebuild by 2019 even with no catch, although catches of 1,100 t or less are predicted to have a 60% chance to immediately end overfishing and initiate rebuilding.

The Committee reiterates that considerable uncertainties remain for the outlook of the western stock, including the effects of mixing and management measures on the eastern stock.

BFTW-5. Effects of current regulations

The Committee previously noted that Recommendations 06-06 and 08-04 were expected to result in a rebuilding of the stock towards the convention objective, but also noted that there has not yet been enough time to detect with confidence the population response to the measure. This statement is also true for Recommendation 10-03, which was implemented this year. However, the available fishery indicators **(BFTW-Figure 3)** continue to suggest the spawning biomass of western bluefin tuna may be slowly rebuilding.

BFTW-6. Management recommendations

In 1998, the Commission initiated a 20-year rebuilding plan designed to achieve B_{MSY} with at least 50% probability. In response to recent assessments, in 2008 the Commission recommended a total allowable catch (TAC) of 1,900 t in 2009, 1,800 t in 2010 [Rec. 08-04], and 1,750 t in 2011 [Rec. 10-03].

The latest (2010) assessment indicates similar historical trends in abundance as in previous assessments. The strong 2003 year class has contributed to stock productivity such that biomass has been increasing in recent years.

Future stock productivity, as with prior assessments, is based upon two hypotheses about future recruitment: a 'high recruitment scenario" in which future recruitment has the potential to achieve levels that occurred in the early 1970's and a "low recruitment scenario" in which future recruitment is expected to remain near present levels. Results in previous assessments have shown that long term implications of future biomass are different between the two hypotheses and this research question remains unresolved. However, the 2010 assessment was also based on new information on western bluefin growth rates that has modified the Committee's perception of the ages at which spawning and maturity occur. Maturity schedules remain very uncertain, and, thus, the application of the new information in the 2010 assessment accentuates the differences between the two recruitment hypotheses.

Probabilities of achieving B_{MSY} within the Commission rebuilding period were projected for alternative catch levels **(BFTW-Table 1, BFTW-Figure 7)**. The "low recruitment scenario" suggests that biomass is currently sufficient to produce MSY, whereas the "high recruitment scenario" suggests that B_{MSY} has a very low probability of being achieved within the rebuilding period. Despite this large uncertainty about the long term future productivity of the stock, under either recruitment scenario current catches (1,800 t) should allow the biomass to continue to increase. Also, catches in excess of 2,500 t will prevent the possibility of the 2003 year class elevating the productivity potential of the stock in the future.

The SCRS notes that the 2010 assessment is the first time that this strong 2003 year-class has been clearly demonstrated, likely as a result of age assignment refinements resulting from the growth curve and additional years of data; more observations from the fishery are required to confirm its relative strength. A further concern is that subsequent year-classes, although even less well estimated, are the lowest observed values in the time series. The Commission may wish to protect the 2003 year class until it reaches maturity and can contribute to spawning. Maintaining TAC at current levels (1,750 t) may offer some protection.

As noted previously by the Committee, both the productivity of western Atlantic bluefin and western Atlantic bluefin fisheries are linked to the eastern Atlantic and Mediterranean stock. Therefore, management actions taken in the eastern Atlantic and Mediterranean are likely to influence the recovery in the western Atlantic, because even small rates of mixing from East to West can have significant effects on the West due to the fact that Eastern plus Mediterranean resource is much larger than that of the West.

WEST ATLANTIC BLUEFIN TUNA SUMMARY
(Catches and Biomass in t)

Current (2010) Catch (including discards)	1,830 t
Assuming Low Potential Recruitment	
Maximum Sustainable Yield (MSY)	2,585 (2,409-2,766)[1]
Relative Spawning Stock Biomass:	
B_{2009}/B_{MSY}	1.1 (0.89-1.35)[1]
Relative Fishing Mortality[2]:	
$F_{2006-2008}/F_{MSY}$	0.73 (0.59-0.91)[1]
$F_{2006-2008}/F_{0.1}$	1.11 (0.91-1.31)[1]
$F_{2006-2008}/F_{max}$	0.57 (0.48-0.68)[1]
Assuming High Potential Recruitment	
Maximum Sustainable Yield (MSY)	6,329 (5,769-7,074)[1]
Relative Spawning Stock Biomass:	
B_{2009}/B_{MSY}	0.15 (0.10-0.22)[1]
Relative Fishing Mortality[2]:	
$F_{2006-2008}/F_{MSY}$	1.88 (1.49-2.35)[1]
$F_{2006-2008}/F_{0.1}$	1.11 (0.91-1.31)[1]
$F_{2006-2008}/F_{max}$	0.57 (0.48-0.68)[1]
Management Measures:	[Rec. 08-04] TAC of 1,900 t in 2009 and 1,800 t in 2010, including dead discards. [Rec. 10-03] TAC of 1,750 t in 2011 and 2012, including dead discards.

[1] Median and approximate 80% confidence interval from bootstrapping from the assessment.
[2] $F_{2006-2008}$ refers to the geometric mean of the estimates for 2006-2008 (a proxy for recent F levels).

BFT-Table 1. Estimated Catches (t) of bluefin tuna (*Thunnus thynnus*) by major area, gear and flag.

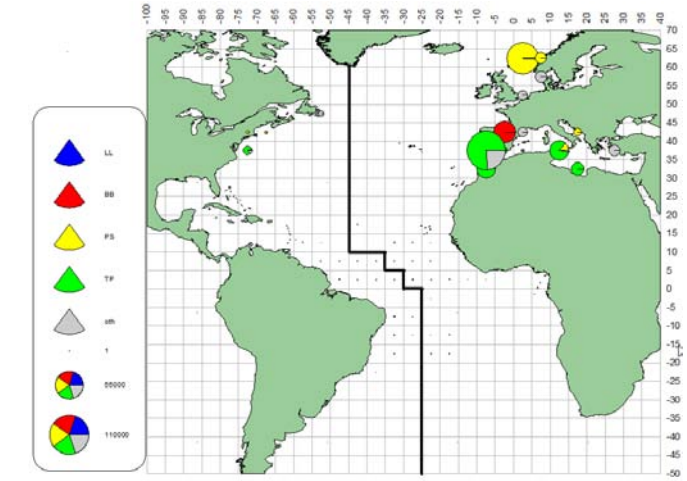
			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
TOTAL			21570	20723	27016	23819	26027	29350	34131	36636	48853	49714	53320	49489	42375	35228	36541	37390	37089	33469	33505	37602	32501	36154	25849	21680	13124
	ATE+MED		19247	18220	24118	21061	23247	26429	31849	34268	46740	47291	50807	47155	39718	32456	33766	34605	33770	31163	31381	35845	30689	34516	23849	19701	11294
	ATE		4687	4456	6951	5433	6040	6556	7619	9367	6930	9650	12663	13539	11376	9628	10528	10086	10347	7362	7410	9036	7535	8037	7645	6684	4345
	MED		14560	13764	17167	15628	17207	19872	24230	24901	39810	37640	38144	33616	28342	22828	23238	24519	23424	23801	23971	26810	23154	26479	16205	13016	6949
	ATW		2322	2503	2898	2759	2780	2921	2282	2368	2113	2423	2514	2334	2657	2772	2775	2784	3319	2306	2125	1756	1811	1638	2000	1980	1830
Landings	ATE	Bait boat	1414	1821	1936	1971	1693	1445	1141	3447	1980	2601	4985	3521	2550	1492	1822	2275	2567	1371	1790	2018	1116	2032	1794	1260	725
		Longline	967	924	1169	962	1496	3197	3817	2717	2176	4392	4788	4534	4300	4020	3736	3303	2896	2750	2074	2713	2448	1706	2491	1960	1159
		Other surf.	972	668	1221	1020	562	347	834	1548	932	1047	646	511	621	498	703	712	701	560	402	1014	1047	502	187	298	143
		Purse seine	276	0	0	0	54	46	462	24	213	458	323	828	692	726	1147	150	884	490	1078	871	332	0	0	0	1
		Sport (HL+RR)	1	3	1	2	1	0	0	0	0	0	0	162	28	33	126	61	63	109	87	11	4	10	6	2	25
		Traps	1057	1040	2624	1478	2234	1522	1365	1631	1630	1152	1921	3982	3185	2859	2996	3585	3235	2082	1978	2408	2588	3788	3166	3164	2292
	MED	Bait boat	0	0	0	0	25	148	158	48	0	206	5	4	11	4	0	0	1	9	17	5	0	0	0	0	
		Longline	678	799	1227	1121	1026	2869	2599	2342	7048	8475	8171	5672	2749	2463	3317	3750	2614	2476	2564	3101	2202	2656	2254	1213	922
		Other surf.	3544	2762	2870	3289	1212	1401	1894	1607	3218	1043	1197	1037	1880	2976	1067	1096	990	2536	1106	480	301	699	1022	169	411
		Purse seine	9333	8857	11198	9450	11250	13245	17807	19297	26083	23588	26021	24178	21291	14910	16195	17174	17656	17167	18785	22475	20020	22952	12641	11345	4984
		Sport (HL+RR)	322	433	838	457	1552	738	951	1237	2257	3556	2149	2340	1336	1622	1921	1321	1647	1392	1340	634	503	78	137	146	351
		Traps	683	913	1034	1311	2142	1471	821	370	1204	772	601	385	1074	852	739	1177	515	221	159	115	129	95	152	144	281
	ATW	Longline	764	1138	1373	698	739	895	674	696	539	466	547	382	764	914	858	610	730	186	644	425	565	420	606	366	529
		Other surf.	166	156	425	755	536	578	509	406	307	384	432	293	342	281	284	202	108	140	97	89	85	63	82	121	107
		Purse seine	360	367	383	385	384	237	300	295	301	249	245	250	249	248	275	196	208	265	32	178	4	28	0	11	
		Sport (HL+RR)	518	726	601	786	1004	1083	586	854	804	1114	1029	1181	1108	1124	1120	1649	2035	1398	1139	924	1005	1023	1130	1251	1009
		Traps	0	17	14	1	2	0	1	29	79	72	90	59	68	44	16	16	28	84	32	8	3	4	23	23	39
Discards	ATW	Longline	514	99	102	119	115	128	211	88	83	138	167	155	123	160	222	105	211	232	181	131	149	100	159	207	147
		Other surf.	0	0	0	14	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Sport (HL+RR)	0	0	0	0	0	0	0	0	0	0	0	14	3	0	0	6	0	0	0	0	0	0	0	0	
Landings	ATE	Cape Verde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		China P.R.	0	0	0	0	0	0	0	0	0	0	0	0	85	103	80	68	39	19	41	24	42	72	119	42	4
		Chinese Taipei	197	20	0	109	0	0	0	6	20	8	61	226	350	222	144	304	158	0	0	10	4	0	0	0	**0**
		EU.Denmark	0	0	1	0	0	0	0	37	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	
		EU.España	2876	2479	4567	3565	3557	2272	2319	5078	3137	3819	6174	6201	3800	3360	3474	3633	4089	2138	2801	3102	2033	3276	2938	2409	1550
		EU.France	348	533	724	460	510	565	894	1099	336	725	563	269	613	588	542	629	755	648	561	818	1218	629	253	366	228
		EU.Germany	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.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	
		EU.Ireland	0	0	0	0	0	0	0	0	0	0	0	14	21	52	22	8	15	3	1	1	2	1	1	1	2
		EU.Poland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Portugal	193	163	48	3	27	117	38	25	240	35	199	712	323	411	441	404	186	61	27	79	97	29	36	53	58
		EU.Sweden	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.United Kingdom	0	0	0	0	0	0	0	0	0	1	0	1	1	12	0	0	0	0	0	0	0	0	0	1	
		Faroe Islands	0	0	0	0	0	0	0	0	0	0	0	0	67	104	118	0	0	0	0	0	0	0	0	0	
		Guinée Conakry	0	0	0	0	0	0	0	0	330	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Iceland	0	0	0	0	0	0	0	0	0	0	0	0	2	27	0	0	1	0	0	0	0	0	0	0	**0**
		Japan	739	900	1169	838	1464	2981	3350	2484	2075	3971	3341	2905	3195	2690	2895	2425	2536	2695	2015	2598	1896	1612	2351	1904	1155
		Korea Rep.	0	0	0	0	0	0	0	0	4	205	92	203	0	0	6	1	0	0	3	0	1	0	0	0	
		Libya	0	0	0	0	0	0	312	0	0	0	576	477	511	450	487	0	0	0	0	0	47	0	0	0	
		Maroc	288	356	437	451	408	531	562	415	720	678	1035	2068	2341	1591	2228	2497	2565	1797	1961	2405	2196	2418	1947	1909	1348
		NEI (ETRO)	4	0	5	6	74	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		NEI (Flag related)	0	0	0	0	0	85	144	223	68	189	71	208	66	0	0	0	0	0	0	0	0	0	0	0	
		Norway	31	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	**0**
		Panama	11	4	0	0	0	0	0	0	1	19	550	255	0	13	0	0	0	0	0	0	0	0	0	0	
		Seychelles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	
		Sierra Leone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	93	118	0	0	0	0	0	0	0	0	
		U.S.A.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

MED	Algerie	566	420	677	820	782	800	1104	1097	1560	156	156	157	1947	2142	2330	2012	1710	1586	1208	1530	1038	1511	1311	0		
	China P.R.	0	0	0	0	0	0	0	0	97	137	93	49	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	Chinese Taipei	0	0	0	0	0	0	0	328	709	494	411	278	106	27	169	329	508	445	51	267	5	0	0	0	0	**0**
	Croatia	0	0	0	0	0	1418	1076	1058	1410	1220	1360	1105	906	970	930	903	977	1139	828	1017	1022	825	834	619	389	
	EU.Cyprus	10	10	10	10	10	10	10	14	10	10	10	10	21	31	61	85	91	79	105	149	110	1	132	2	3	
	EU.España	701	1178	1428	1645	1822	1392	2165	2018	2741	4607	2588	2209	2000	2003	2772	2234	2215	2512	2353	2758	2689	2414	2465	1769	1056	
	EU.France	3490	4330	5780	4434	4713	4620	7376	6995	11843	9604	9171	8235	7122	6156	6794	6167	5832	5859	6471	8638	7663	10157	2670	3087	1754	
	EU.Greece	131	156	159	182	201	175	447	439	886	1004	874	1217	286	248	622	361	438	422	389	318	255	285	350	373	224	
	EU.Italy	7576	4607	4201	4317	4110	3783	5005	5328	6882	7062	10006	9548	4059	3279	3845	4377	4628	4973	4686	4841	4695	4621	2234	2735	1053	
	EU.Malta	41	36	24	29	81	105	80	251	572	587	399	393	407	447	376	219	240	255	264	346	263	334	296	263	136	
	EU.Portugal	0	0	0	0	0	278	320	183	428	446	274	37	54	76	61	64	0	2	0	0	11	0	0	0		
	Iceland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	**0**
	Israel	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Japan	341	280	258	127	172	85	123	793	536	813	765	185	361	381	136	152	390	316	638	378	556	466	80	18	**0**	
	Korea Rep.	0	0	0	0	0	0	0	0	684	458	591	410	66	0	0	0	0	0	700	1145	26	276	335	102	**0**	
	Libya	300	300	300	84	328	370	425	635	1422	1540	812	552	820	745	1063	1941	638	752	1300	1091	1280	1358	1318	1082	645	
	Maroc	56	116	140	295	1149	925	205	79	1092	1035	586	535	687	636	695	511	421	760	819	92	190	641	531	369	205	
	NEI (Flag related)	0	0	0	0	0	0	0	0	427	639	171	1066	825	140	17	0	0	0	0	0	0	0	0	0		
	NEI (MED)	168	183	633	757	360	1799	1398	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	NEI (combined)	0	0	0	0	0	0	0	0	773	211	0	101	1030	1995	109	571	508	610	709	0	0	0	0	0		
	Panama	0	72	67	0	74	287	484	467	1499	1498	2850	236	0	0	0	0	0	0	0	0	0	0	0	0		
	Serbia & Montenegro	0	0	0	0	0	0	0	0	0	2	4	0	0	0	4	0	0	0	0	0	0	0	0	0		
	Syria Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	41	0	34	
	Tunisie	315	456	624	661	406	1366	1195	2132	2773	1897	2393	2200	1745	2352	2184	2493	2528	791	2376	3249	2545	2622	2679	1932	1042	
	Turkey	69	972	1343	1707	2059	2459	2817	3084	3466	4220	4616	5093	5899	1200	1070	2100	2300	3300	1075	990	806	918	879	665	409	
	Yugoslavia Fed.	796	648	1523	560	940	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
ATW	Argentina	0	2	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Brasil	0	2	0	2	1	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0	**0**
	Canada	73	83	393	619	438	485	443	459	392	576	597	503	595	576	549	524	604	557	537	600	733	491	575	530	505	
	Chinese Taipei	3	4	0	20	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	Cuba	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	74	11	19	27	19	0	0	0		
	EU.Poland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	FR.St Pierre et Miquelon	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	3	1	10	5	0	4	3	2	8	
	Japan	584	960	1109	468	550	688	512	581	427	387	436	322	691	365	492	506	575	57	470	265	376	277	492	162	353	
	Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	52	0	0	0		
	Mexico	0	0	0	0	0	0	0	0	4	0	19	2	8	14	29	10	12	22	9	10	14	7	7	10	14	
	NEI (ETRO)	0	0	0	30	24	23	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	NEI (Flag related)	0	0	0	0	0	0	0	0	0	0	2	0	0	429	270	49	0	0	0	0	0	0	0	0		
	Norway	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	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		
	Sta. Lucia	0	1	3	2	14	14	14	2	43	9	3	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Trinidad and Tobago	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	U.S.A.	1142	1352	1289	1483	1636	1582	1085	1237	1163	1311	1285	1334	1235	1213	1212	1583	1840	1426	899	717	468	758	764	1068	803	
	UK.Bermuda	0	0	0	0	0	0	0	0	0	0	1	2	2	1	1	1	1	0	0	0	0	0	0	0		
	Uruguay	6	0	2	0	0	1	0	1	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0		
Discards	ATW	Canada	0	0	0	14	0	0	0	0	0	0	0	6	16	11	46	13	37	14	15	0	2	0	1	3	25
		Japan	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	
		U.S.A.	514	99	102	119	115	128	211	88	83	138	171	155	110	149	176	98	174	218	167	131	147	100	158	204	122

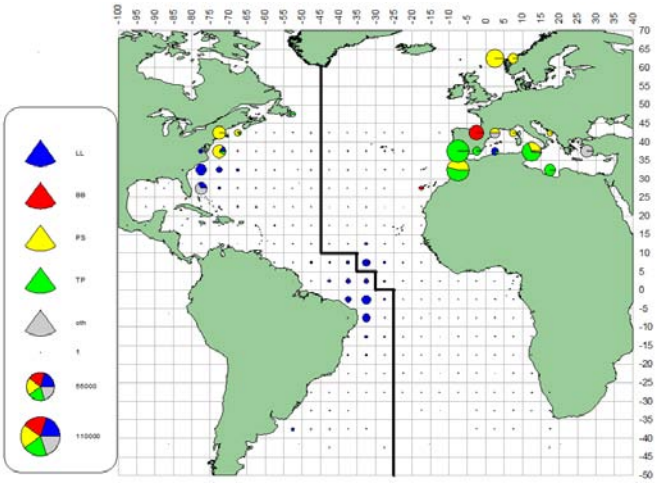
Canada discards in 2010 (25 t) includes an estimated post-release mortality of 7.5 t from catch and release fisheries and scientific tagging.
China P.R. 2010 catches will change to 38. t (mistakenly reported as 3.8 t).

BFTE-Table 1. Probabilities of stock rebuilding at $SSB_{F0.1}$ by years and TAC levels (the probabilities combined the results obtained from the stochastic runs over the 24 scenarios being investigated). The difference in grey colour underlines the catch (TAC) at which the 60% probability would not be anymore achieved.

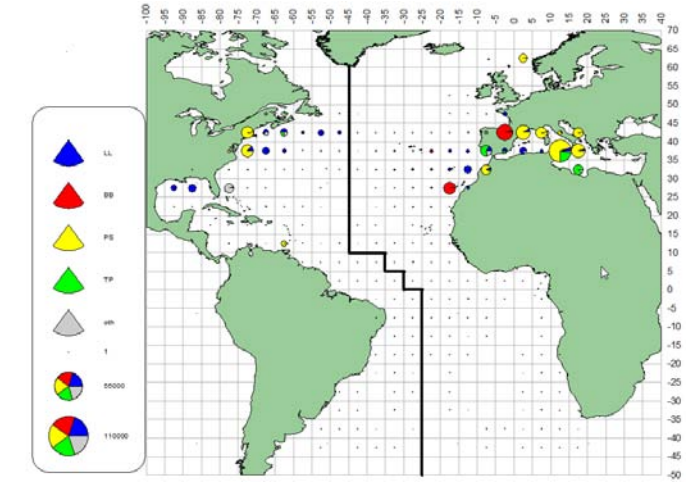
TAC	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
0	0%	0%	0%	2%	6%	14%	25%	38%	52%	69%	89%	98%	99%
2000	0%	0%	0%	1%	5%	12%	21%	33%	46%	62%	83%	97%	99%
4000	0%	0%	0%	1%	4%	9%	18%	28%	40%	55%	75%	93%	99%
6000	0%	0%	0%	1%	3%	7%	14%	23%	34%	47%	66%	86%	97%
8000	0%	0%	0%	0%	2%	6%	11%	19%	29%	40%	56%	77%	92%
10000	0%	0%	0%	0%	2%	4%	9%	15%	23%	33%	46%	65%	84%
12000	0%	0%	0%	0%	1%	3%	6%	11%	18%	26%	37%	53%	73%
13500	0%	0%	0%	0%	1%	2%	5%	9%	14%	21%	30%	45%	63%
14000	0%	0%	0%	0%	1%	2%	4%	8%	13%	20%	28%	42%	59%
16000	0%	0%	0%	0%	0%	1%	3%	6%	9%	14%	20%	31%	46%
18000	0%	0%	0%	0%	0%	1%	2%	4%	6%	10%	15%	22%	34%
20000	0%	0%	0%	0%	0%	0%	1%	2%	4%	6%	10%	15%	24%



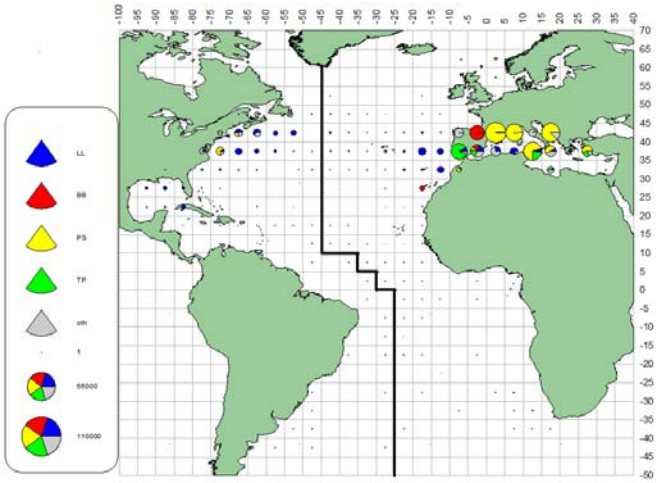
a. BFT(1950-59)



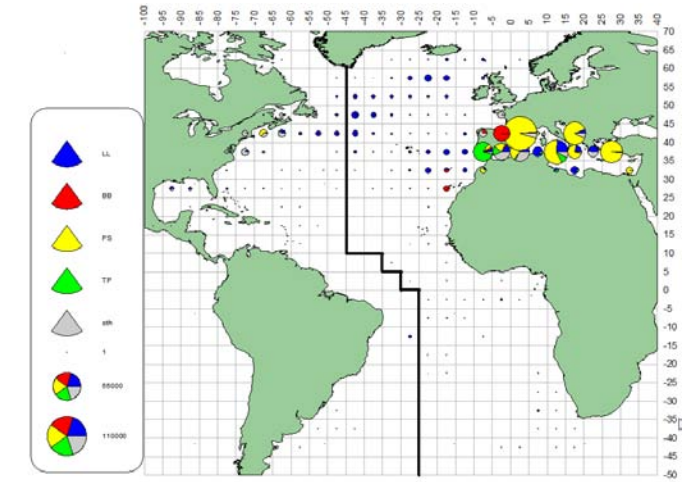
b. BFT(1960-69)



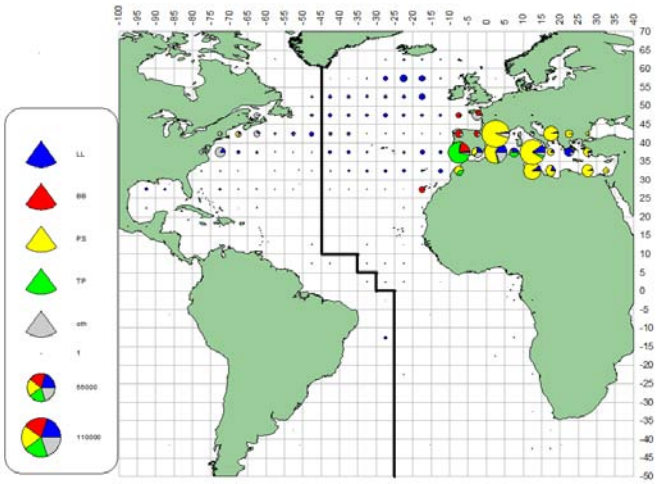
c. BFT(1970-79)



d. BFT(1980-89)

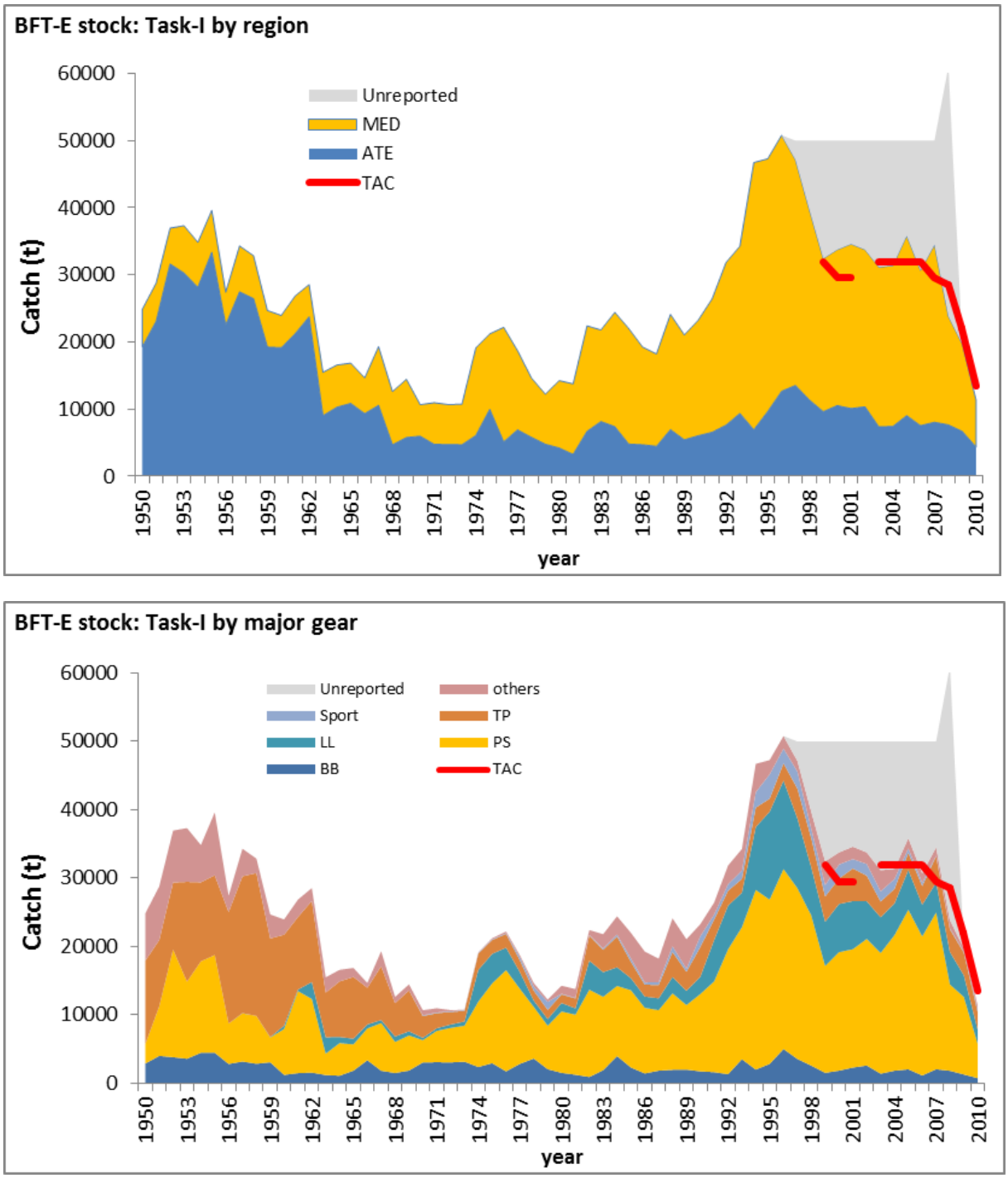


e. BFT (1990-99)

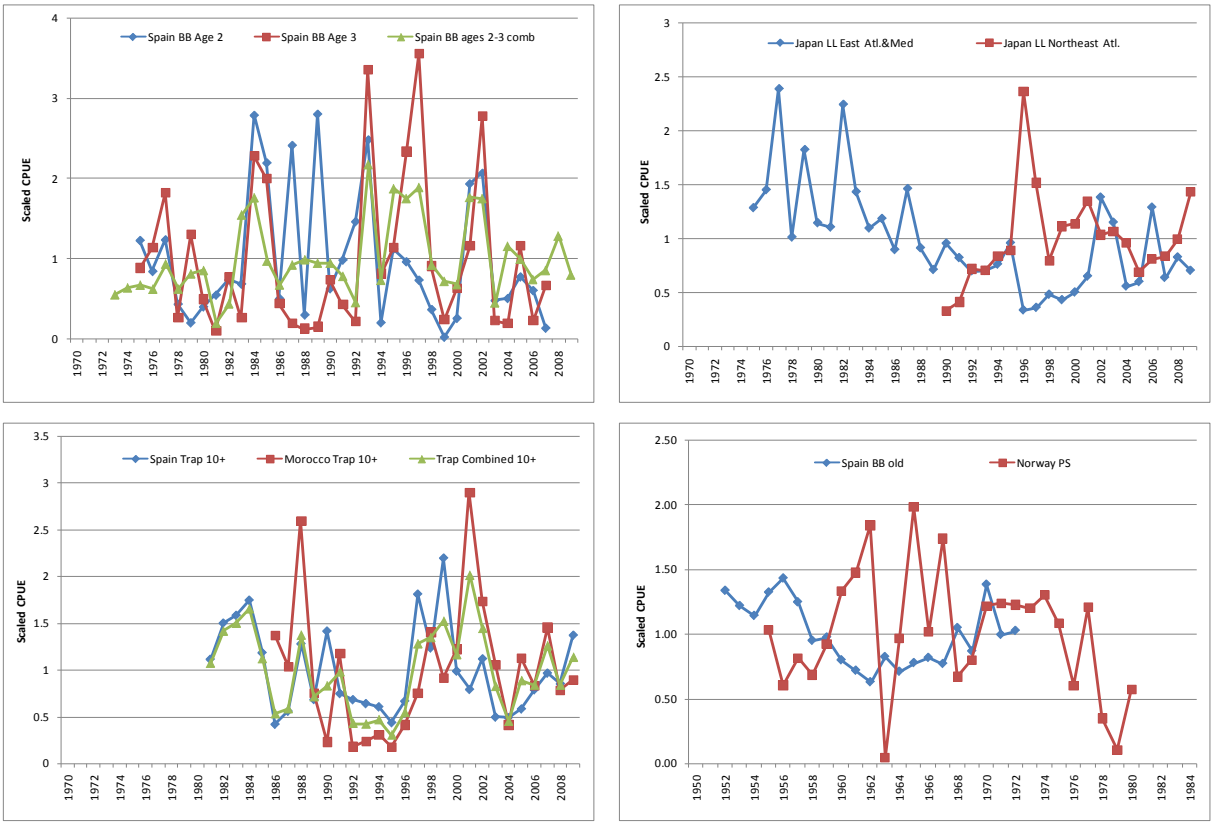


f. BFT (2000-09)

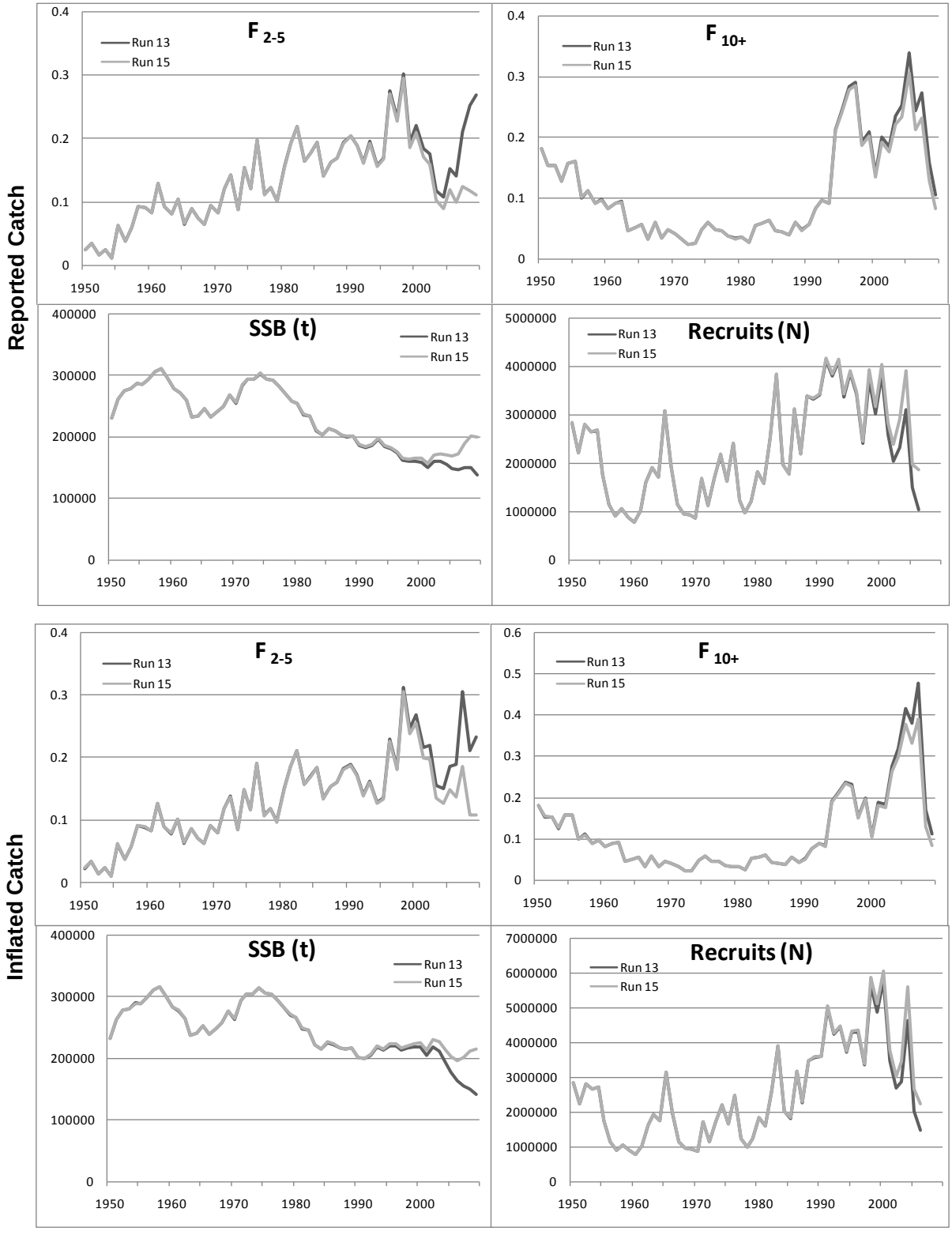
BFT-Figure 1. Geographic distribution of bluefin tuna catches per 5x5 degrees and per main gears.



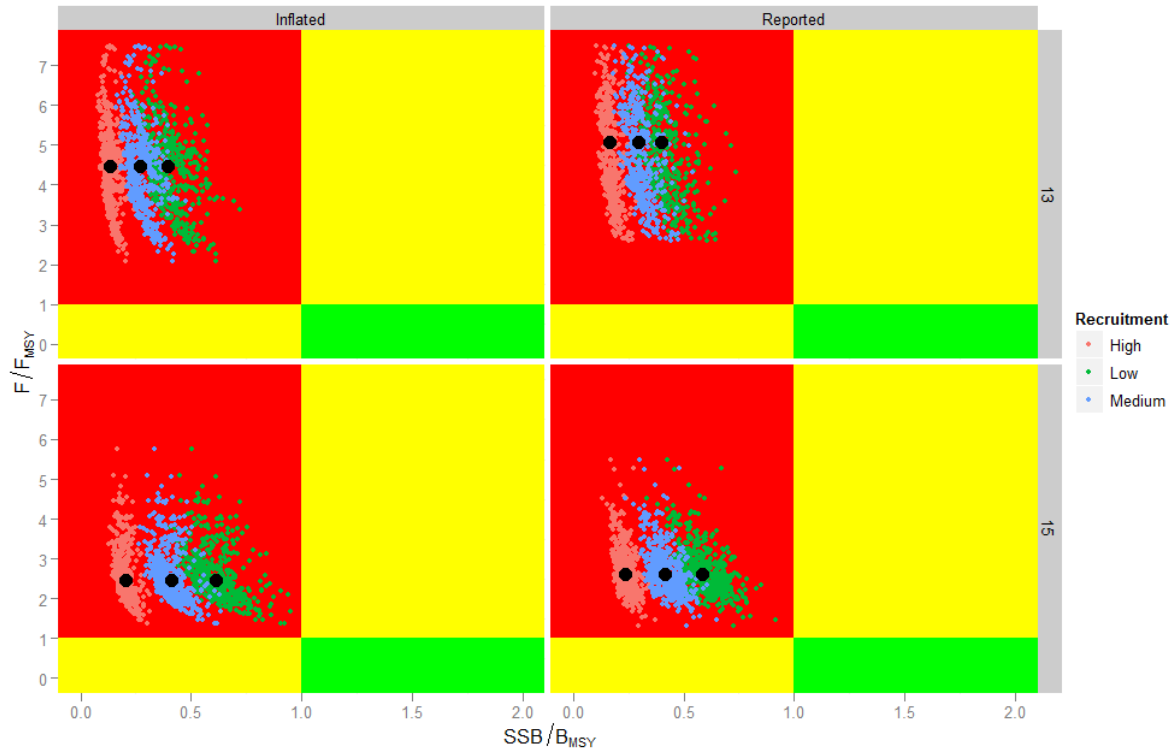
BFTE-Figure 1. Reported catch for the East Atlantic and Mediterranean from Task I data from 1950 to 2010 split by main geographic areas (top panel) and by gears (bottom panel) together with unreported catch estimated by the Committee (using from fishing capacity and mean catch rates over the last decade) and TAC levels since 1999.



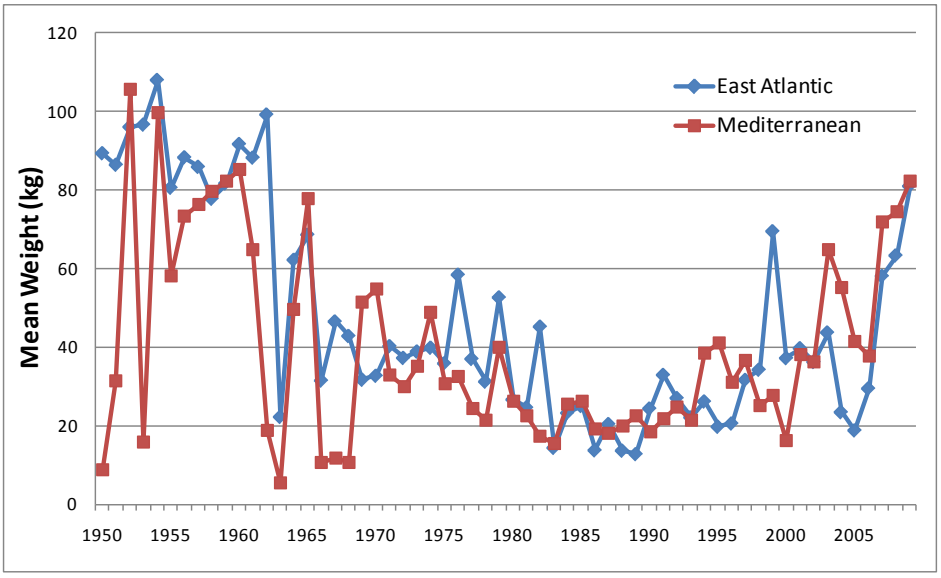
BFTE-Figure 2. Plots of the CPUE time series fishery indicators for the East Atlantic and Mediterranean bluefin tuna stock used in the 2010 stock assessment. All the CPUE series are standardized series except the nominal Norway PS index.



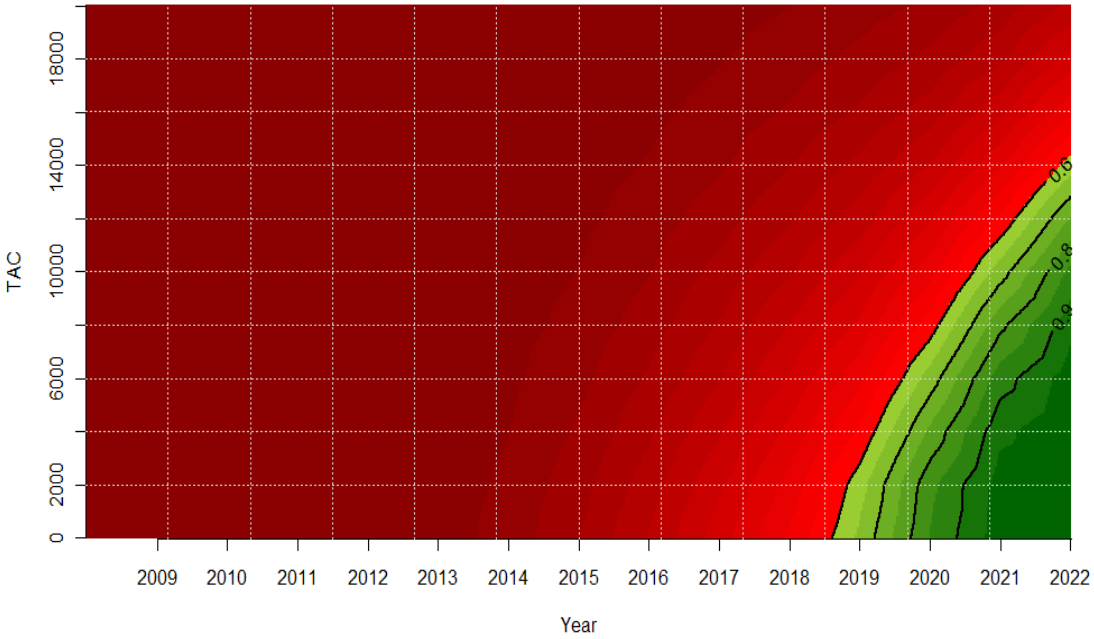
BFTE-Figure 3. Fishing mortality (for ages 2 to 5 and 10+), spawning stock biomass (in tonnes) and recruitment (in number of fish) estimates from VPA runs 13 and 15. Top panel: reported catch; bottom panel: inflated catch.



BFTE-Figure 4. Stock status in the terminal year (2009) estimated from VPA runs 13 and 15 with reported and inflated catch and considering low, medium and high recruitment levels. White dots represent the distribution of the terminal year obtained through bootstrapping.



BFTE-Figure 5. Plots of the annual mean weight from the catch-at-size data per main area from 1950 to 2009.



BFTE-Figure 6. Probabilities plot of stock rebuilding at $SSB_{F0.1}$ by years and TAC levels (the probabilities combined the results obtained from the stochastic runs over the 24 scenarios being investigated). According to Rec.[09.06], red area corresponds to probabilities < 60% while green area corresponds to probabilities > 60%. Contours for 60%, 70%, 80% and 90% probabilities are further displayed by black lines.

BFTW-Table 1. Kobe II matrices giving the probability that the spawning stock biomass (SSB) will exceed the level that will produce MSY in any given year for various constant catch levels under the low recruitment, high recruitment, and combined scenarios.

Low recruitment scenario (two-line)

TAC	2011	2012	2013	2014	2015	2016	2017	2018	2019
0 mt	67.8%	98.4%	99.4%	99.4%	99.8%	100.0%	100.0%	100.0%	100.0%
250 mt	66.8%	98.2%	98.8%	98.8%	99.8%	99.8%	100.0%	100.0%	100.0%
500 mt	66.0%	98.0%	98.8%	98.8%	99.0%	99.8%	99.8%	100.0%	100.0%
750 mt	65.6%	97.4%	98.4%	98.0%	98.8%	99.0%	99.4%	99.6%	100.0%
1000 mt	64.6%	97.0%	97.6%	97.0%	98.2%	98.8%	99.0%	99.0%	99.4%
1250 mt	63.8%	96.4%	97.0%	96.2%	97.8%	98.2%	98.4%	98.4%	98.8%
1500 mt	63.2%	96.2%	96.4%	95.2%	95.8%	97.0%	97.6%	97.4%	97.6%
1750 mt	61.6%	95.2%	95.4%	93.2%	93.6%	94.0%	94.4%	95.0%	95.8%
2000 mt	60.6%	94.8%	94.6%	90.4%	91.0%	91.8%	92.0%	92.4%	92.6%
2250 mt	59.6%	94.4%	93.2%	87.4%	87.8%	86.8%	86.4%	86.6%	86.2%
2500 mt	58.8%	93.2%	91.4%	84.2%	81.8%	81.2%	81.2%	78.6%	78.2%
2750 mt	57.6%	92.8%	88.6%	78.4%	76.4%	74.0%	73.4%	69.6%	68.0%
3000 mt	56.4%	91.2%	86.4%	74.0%	69.0%	66.2%	62.4%	59.8%	56.8%
3250 mt	54.6%	89.6%	83.2%	68.2%	62.2%	57.4%	53.0%	48.2%	44.0%
3500 mt	54.2%	87.2%	79.0%	61.4%	55.4%	49.0%	43.6%	38.2%	34.0%

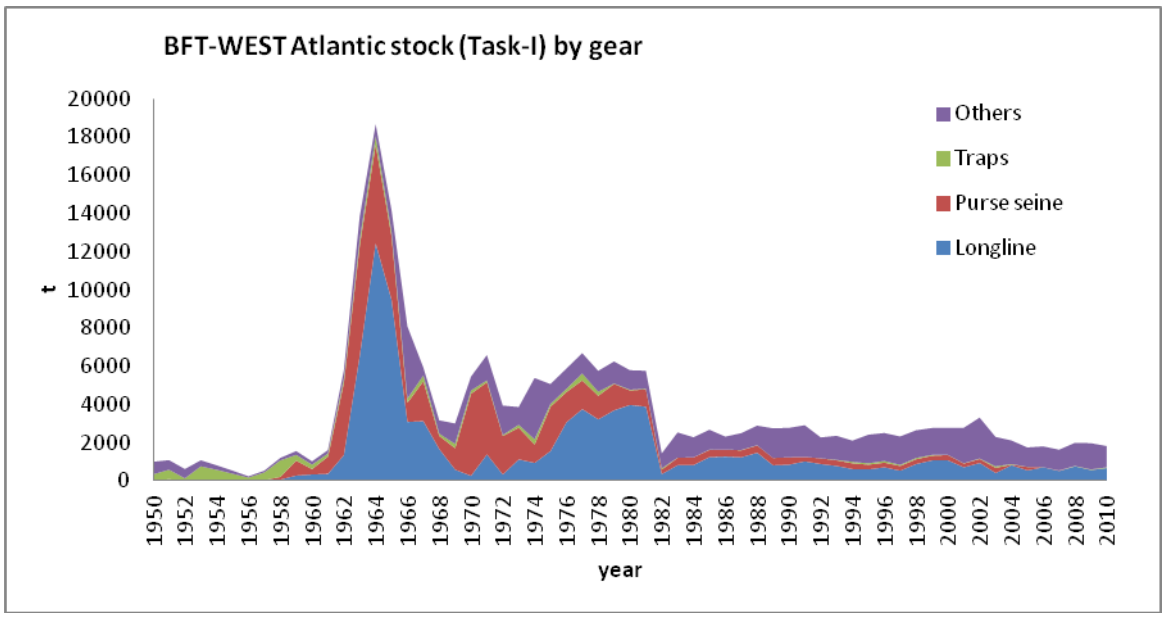
High recruitment scenario (Beverton-Holt)

TAC	2011	2012	2013	2014	2015	2016	2017	2018	2019
0 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
250 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
500 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
750 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1000 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1250 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1500 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1750 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2000 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2250 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2500 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2750 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3000 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3250 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3500 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

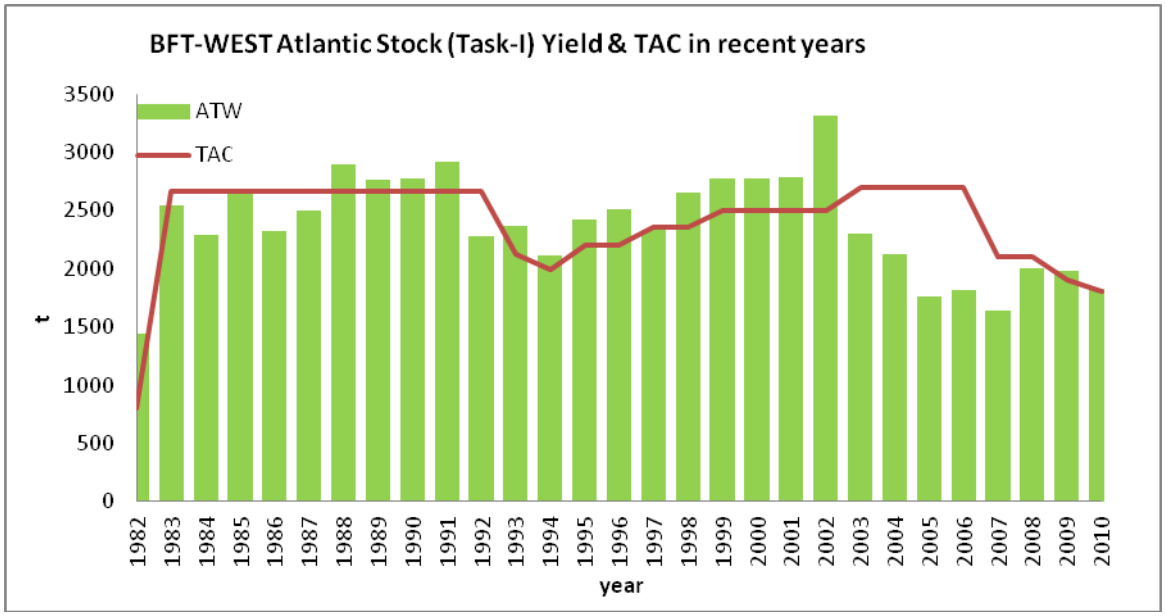
Combined recruitment scenarios (low and high equally probable)

TAC	2011	2012	2013	2014	2015	2016	2017	2018	2019
0 mt	33.9%	49.2%	49.7%	49.7%	49.9%	50.0%	50.0%	50.0%	50.0%
250 mt	33.4%	49.1%	49.4%	49.4%	49.9%	49.9%	50.0%	50.0%	50.0%
500 mt	33.0%	49.0%	49.4%	49.4%	49.5%	49.9%	49.9%	50.0%	50.0%
750 mt	32.8%	48.7%	49.2%	49.0%	49.4%	49.5%	49.7%	49.8%	50.0%
1000 mt	32.3%	48.5%	48.8%	48.5%	49.1%	49.4%	49.5%	49.5%	49.7%
1250 mt	31.9%	48.2%	48.5%	48.1%	48.9%	49.1%	49.2%	49.2%	49.4%
1500 mt	31.6%	48.1%	48.2%	47.6%	47.9%	48.5%	48.8%	48.7%	48.8%
1750 mt	30.8%	47.6%	47.7%	46.6%	46.8%	47.0%	47.2%	47.5%	47.9%
2000 mt	30.3%	47.4%	47.3%	45.2%	45.5%	45.9%	46.0%	46.2%	46.3%
2250 mt	29.8%	47.2%	46.6%	43.7%	43.9%	43.4%	43.2%	43.3%	43.1%
2500 mt	29.4%	46.6%	45.7%	42.1%	40.9%	40.6%	40.6%	39.3%	39.1%
2750 mt	28.8%	46.4%	44.3%	39.2%	38.2%	37.0%	36.7%	34.8%	34.0%
3000 mt	28.2%	45.6%	43.2%	37.0%	34.5%	33.1%	31.2%	29.9%	28.4%
3250 mt	27.3%	44.8%	41.6%	34.1%	31.1%	28.7%	26.5%	24.1%	22.0%
3500 mt	27.1%	43.6%	39.5%	30.7%	27.7%	24.5%	21.8%	19.1%	17.0%

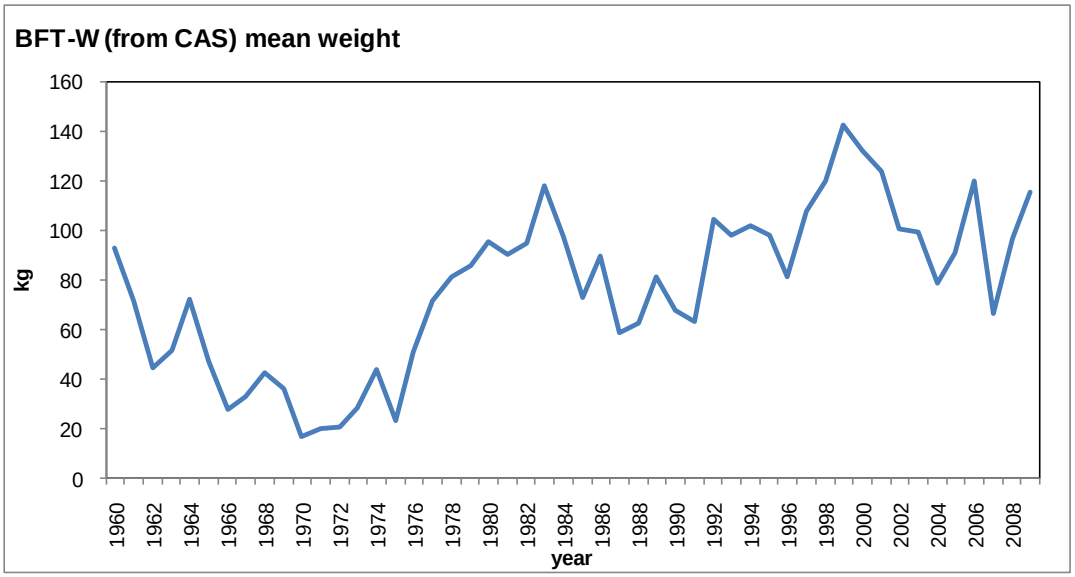
(a)



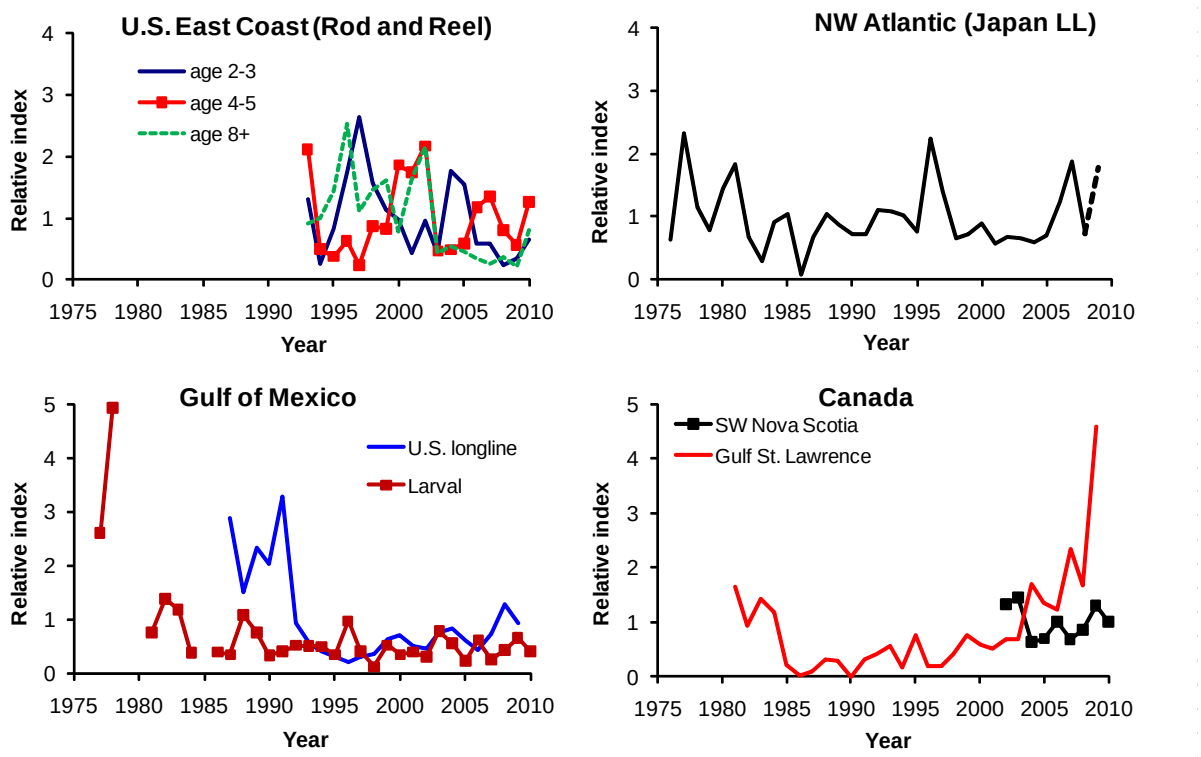
(b)



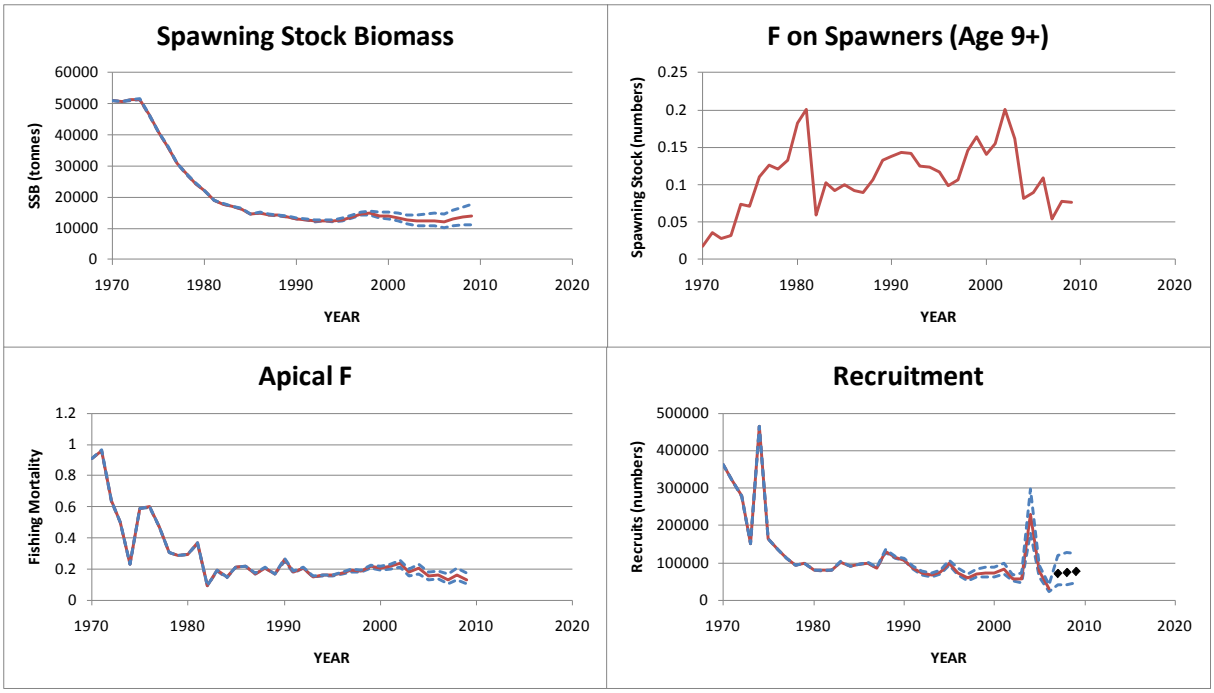
BFTW-Figure 1. Historical catches of western bluefin tuna: (a) by gear type and (b) in comparison to TAC levels agreed by the Commission.



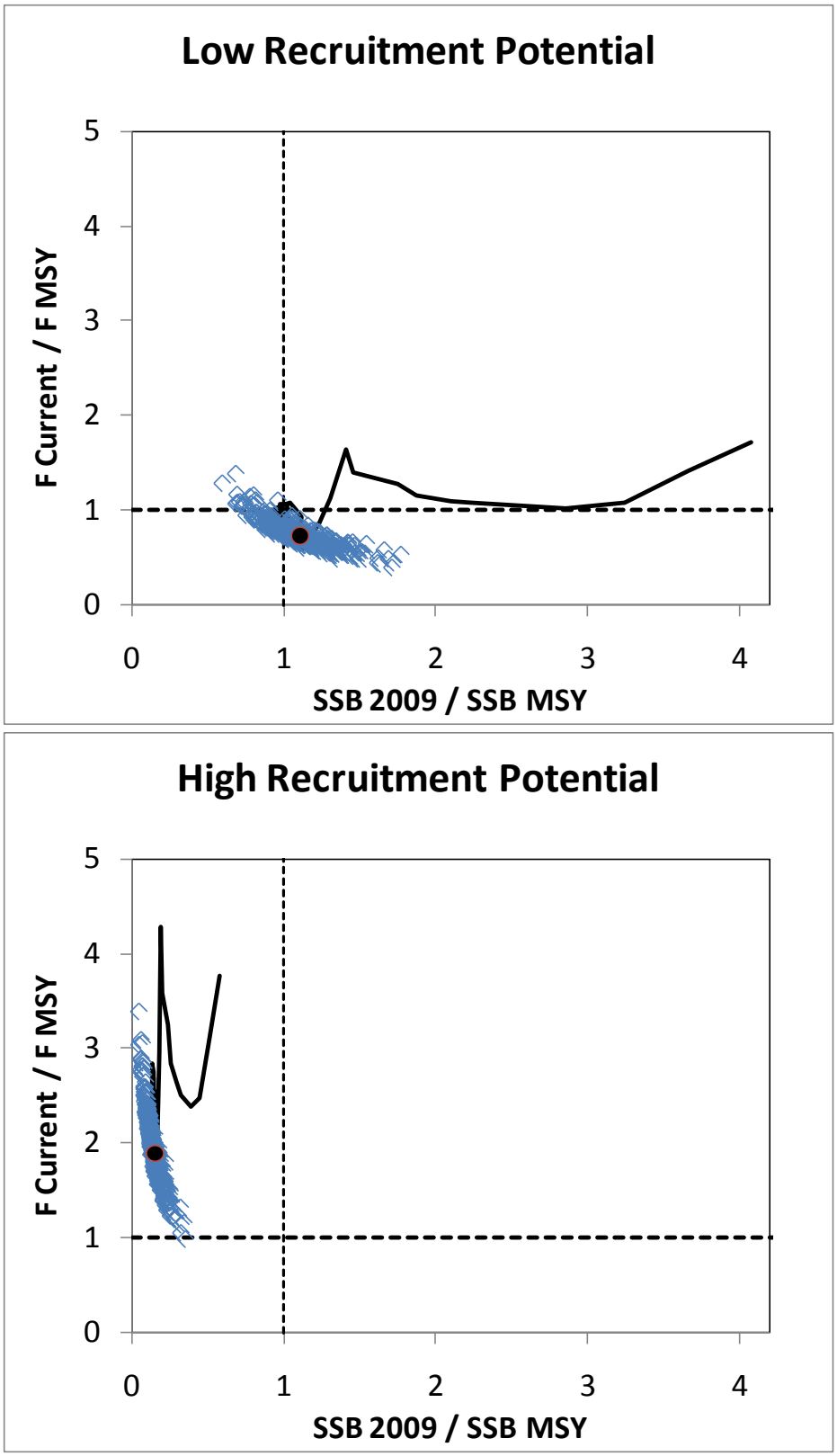
BFTW-Figure 2. Historical average weight of bluefin tuna caught by fisheries operating in the western management area.



BFTW-Figure 3. Updated indices of abundance for western bluefin tuna. The dashed portion of the Japanese longline series represents the trend estimated in 2009, which was considered unreliable by the 2010 SCRS. The values for 2010 were considered too preliminary to be shown for the series representing Japanese longline, U.S. longline (Gulf of Mexico), and Canada Gulf of St. Lawrence.

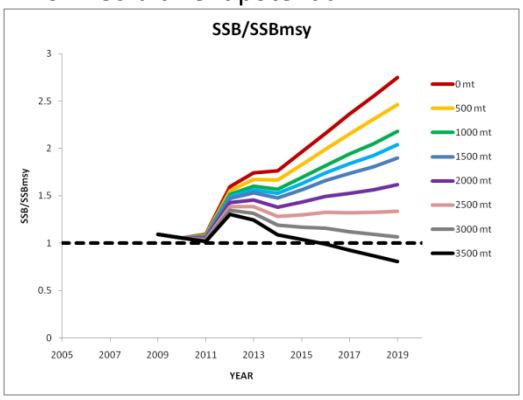


BFTW-Figure 4. Median estimates of spawning biomass (age 9+), fishing mortality on spawners, apical fishing mortality (F on the most vulnerable age class) and recruitment for the base VPA model. The 80% confidence intervals are indicated with dotted lines. The recruitment estimates for the last three years of the VPA are considered unreliable and have been replaced by the median levels corresponding to the low recruitment scenario.

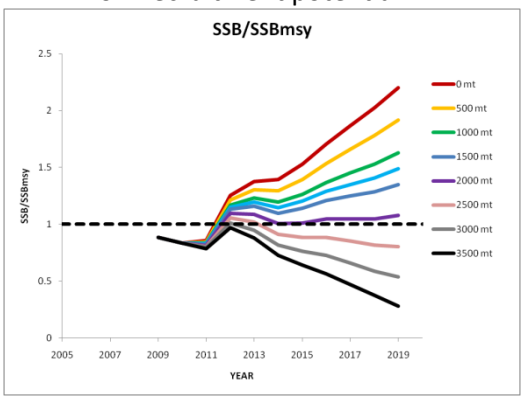


BFTW-Figure 5. Estimated status of stock relative to the Convention objectives (MSY) by year (1970 to 2009). The lines give the time series of point estimates for each recruitment scenario and the cloud of symbols depicts the corresponding bootstrap estimates of uncertainty for the most recent year. The large black circle represents the status estimated for 2009.

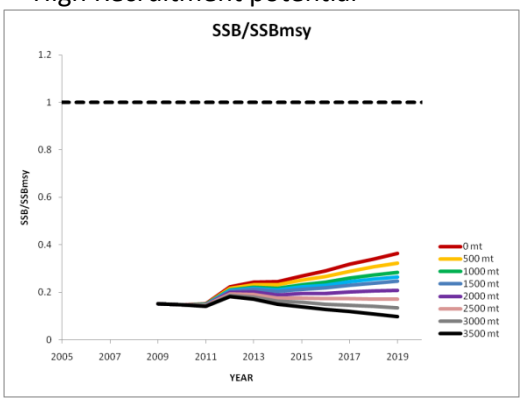
A) 50% probability
Low recruitment potential



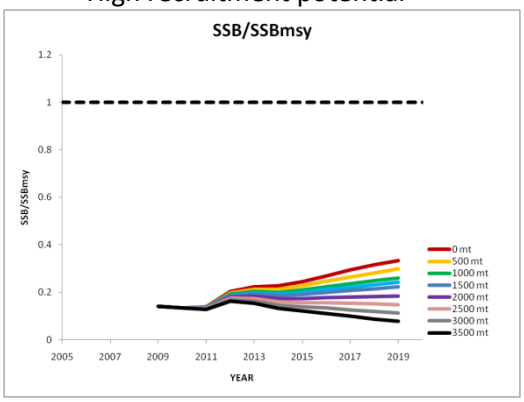
B) 60% probability
Low recruitment potential



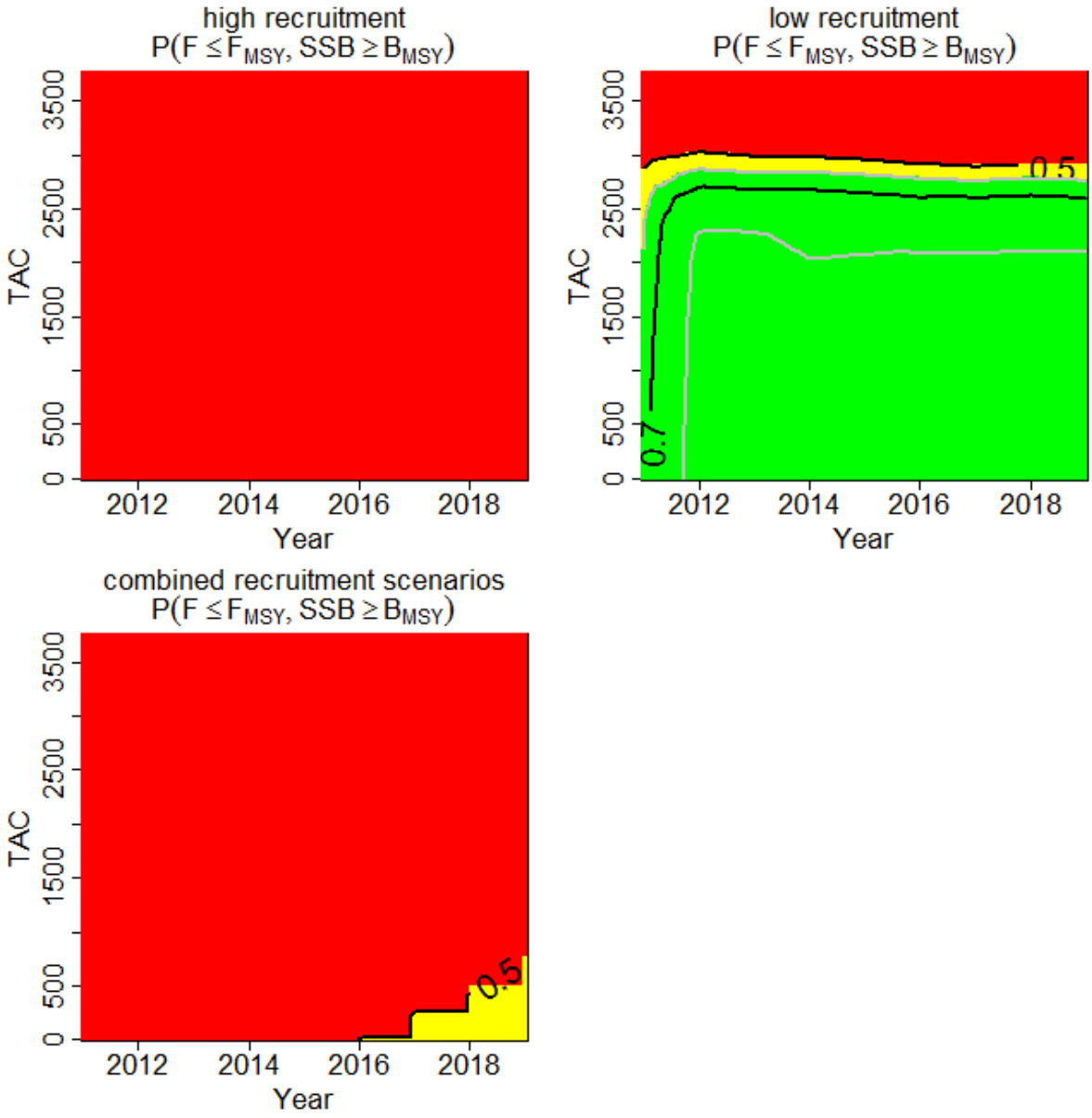
C) 50% probability
High Recruitment potential



D) 60% probability
High recruitment potential



BFTW-Figure 6. Projections of spawning stock biomass (SSB) for the Base Case assessment under low recruitment potential (top panels) and high recruitment potential (bottom panels) and various levels of constant catch. The labels "50%" and "60%" refer to the probability that the SSB will be greater than or equal to the values indicated by each curve. The curves corresponding to each catch level are arranged sequentially in the same order as the legends. A given catch level is projected to have a 50% or 60% probability of meeting the convention objective (SSB greater than or equal to the level that will produce the MSY) in the year that the corresponding curve meets the dashed horizontal line.



BFTW-Figure 7. Kobe II matrices giving the chance that the spawning stock biomass (SSB) will exceed the level that will produce MSY in any given year under various constant catch levels for the Base Case assessment under the low recruitment, high recruitment, and combined scenarios. The red, yellow and green regions represent chances of less than 50%, 50-59% and 60% or better, respectively.

8.6 BLUE MARLIN AND WHITE MARLIN

The most recent assessment for blue marlin was conducted in 2011 through a process that included a data preparatory meeting in May 2010 (Anon. 2011e) and an assessment meeting in April (SCRS/2011/013). The last year of fishery data used in the assessment was 2009.

BUM/WHM-1. Biology

The central and northern Caribbean Sea and northern Bahamas have historically been known as the primary spawning area for blue marlin in the western North Atlantic. Recent reports show that blue marlin spawning can also occur north of the Bahamas in an offshore area near Bermuda at about 32º-34º North. Ovaries of female blue marlin caught by artisanal vessel in Côte d'Ivoire show evidence of pre-spawning and post-spawning, but not of spawning. In this area females are more abundant than males (4:1 female/male ratio). Coastal areas off West Africa have strong seasonal upwelling, and may be feeding areas for blue marlin.

Previous reports have mentioned spawning of white marlin off southeast Brazil (25º to 26ºS and 45º to 45ºW) in the same area where blue marlin spawn. In this area blue marlin spawn from April to June and white marlin spawn from December to March. In the northwest Atlantic white marlin have been reported spawning in the Gulf of Mexico in June. Recent reports confirm that white marlin also spawns offshore and north of the Antilles (19º to 23ºN and 60º to 70ºW) between April and July.

Atlantic blue marlin inhabit the upper parts of the open ocean. Although they spend much of the time on the upper mixed layer they dive regularly to maximum depths of around 300 m, with some vertical excursions down to 800m. They do not confine themselves to a narrow range of temperatures but most tend to be found in waters warmer than 17°C. The distributions of times at depth are significantly different between day and night. At night, the fish spent most of their time at or very close to the surface. During daylight hours, they are typically below the surface, often at 40 to 100+ m. These patterns, however, can be highly variable between individuals and also vary depending on the temperature and dissolved oxygen of the surface mixed layer. This variability in the use of habitat by marlins indicates that simplistic assumptions about habitat usage made during the standardization of CPUE data may be inappropriate.

All biological material sampled to date from white marlin, prior to the confirmation of the existence of roundscale spearfish (*T. georgii*) in 2006, contains unknown mixture of the roundscale spearfish and white marlin. Therefore reproductive parameters, growth curves and other biological studies previously thought to describe white marlin may not exclusively represent this species.

BUM/WHM-2. Fishery indicators

It has now been confirmed that white marlin landings reported to ICCAT include roundscale spearfish in significant numbers, so that historical statistics of white marlin include a mixture of both species. Studies of white marlin/roundscale spearfish ratios have been conducted, with overall estimated ratios between 23-27%. Previously, these were thought to represent only white marlin. In some areas, however, only one species is present in these samples.

The decadal geographic distribution of the catches is given in **BUM/WHM-Figure 1**. The Committee used Task I catches as the basis for the estimation of total removals **(BUM/WHM-Figure 2)**. Total removals for the period 1990-2009 were obtained during the 2011 Blue Marlin Stock Assessment Session and the White Marlin Data Preparatory Meeting (SCRS/2011/013) by modifying Task I values with the addition of blue marlin and white marlin that the Committee estimated from catches reported as billfish unclassified. Additionally the reporting gaps were filled with estimated values for some fleets.

During the 2011 blue marlin assessment it was noted that catches continued to decline through 2009, while catches of white marlin seemed to be stabilizing. Over the last 20 years, Antillean artisanal fleets have increased the use of Moored Fish Aggregating Devices (MFADs) to capture pelagic fish. Catches of blue marlin caught around MFADs are known to be significant and increasing in some areas, however reports to ICCAT on these catches are incomplete. Even though catches from the Antillean artisanal fleets were included in the stock assessment, additional documentation of past and present Task I catches from these fisheries is required. Recent reports from purse seine fleets in West Africa suggest that blue marlin are more commonly caught with tuna schools associated with FADs than with free tuna schools. Task I catches of blue marlin (**BUM/WHM-Table 1)** in 2010 were 3,160 t, compared to 3,240 t reported for 2009. Task I catches of white marlin in 2009 and 2010

were 644 t and 372 t, respectively (**BUM/WHM-Table 2)**. Task I catches of white marlin and blue marlin for 2010 are preliminary. Due to the work conducted by the Committee and improved reporting by CPCs the amount of unclassified billfish in the Task I table has been minimized.

A number of relative abundance indices were estimated during the blue marlin 2011 assessment and white marlin data preparatory meeting. However, given the apparent shift in landings from industrial to non-industrial fleets in recent times, it is imperative that CPUE indices are developed for all fleets that have substantial landings.

During the 2011 assessment, an estimated standardized combined CPUE index for blue marlin showed a sharp decline during the period 1960-1975, followed by a period of stabilization from about 1976 to 1995 and further decline thereafter (**BUM/WHM-Figure 3**).

A series of indices of abundance for white marlin were presented and discussed during the 2011 meetings. In general, the indices showed no discerning trend during the latter part of the time series examined (**BUM/WHM-Figure 4**).

BUM/WHM-3. State of the stocks

Blue marlin

Unlike the partial assessment of 2006 assessment, the Committee conducted a full assessment in 2011, which included estimations of management benchmarks. The results of the 2011 assessment indicated that the stock remains overfished and undergoing overfishing (**BUM/WHM-Figure 5**). This is in contrast to the results of the 2006 assessment which indicated that even though the stock was likely overfished, the declining trend had partially stabilized. Current status of the blue marlin stock is presented in **BUM-WHM Figure 6.** However, the Committee recognizes the high uncertainty with regard to data and the productivity of the stock.

White marlin

No new information on stock status has been provided since the 2006 assessment (Anon. 2007). The biomass for 2000-2004 most likely remained well below the B_{MSY} estimated in the 2002 assessment (Anon. 2003). During the last assessment, it was estimated that F 2004 was probably smaller than $F_{replacement}$ and also probably larger than the F_{MSY} estimated in the 2002 assessment. Over the period 2001-2004, combined longline indices and some individual fleet indices suggest that the decline has been at least partially reversed, while other individual fleet indices suggest that abundance has continued to decline. The next stock assessment (2012) may confirm if these recent apparent changes in trend have continued. During the 2011 data preparatory meeting, the Committee reviewed available information and concluded that the separation of historical landings of white marlin and roundscale spearfish can not be conducted. In addition, all historical indices of abundance of white marlin most likely included roundscale spearfish.

BUM/WHM-4. Outlook

Although uncertain, the results of the 2011 stock assessement indicated that if the recent catch levels of blue marlin (3,240 t in 2009) are not substantially reduced, the stock will continue to decline further (**BUM/WHM-Figure 7**). The current management plan does not have the potential of recovering the blue marlin stock to the B_{MSY} level.

No new information on the recovery/outlook for white marlin has been provided since the 2006 assessment (Anon. 2007). Based on the results of the 2006 stock assessment, the Committee noted that the Commission's current management plan has the potential of recovering the white marlin stock. However, this conclusion requires further confirmation based on the 2012 white marlin stock assessment.

Most recent catch per unit effort data for white marlin lacked any discernable trend.

The presence of unknown quantities of roundscale spearfish in the biological parameters, historical landings and relative abundance estimates of white marlin increase the uncertainty for the stock status and outlook for this species.

BUM/WHM-5. Effect of current regulations

Recommendations [Rec. 00-13], [Rec. 01-10] and [Rec. 02-13] placed additional catch restrictions for blue marlin and white marlin. The latter established that "*the annual amount of blue marlin that can be harvested by pelagic longline and purse seine vessels and retained for landing must be no more than 33% for white marlin and 50% for blue marlin of the 1996 or 1999 landing levels, whichever is greater*". That recommendation established that: "All blue marlin and white marlin brought to pelagic longline and purse seine vessels alive shall be released in a manner that maximizes their survival. The provision of this paragraph does not apply to marlins that are dead when brought along the side of the vessel and that are not sold or entered into commerce". The Committee estimated the catch of pelagic longline vessels for a subset of fleets that the Committee thought would be expected to be affected by Recommendations [Rec. 00-13] and [Rec. 02-13]. Catches of these fleets represent 97% of all longline caught blue marlin, and 93% of all longline caught white marlin for the period 1990-2007. Catches of both species have declined since 1996-99, the period selected as the reference period by the recommendations. Since 2002, the year of implementation of the last of these two recommendations, the catch of blue marlin has been below the 50% value recommended by the Commission. Specifically, the 2011 longline landings were 51% of the baseline established by the Commission. Similarly, the catch of white marlin since 2002 has been at about the 33% value recommended by the Commission. This analysis represents only longline caught marlin even though the recommendations referred to the combined catch of pelagic longline and purse seine, because the catch estimates of billfish bycatch from purse seine vessels are more uncertain than those from longline. Over the period considered, purse seine caught marlin represent 2% of the total catch reported by the combination of purse seine and pelagic longline.

The Committee notes that the management plan developed by the Commission was based on the fact that at that time most blue marlin and white marlin originated from industrial fisheries. Since then, the Committee noted a significant increase in the contribution from non-industrial fisheries to the total blue marlin and white marlin harvest and that these fisheries are not fully accounted for in the current management plan.

Some fisheries/fleets are using circle hooks, which can minimize deep hooking and increase the survival of marlins hooked on longlines and recreational gear. More countries have started reporting data on live releases in 2006. Additional information has come about, for some fleets, regarding the potential for modifying gears to reduce the by-catch and increase the survival of marlins. Such studies have also provided information on the rates of live releases for those fleets. However there is not enough information on the proportion of fish being released alive for all fleets, to evaluate the effectiveness of the ICCAT recommendation relating to the live release of marlins.

BUM/WHM-6. Management recommendations

The current blue marlin stock assessment, considering all the uncertainties in the assessment, indicates that the stock is below B_{MSY} and that fishing mortality is above F_{MSY} (2009). Unless the recent catch levels (3,240 t, 2009) are substantially reduced, the stock will likely continue to decline. The Commission should adopt a rebuilding plan for the stock of Atlantic blue marlin.

The Commission should implement management measures to immediately reduce fishing mortality on blue marlin stock by adopting a TAC that allow the stock to increase (2,000 t or less, including dead discards; **BUM/WHM-Table 2**):

1. To facilitate the implementation of the TAC, the commission may consider the adoption of measures such as, but not limited to:
   a) Total prohibition of landings of blue marlin from pelagic longline and purse seine fisheries to improve the effectiveness of current management measures.
   b) Encouraging the use of alternative gear configurations that reduce the likelihood of deep hooking therefore increasing the post-release survival (for example, circle hooks) and/or reduce catchability (e.g., reducing the number of shallowhooks in a longline set, etc).
   c) Implementation of time-area closures.
   d) Reduce fishing mortality of blue marlin from non-industrial fisheries.
2. Noting the misidentification problems between white marlin and spearfishes, the Group recommended that management recommendations combine these species as a mixed stock until more accurate species identification and differentiation of species catches are available.
3. The Commission should encourage the reporting of catches of white marlin and roundscale spearfish separated.

ATLANTIC BLUE MARLIN SUMMARY	
	BUM
Maximum Sustainable Yield	2,837 t (2,343 – 3,331 t)[1]
Current (2010) Yield	3,160 t[2]
Relative Biomass (SSB_{2009}/SSB_{MSY})	0.67 (0.53 – 0.81)[1]
Relative Fishing Mortality (F_{2009}/F_{MSY})	1.63 (1.11 – 2.16)[1]
Conservation and Management Measure in Effect	Recommendation [Rec. 06-09]. The annual amount of blue marlin that can be harvested by pelagic longline and purse seine vessels and retained for landing must be no more than 33% for white marlin and 50% for blue marlin of the 1996 or 1999 landing levels, whichever is greater.

[1] Stock Synthesis version 3.2.0.b model results. Values correspond to median estimates, 95% confidence interval values are provided in parenthesis.
[2] 2010 yield should be considered provisional. 2009 yield corresponded to 3,240 t. The 2009 yield used in the 2011 assessment was 3,341 t.

ATLANTIC WHITE MARLIN SUMMARY	
	WHM
[1]MSY	[5] 600-1,320 t
Current (2010) Yield	372 t [2]
B_{2004} / [1]B_{MSY}	< 1.0
Recent Abundance Trend (2001-2004)	Slightly upward
$F_{2004} > F_{replacement}$	No
F_{2004} > [1]F_{MSY}	Possibly > 1.0
[3]$Catch_{recent}/Catch_{1996}$ Longline and Purse seine	0.47
[4]$Catch_{2004}$	610 t
Rebuilding to B_{MSY}	Potential to rebuild under current management plan, but needs verification.
Conservation and Management Measure in Effect	Recommendation [Rec. 06-09]. The annual amount of blue marlin that can be harvested by pelagic longline and purse seine vessels and retained for landing must be no more than 33% for white marlin and 50% for blue marlin of the 1996 or 1999 landing levels, whichever is greater.

[1] As estimated during the 2000 (Anon. 2001) and 2002 (Anon. 2003) assessments.
[2] 2010 yield should be considered provisional.
[3] $Catch_{recent}$ is the average longline catch for 2000-2004.
[4] Estimate of total removals obtained by the Committee.
[5] Range of estimates were obtained in the previous assessments, but recent analyses suggest that the lower bound for white marlin should be at least 600 t.

BUM-Table 1. Estimated catches (t) of Atlantic blue marlin (*Makaira nigricans*) by area, gear and flag.

			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
TOTAL			2086	2237	2882	4325	4565	4171	3027	3044	4127	4063	5199	5488	5458	5086	4912	3867	3159	3729	2234	3454	2341	3382	4505	3240	3160
	ATN		1162	1020	1027	1632	1970	1430	1122	1071	1537	1560	1961	2011	2494	2017	2122	1236	1047	1161	730	1555	803	1035	2101	1571	1644
	ATS		924	1217	1855	2693	2595	2741	1905	1974	2590	2503	3238	3478	2963	3069	2790	2631	2112	2568	1503	1899	1538	2346	2404	1669	1516
Landings	ATN	Longline	720	418	459	995	1607	982	625	613	1088	991	1339	1413	1300	1078	971	492	477	533	518	561	512	600	912	825	864
		Other surf.	228	284	258	300	155	245	261	217	220	343	363	440	1088	820	1056	622	431	587	146	951	193	273	954	611	652
		Sport (HL+RR)	214	181	186	147	49	62	90	113	118	73	64	60	56	38	36	97	90	22	31	18	62	120	197	92	110
	ATS	Longline	661	964	1530	2017	1958	2286	1490	1419	1767	1679	2194	2545	2068	1977	1776	1465	901	1234	909	1010	807	1400	1050	944	804
		Other surf.	262	253	324	675	634	453	414	553	821	822	1041	863	893	1090	1014	1165	1212	1334	595	887	728	938	1351	722	706
		Sport (HL+RR)	1	0	1	1	2	1	0	1	2	2	2	28	0	0	0	0	0	0	0	2	1	9	3	3	6
Discards	ATN	Longline	0	138	124	191	159	142	146	127	111	153	196	97	49	81	60	22	37	19	34	24	36	42	37	40	17
		Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	11	0	1	1	0	0	1	2	0
	ATS	Longline	0	0	0	0	0	0	0	0	0	0	1	42	2	2	0	0	0	0	0	0	2	0	0	0	
Landings	ATN	Barbados	14	13	46	3	18	12	18	21	19	31	25	30	25	19	19	18	11	11	0	0	25	0	0	0	9
		Belize	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
		Brasil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	**0**
		Canada	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**
		China P.R.	0	0	0	0	0	0	0	0	41	48	41	51	79	133	9	31	15	17	10	49	0	4	2	26	47
		Chinese Taipei	117	52	26	11	937	716	336	281	272	187	170	355	80	44	64	65	48	66	104	38	35	30	16	25	14
		Cuba	103	68	94	74	112	127	135	69	39	85	43	53	12	38	55	56	34	3	4	7	7	0	0	0	
		Curaçao	50	50	50	50	50	40	40	40	40	40	40	40	40	40	40	0	0	0	0	0	0	0	0	0	
		Dominica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	64	69	75	36	44	55	58	106	76	76
		Dominican Republic	0	0	0	0	0	0	0	0	0	0	0	41	71	29	19	23	0	207	0	0	0	0	0	0	
		EU.España	1	0	8	7	5	1	6	7	6	2	25	5	36	15	25	8	1	6	27	12	23	14	23	6	14
		EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	776	0	0	753	434	498
		EU.Portugal	12	8	2	5	1	4	2	15	11	10	7	3	47	8	20	17	2	31	27	24	36	56	56	25	32
		Grenada	36	33	34	40	52	64	52	58	52	50	26	47	60	100	87	104	69	72	45	42	33	49	54	45	45
		Jamaica	0	0	0	0	0	0	0	0	0	0	0	24	0	0	0	0	0	0	0	0	0	0	0	0	
		Japan	174	78	206	593	250	145	193	207	532	496	798	625	656	427	442	155	125	148	174	251	199	221	489	477	490
		Korea Rep.	36	13	14	252	240	34	11	2	16	16	41	16	0	0	0	0	0	0	0	3	14	30	43	0	40
		Liberia	0	0	0	0	0	0	0	0	0	87	148	148	701	420	712	235	158	115	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	12	0	0	0	0	**0**
		Mexico	0	0	0	0	0	0	0	3	13	13	13	13	27	35	68	37	50	70	90	86	64	91	81	93	89
		NEI (BIL)	68	94	74	103	18	20	38	0	0	0	0	0	0	0	52	164	254	151	28	0	49	68	82	45	
		NEI (ETRO)	0	0	0	0	0	0	0	71	134	149	178	225	330	312	202	112	7	6	0	0	0	0	0	0	
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	
		Philippines	0	0	0	0	0	0	0	0	0	0	0	0	5	38	38	0	0	0	0	0	0	0	1	0	
		Senegal	0	0	0	1	1	4	8	0	9	0	2	5	0	0	0	11	24	32	11	1	5	91	114	61	41
		St. Vincent and Grenadines	0	0	0	1	0	0	1	2	2	2	0	1	0	0	0	0	19	0	0	0	0	1	3	2	1
		Sta. Lucia	0	0	0	0	0	0	0	0	0	0	0	4	1	0	10	5	0	18	17	21	53	46	70	72	58
		Trinidad and Tobago	43	93	45	13	11	6	1	2	16	28	14	49	15	20	51	17	16	9	11	7	14	16	34	26	22
		U.S.A.	273	291	221	124	29	33	51	80	88	43	43	46	50	37	24	16	17	19	26	16	17	9	13	6	4
		U.S.S.R.	7	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		UK.Bermuda	11	6	8	15	17	18	19	11	15	15	15	3	5	1	2	2	2	2	2	2	2	2	2	2	1
		UK.British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
		UK.Turks and Caicos	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	
		Ukraine	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	8
		Venezuela	218	60	76	149	70	49	66	74	122	106	137	130	205	220	108	72	76	84	83	138	131	206	120	107	136
	ATS	Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	2
		Benin	7	4	12	0	6	6	6	6	5	5	5	5	5	5	5	0	0	0	0	0	0	0	0	0	
		Brasil	46	51	74	60	52	61	125	147	81	180	331	193	486	509	452	780	387	577	195	612	298	262	160	149	130
		China P.R.	0	0	0	0	0	0	0	0	21	25	21	27	41	68	15	61	73	72	49	47	0	61	11	51	54
		Chinese Taipei	98	265	266	462	767	956	488	404	391	280	490	1123	498	442	421	175	246	253	211	113	64	203	132	170	139
		Cuba	111	137	191	77	90	62	69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Côte D'Ivoire	100	100	130	82	88	105	79	139	212	177	157	222	182	275	206	196	78	109	115	107	178	150	991	463	450
		EU.España	0	0	0	15	0	12	40	37	49	38	133	117	159	110	115	86	27	6	24	12	68	25	32	54	151
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	6	1	0	24	69	79	102	81	72
		Gabon	0	0	0	0	0	0	0	1	2	0	304	5	0	0	0	1	0	3	0	0	0	0	0	0	
		Ghana	16	5	7	430	324	126	123	236	441	471	422	491	447	624	639	795	999	415	470	759	405	683	191	140	116
		Japan	335	362	617	962	967	755	824	719	991	913	881	724	529	363	441	180	142	294	366	191	290	699	539	345	289
		Korea Rep.	60	139	361	437	84	503	13	11	40	40	103	40	2	3	1	1	0	0	1	4	19	33	47	8	15
		Mixed flags (FR+ES)	135	132	137	144	199	137	116	146	133	126	96	82	80	83	79	0	0	0	0	0	0	0	0	0	
		NEI (BIL)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	20	4	16	61	7	110	141	123	133	
		NEI (ETRO)	0	0	0	0	0	0	0	103	192	214	256	323	474	449	290	162	10	8	0	0	0	0	0	0	
		Namibia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	0	0	0	0	0	0	0	0	0	
		Philippines	0	0	0	0	0	0	0	0	0	0	0	0	2	33	0	0	0	0	0	0	0	0	7	0	
		Russian Federation	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**
		S. Tomé e Príncipe	0	0	28	19	17	18	21	25	28	33	36	35	33	30	32	32	32	32	9	21	26	0	68	70	72
		South Africa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0	0	2	0	0	1
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	

			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		Togo	0	0	0	0	0	0	0	0	0	0	0	23	0	73	53	141	103	775	0	0	0	0	0	0	
		U.S.S.R.	16	22	32	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		UK.Sta Helena	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
		Uruguay	0	0	0	0	0	0	0	0	3	1	1	26	23	0	0	0	1	5	3	2	8	5	0	6	**0**
		Vanuatu	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
Discards	ATN	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
		U.S.A.	0	138	124	191	159	142	146	127	111	153	196	97	50	81	60	25	49	19	35	25	36	42	38	42	17
	ATS	Brasil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	
		U.S.A.	0	0	0	0	0	0	0	0	0	0	1	42	2	2	0	0	0	0	0	0	0	0	0	0	

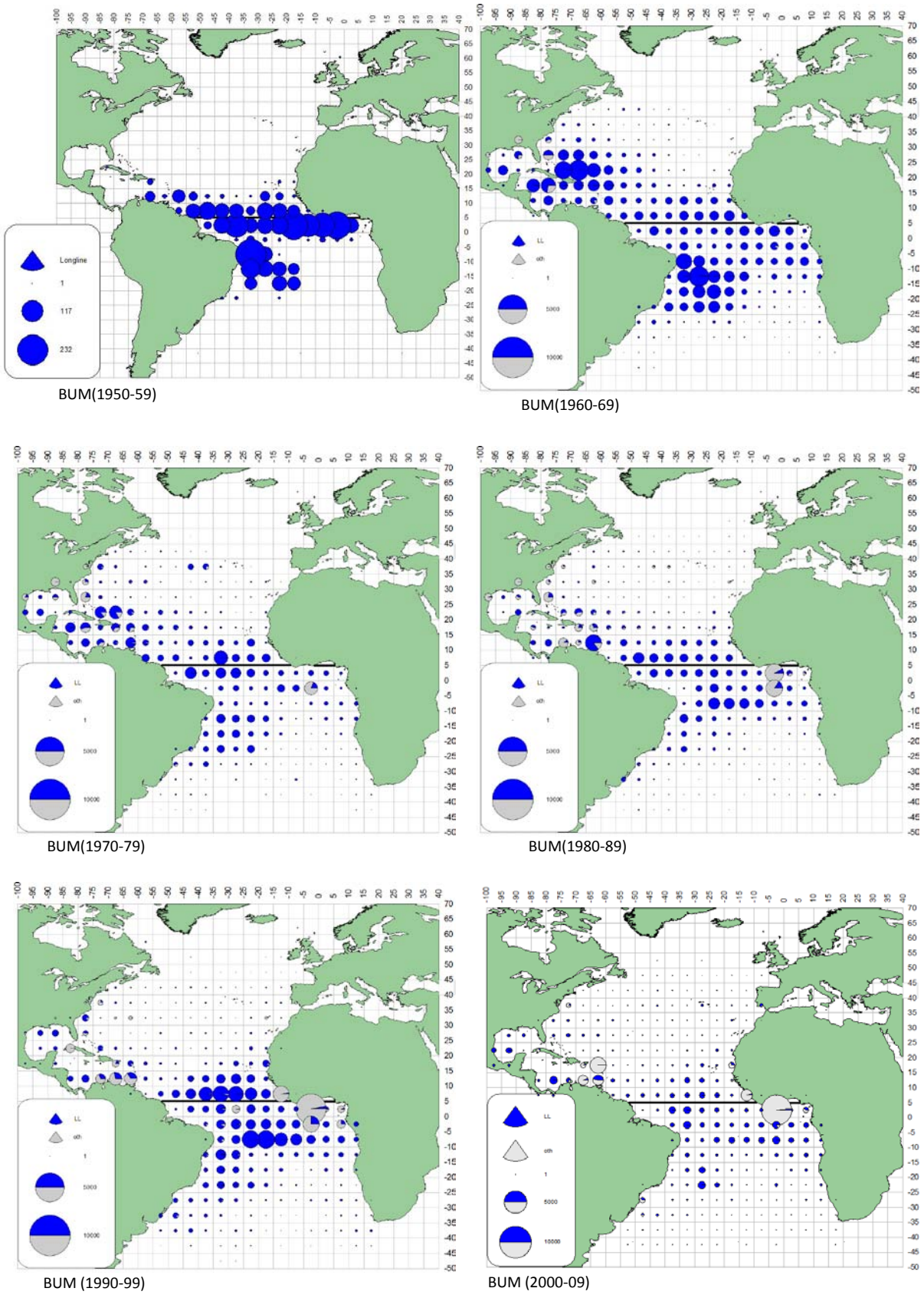
WHM-Table 1. Estimated catches (t) of Atlantic white marlin (*Tetrapturus albidus*) by area, gear and flag.

			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
TOTAL			1639	1552	1396	1829	1659	1627	1462	1544	2114	1761	1573	1430	1682	1569	1363	965	894	719	730	645	436	591	615	644	372
	ATN		933	648	436	376	407	239	610	543	660	639	669	483	529	492	482	426	290	250	252	284	194	160	134	200	196
	ATS		705	904	960	1453	1252	1388	853	1002	1454	1122	905	947	1152	1077	881	539	604	469	478	360	243	432	481	444	176
Landings	ATN	Longline	840	494	196	241	266	108	466	413	531	473	554	431	475	399	408	381	230	204	204	252	161	123	105	164	174
		Other surf.	61	54	150	11	40	21	35	34	57	48	31	10	17	29	31	24	22	28	20	14	21	28	17	20	9
		Sport (HL+RR)	32	38	29	16	21	19	21	30	30	18	20	9	6	6	2	4	6	1	1	1	2	1	2	2	6
	ATS	Longline	654	870	832	1333	1152	1328	805	950	1420	1086	860	853	979	1021	827	475	497	425	454	325	202	404	417	380	130
		Other surf.	51	34	128	119	96	60	48	52	33	31	40	57	173	55	54	63	107	44	23	35	40	9	64	63	44
		Sport (HL+RR)	0	0	0	0	4	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	
Discards	ATN	Longline	0	62	60	107	81	90	88	66	42	100	64	33	31	57	41	16	29	17	27	17	9	8	9	13	8
		Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	4	0	0	0	0	0	0	2	0
	ATS	Longline	0	0	0	0	0	0	0	0	0	0	0	37	1	0	0	1	0	0	0	0	2	19	1	0	2
Landings	ATN	Barbados	0	0	117	11	39	17	24	29	26	43	15	41	33	25	25	24	15	15	0	0	33	0	0	0	6
		Brasil	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**
		Canada	0	1	0	0	0	0	0	0	4	4	8	8	8	5	5	3	2	1	2	5	3	2	2	1	2
		China P.R.	0	0	0	0	0	0	0	0	6	7	6	7	10	20	1	7	4	2	1	4	1	0	1	3	4
		Chinese Taipei	319	153	0	4	85	13	92	123	270	181	146	62	105	80	59	68	61	15	45	19	16	1	0	1	1
		Costa Rica	0	0	0	0	0	0	0	0	0	0	0	0	0	3	14	0	0	1	0	0	0	0	0	0	
		Cuba	225	30	13	21	14	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	
		EU.España	0	0	61	12	12	9	18	15	25	17	97	89	91	74	118	43	4	19	19	48	28	32	10	8	50
		EU.France	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
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	11	30	3	2	0	1	1
		Grenada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	15	8	14	33	10	12	11	17	14	
		Japan	56	60	68	73	34	45	180	33	41	31	80	29	39	25	66	15	10	21	23	28	27	10	22	27	34
		Korea Rep.	37	2	2	82	39	1	9	4	23	3	7	5	0	0	0	0	0	0	0	4	0	0	0	8	
		Liberia	0	0	0	0	0	0	0	0	0	0	1	1	3	8	4	3	4	3	0	0	0	0	0	0	
		Mexico	0	0	0	0	0	0	0	2	8	8	3	5	6	11	18	44	15	15	28	25	16	13	14	19	20
		NEI (BIL)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34	72	4	8	0	26	9	14	18	20	
		NEI (ETRO)	0	0	0	0	0	0	0	23	43	47	57	72	105	100	64	36	2	2	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	
		Philippines	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	1	0	
		St. Vincent and Grenadines	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	44	0	0	0	0	0	0	0
		Sta. Lucia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Trinidad and Tobago	28	61	29	7	6	3	0	1	11	18	8	32	10	13	4	2	5	12	6	6	5	12	10	11	15
		U.S.A.	116	124	42	10	17	13	11	19	13	7	12	8	5	5	1	3	6	1	1	1	1	0	2	2	2
		U.S.S.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		UK.Bermuda	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0
		UK.British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
		Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Venezuela	151	154	42	47	79	47	187	226	148	171	164	90	80	61	25	72	110	55	55	60	26	52	26	70	54
	ATS	Argentina	4	0	0	8	9	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Belize	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	
		Brasil	143	93	149	204	205	377	211	301	91	105	75	105	217	158	105	172	407	266	80	244	90	52	47	52	35
		Cambodia	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
		China P.R.	0	0	0	0	0	0	0	0	3	4	3	4	5	10	1	13	19	6	6	4	5	10	3	5	4
		Chinese Taipei	196	613	565	979	810	790	506	493	1080	726	420	379	401	385	378	84	117	89	127	37	28	53	38	27	19
		Cuba	192	62	24	22	6	10	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Côte D'Ivoire	0	0	0	0	0	0	0	0	0	0	1	2	1	5	1	2	2	3	1	1	1	1	3	2	
		EU.España	0	0	1	1	0	17	6	12	2	19	54	4	10	45	68	18	2	3	45	10	23	14	21	8	62
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	19	0	35	39	6
		Gabon	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Ghana	22	6	88	68	31	17	14	22	1	2	1	3	7	6	8	21	2	1	1	1	0	0	4	4	**0**
		Honduras	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	73	74	76	73	92	77	68	49	51	26	32	29	17	15	17	41	5	12	13	6	11	11	12	16	10
		Korea Rep.	34	25	17	53	42	56	1	4	20	20	52	18	0	0	0	0	0	11	40	3	0	113	96	70	
		Mixed flags (FR+ES)	25	25	25	27	37	11	10	12	11	9	7	7	9	8	7	0	0	0	0	0	0	0	0	0	
		NEI (BIL)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	21	134	16	27	156	186	179	
		NEI (ETRO)	0	0	0	0	0	0	0	91	171	190	228	288	421	399	258	144	9	7	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	
		Philippines	0	0	0	0	0	0	0	0	0	0	0	0	1	8	0	0	0	0	0	0	0	0	1	0	

			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		S. Tomé e Príncipe	0	0	14	16	19	26	24	17	21	21	30	45	40	36	37	37	37	37	21	33	29	0	36	37	38
		South Africa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	
		Togo	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	2	0	0	0	0	0	0	
		U.S.S.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Uruguay	16	6	1	1	1	1	3	0	3	0	1	24	22	0	0	0	1	9	2	5	9	3	0	5	
Discards	ATN	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
		U.S.A.	0	62	60	107	81	90	88	66	42	100	64	33	32	57	41	17	33	17	27	17	10	8	10	14	8
	ATS	Brasil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	19	1	0	
		Korea Rep.	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
		U.S.A.	0	0	0	0	0	0	0	0	0	0	0	37	1	0	0	1	0	0	0	0	0	0	0	0	

BUM-WHM Table 2. Kobe II Strategy Matrix (K2SM). Percent values indicate the probability of achieving the goal of SSB_{yr} >= SSB_{MSY} and F_{yr} < F_{MSY} for each year (yr) under different constant catch scenarios (TAC tons). Red corresponds to 0-39%, yellow 40-60%, green >60%.

	TAC								
Year	**0**	**500**	**1000**	**1500**	**2000**	**2500**	**3000**	**3500**	**4000**
2012	0%	0%	0%	0%	0%	0%	0%	0%	0%
2013	2%	2%	1%	1%	1%	1%	0%	0%	0%
2014	9%	6%	4%	3%	2%	1%	1%	0%	0%
2015	19%	13%	9%	6%	3%	2%	1%	0%	0%
2016	33%	23%	15%	9%	5%	3%	1%	0%	0%
2017	49%	35%	22%	13%	7%	3%	2%	0%	0%
2018	63%	47%	31%	18%	10%	4%	2%	0%	0%
2019	74%	58%	40%	24%	12%	5%	2%	1%	0%
2020	81%	67%	49%	30%	16%	6%	2%	1%	0%
2021	87%	74%	56%	36%	18%	7%	2%	0%	0%
2022	92%	80%	63%	41%	21%	8%	3%	0%	0%
2023	94%	84%	68%	46%	24%	9%	3%	0%	0%
2024	96%	88%	73%	50%	27%	10%	3%	0%	0%
2025	97%	91%	77%	55%	29%	11%	3%	0%	0%
2026	98%	93%	81%	59%	32%	12%	3%	0%	0%

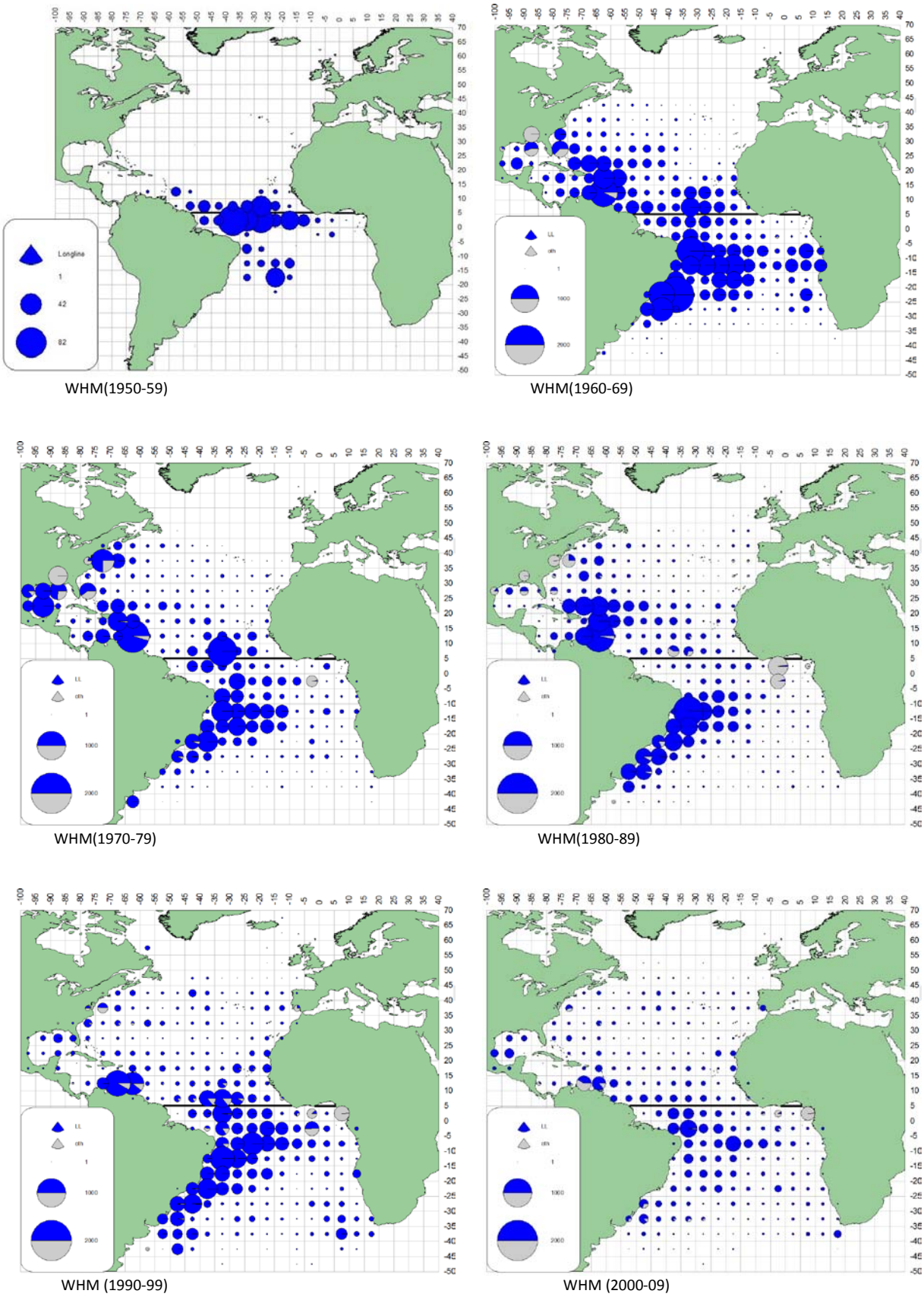


BUM(1950-59) BUM(1960-69)

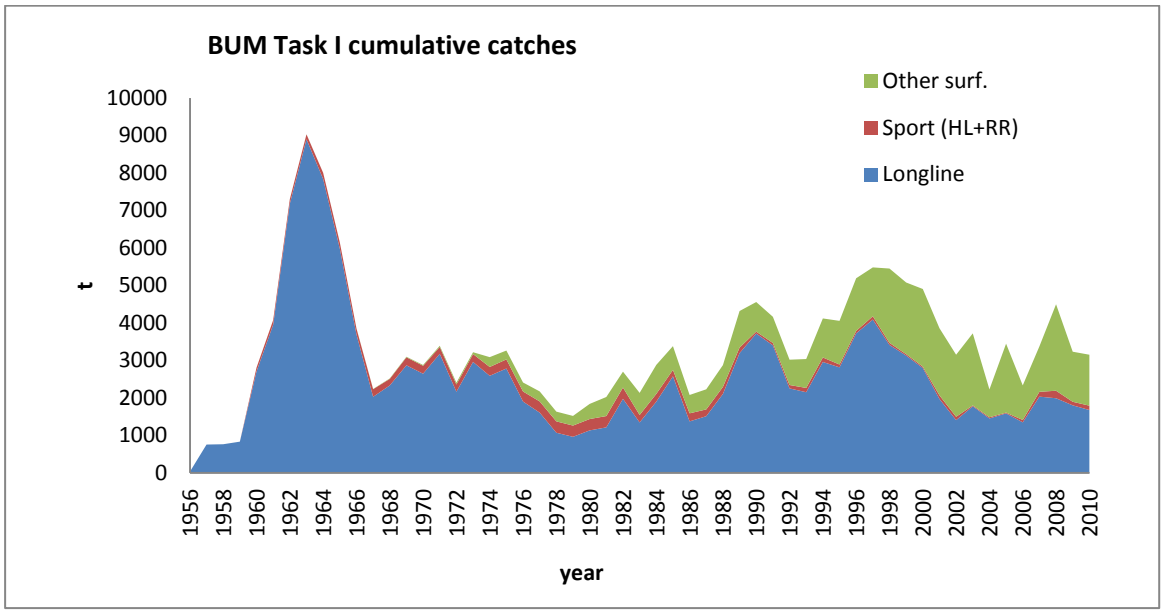
BUM(1970-79) BUM(1980-89)

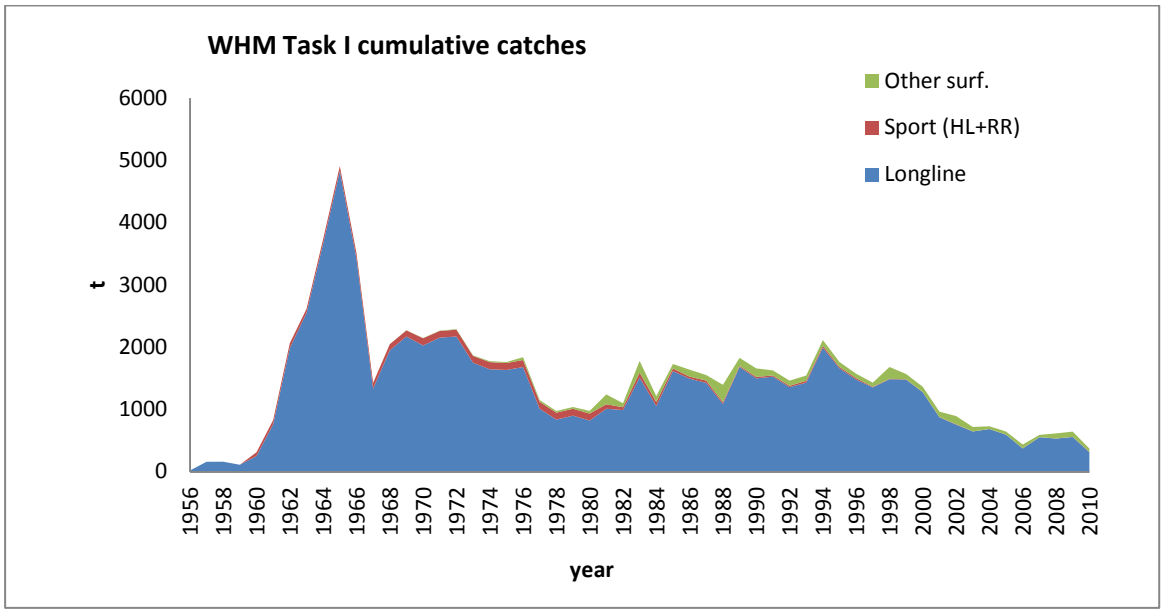
BUM (1990-99) BUM (2000-09)

BUM-WHM Figure 1a. Geographic distribution of mean blue marlin catch by major gears and decade. The symbols for the 1950s information (top left) are scaled to the maximum catch observed during the 1950s, whereas the remaining plots are scaled to the maximum catch observed from 1960 to 2009.

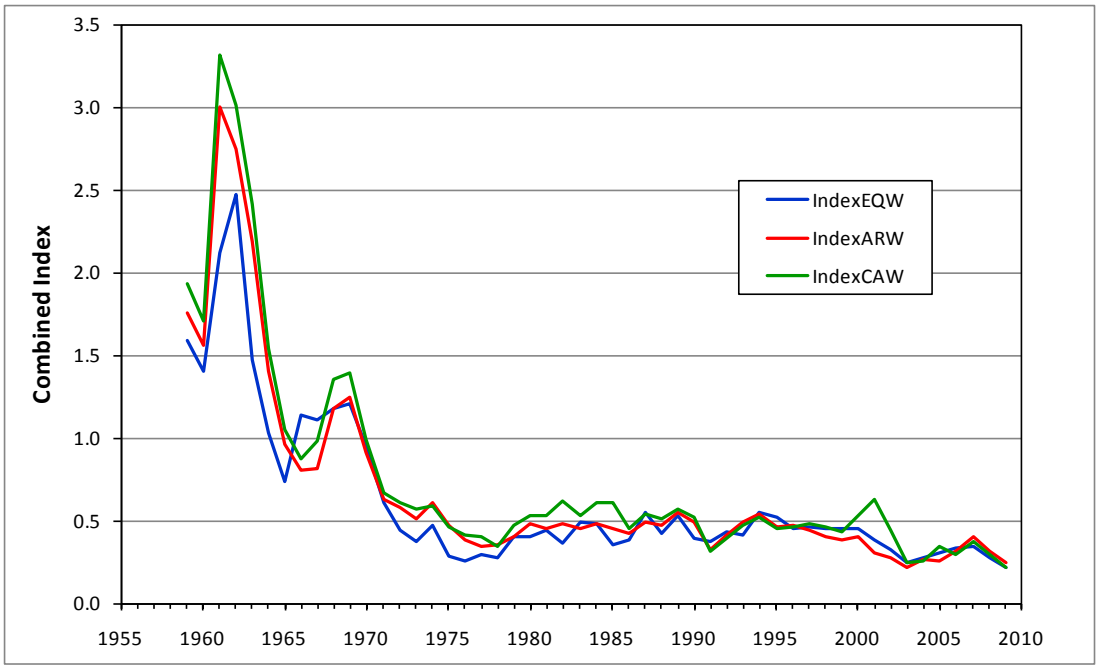


BUM-WHM Figure 1b. Geographic distribution of mean white marlin catch by major gears and decade. The symbols for the 1950s information (top left) are scaled to the maximum catch observed during the 1950s, whereas the remaining plots are scaled to the maximum catch observed from 1960 to 2009.

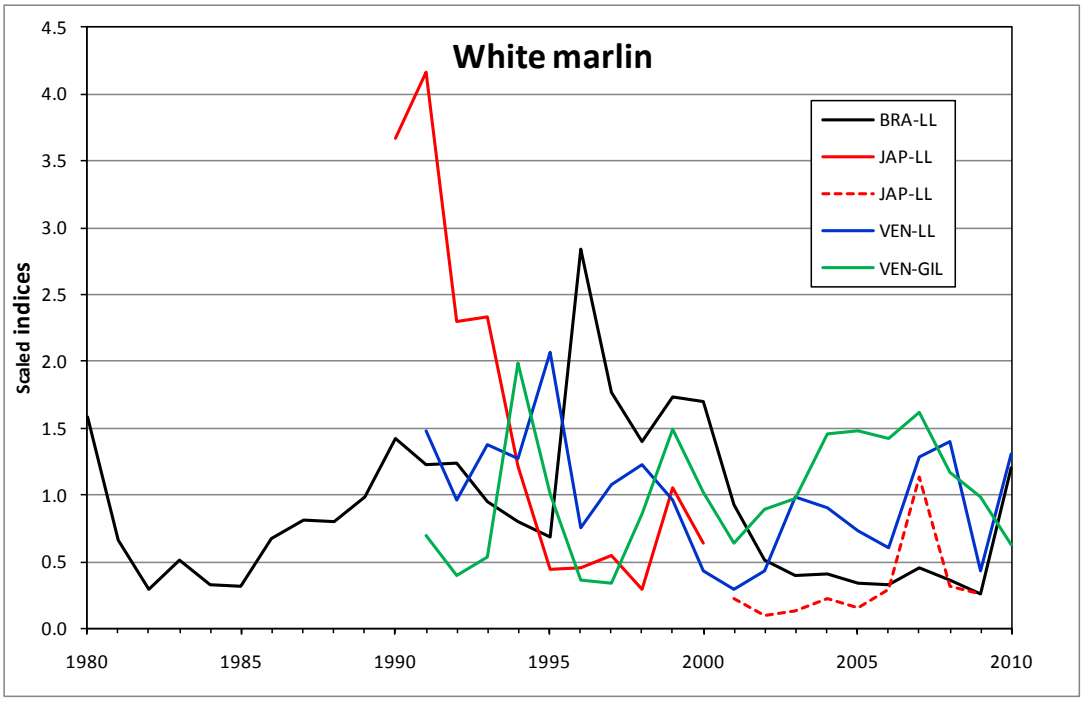




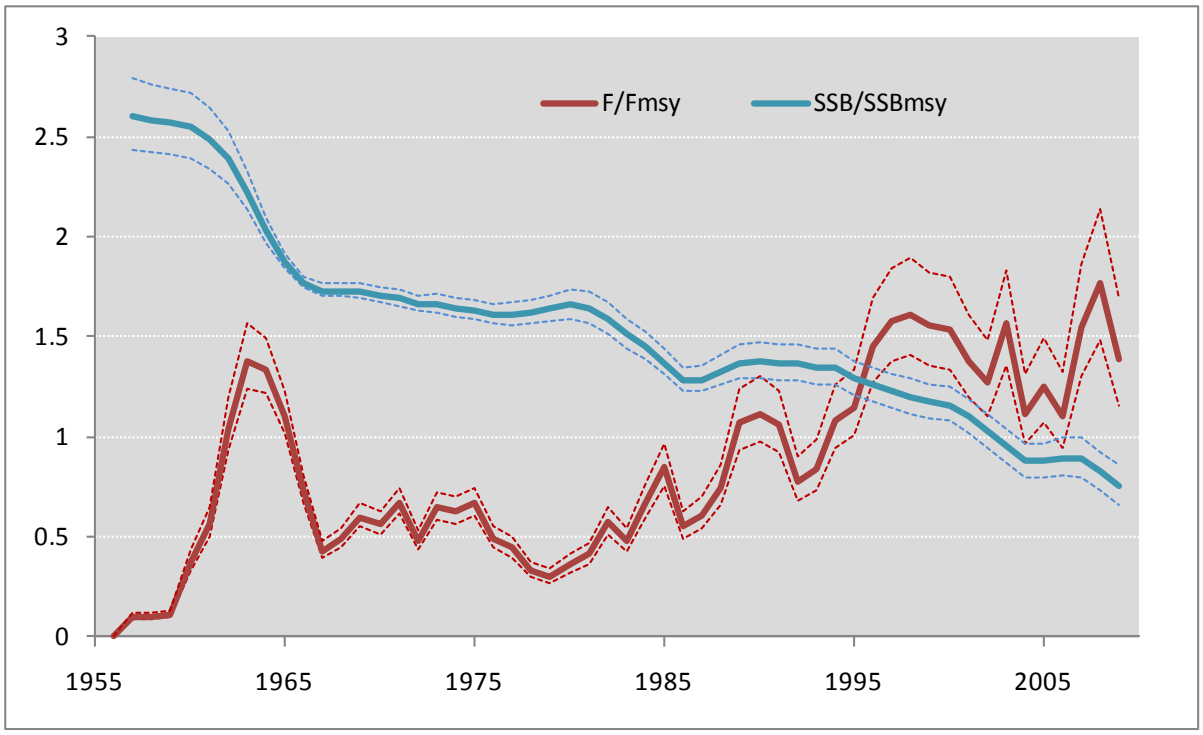
BUM-WHM-Figure 2. Total catch of blue marlin and white marlin reported in Task I.



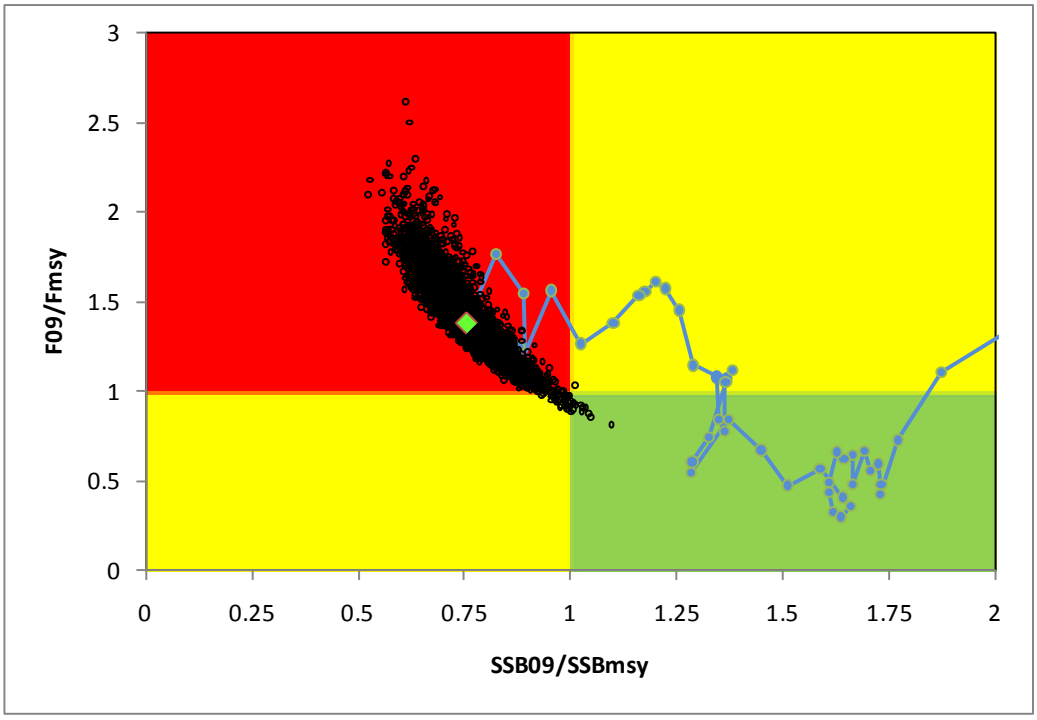
BUM-WHM-Figure 3. Blue marlin standardized combined CPUE indices estimated using equal weighting for all CPUE series (EQW), weighting the CPUE series by area (ARW) and by catch (CAW).



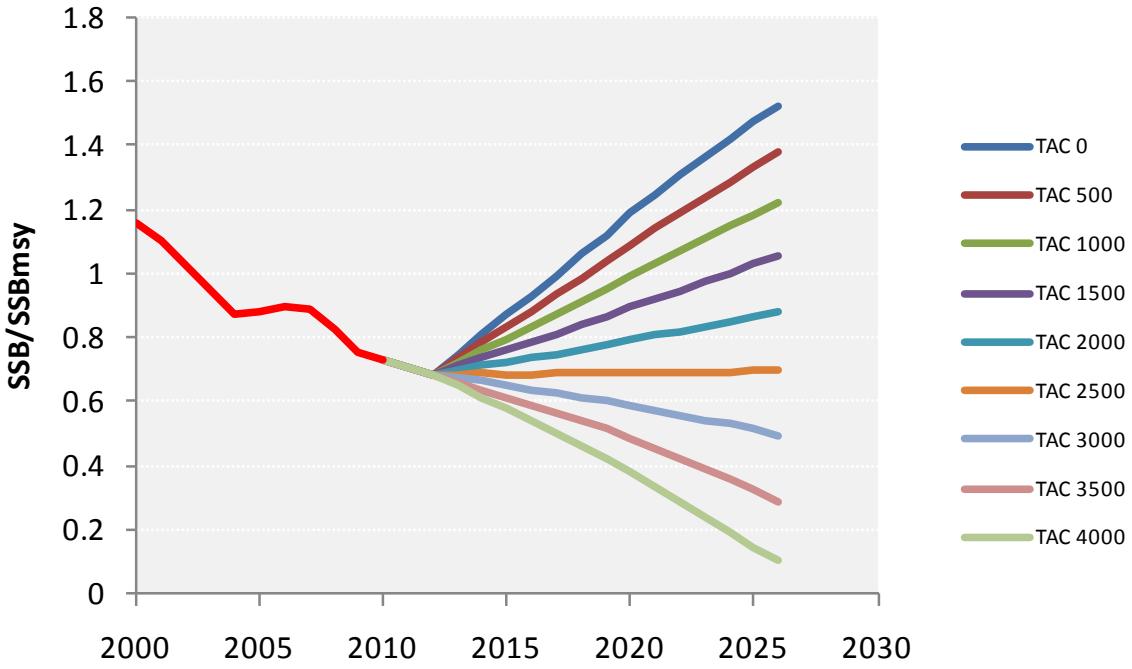
BUM-WHM-Figure 4. White marlin indices of abundance presented during the meeting. For graphing purposes the indices were scaled to their respective mean value for the period 1990-2010.



BUM-WHM Figure 5. Trends of F/F_{MSY} and SSB/SSB_{MSY} ratios for blue marlin from the base model (SS3). Solid lines represent median from MCMC runs, and broken lines the 10% and 90% percentiles, respectively.



BUM-WHM Figure 6. Phase plot for blue marlin from the base model in final year model assessment (2009). Individual points represent MCMC iterations, large diamond the median of the series. Blue circles with line represent the historic trend of the median F/F_{MSY} *vs* SSB/SSB_{MSY} 1965-2008.



BUM-WHM Figure 7. Trends of SSB/SSB_{MSY} ratios under different scenarios of constant catch projections (TAC tons) for blue marlin from the base model. Projections start in 2010, for 2010/11 it was assumed a catch of 3,341 t.

8.7 SAI - SAILFISH

Sailfish *(Istiophorus platypterus)* has a pan-tropical distribution. ICCAT has established, based on life history information on migration rates and geographic distribution of catch, that there are two management units for Atlantic sailfish, eastern and western **(SAI-Figure 1)**. The first successful assessment that estimated reference points for eastern and western sailfish stocks was conducted in 2009 (Anon. 2010a).

SAI-1. Biology

Larval sailfish are voracious feeders initially feeding on crustaceans from the zooplankton but soon switching to a diet of fish larvae. Temperature preferences for adult sailfish appear to be in the range of 25-28°C. A study undertaken in the Strait of Florida and the southern Gulf of Mexico indicated that habitat preferences from satellite tagged sailfish were primarily within the upper 20~50 m of the water column. The tag data also indicated common short-term movements to depths in excess of 100 m, with some dives as deep as 350 m. Sailfish is the most coastal of all billfish species and conventional tagging data suggest that they move shorter distances than the other billfish (**SAI-Figure 2**). Sailfish grow rapidly and reach a maximum size of 160 cm for males and 220 cm for females, with females reaching maturity at 155 cm. Sailfish reach a maximum age of at least 17 years.

Sailfish spawn over a wide area and year around. In the North, evidence of spawning has been detected in the Straits of Florida, and off the Venezuelan, Guyanese and Surinamese coasts. In the southwest Atlantic, spawning occurs off the southern coast of Brazil between 20° and 27°S, and in the east Atlantic, off Senegal and Côte d'Ivoire. Timing of spawning can differ between regions. From the Florida Straits to the areas off Guyana sailfish spawn in the second semester of the year, whist in the southwestern Atlantic and the tropical eastern Atlantic they spawn late and early in the year.

SAI-2. Description of the fisheries

Sailfish are targeted by coastal artisanal and recreational fleets and, to a less extent, are caught as by-catch in longline and purse seine fisheries **(SAI-Figure 1)**. Historically, catches of sailfish were reported together with spearfish by many longline fleets. In 2009 these catches were separated by the Species Group **(SAI-Table 1)**. Historical catches of unclassified billfish continue to be reported to the Committee making the estimation of sailfish catch difficult. Catch reports from countries that have historically been known to land sailfish continue to suffer from gaps and there is increasing ad-hoc evidence of un-reported landings in some other countries. These considerations provide support to the idea that the historical catch of sailfish has been under-reported, especially in recent times where more and more fleets encounter sailfish as by-catch or target them.

Reports to ICCAT estimate that the Task I catch for 2010 was 2,771 t and 625 t for the east and west stocks, respectively **(SAI-Figure 3)**. Task I catches of sailfish for 2010 are preliminary because they do not include reports from all fleets.

SAI-3. State of the stocks

ICCAT recognizes the presence of two stocks of sailfish in the Atlantic, the eastern and western stocks. There is increasing evidence that an alternative stock structure with a north western stock and a south/eastern stock should be considered. Assessments of stocks based on the alternative stock structure option have not been done to date, however, conducting them should be a priority for future assessments.

In 2009 ICCAT conducted a full assessment of both Atlantic sailfish stocks (Anon. 2010a) through a range of production models and by using different combinations of relative abundance indices **(SAI-Figure 4)**. It is clear that there remains considerable uncertainty regarding the stock status of these two stocks, however, many assessment model results present evidence of overfishing and evidence that the stocks are overfished, more so in the east than in the west. Although some of the results suggest a healthy stock in the west, few suggest the same for the east. The eastern stock is also assessed to be more productive than the western stock, and probably able to provide a greater MSY. The eastern stock is likely to be suffering stronger overfishing and most probably has been reduced further below the level that would produce the MSY than the western stock. Reference points obtained with other methods reach similar conclusions.

Examination of recent trends in abundance suggests that both the eastern and western stocks suffered their greatest declines in abundance prior to 1990. Since 1990, trends in relative abundance conflict between different

indices, with some indices suggesting declines, other increases and others not showing a trend **(SAI-Figure 4)**. Examination of available length frequencies for a range of fleets show that average length and length distributions do not show clear trends during the period where there are observations. A similar result was obtained in the past for marlins. Although it is possible that, like in the case of the marlins, this reflects the fact that mean length is not a good indicator of fishing pressure for billfish it could also reflect a pattern of high fishing pressure over the period of observation.

SAI-4. Outlook

Both the eastern and western stocks of sailfish may have been reduced to stock sizes below B_{MSY}. There is considerable uncertainty on the level of reduction, particularly for the west, as various production model fits indicated the biomass ratio B_{2007}/B_{MSY} both above and below 1.0. The results for the eastern stock were more pessimistic than those for the western stock in that more of the results indicated recent stock biomass below B_{MSY}. Therefore there is particular concern over the outlook for the eastern stock.

SAI-5. Effect of current regulations

No ICCAT regulations for sailfish are in effect, however, some countries have established domestic regulations to limit the catch of sailfish. Among these regulations are: requirement of releasing all billfish from longline vessels, minimum size restrictions, circle hooks and catch and release strategies in sport fisheries.

SAI-6. Management recommendations

The Committee recommends that catches for the eastern stock should be reduced from current levels. It should be noted, however, that artisanal fishermen harvest a large part of the sailfish catch along the African coast.

The Committee recommends that catches of the western stock of sailfish should not exceed current levels. Any reduction in catch in the West Atlantic is likely to help stock re-growth and reduce the likelihood that the stock is overfished. It should be noted, however, that artisanal fishermen harvest a large part of the sailfish catch of the western sailfish stock.

The Committee is concerned about the incomplete reporting of sailfish catches, particularly for the most recent years, because it increases uncertainty in stock status determination. The Committee recommends all countries landing or having dead discards of sailfish, report these data to the ICCAT Secretariat.

ATLANTIC SAILFISH SUMMARY

	West Atlantic	**East Atlantic**
Maximum Sustainable Yield (MSY)	600-1,100[1] t	1,250-1,950[1] t
2010 Catches (Provisional)	625 t	2,771[3] t
B_{2007}/B_{MSY}	Possibly < 1.0	Likely < 1.0
F_{2007}/F_{MSY}	Possibly > 1.0	Likely > 1.0
2008 Replacement Yield	not estimated	not estimated
Management Measures in Effect	None[2]	None[2]

[1] Results from Bayesian production model with informative priors. These results represent only the uncertainty in the production model fit. This range underestimates the total uncertainty in the estimates of MSY.
[2] Some countries have domestic regulations.
[3] Provisional estimate. The final figure, after discounting 1,100 t of Maroc (see footnote in SAI-Table 1) would be 1,671 t.

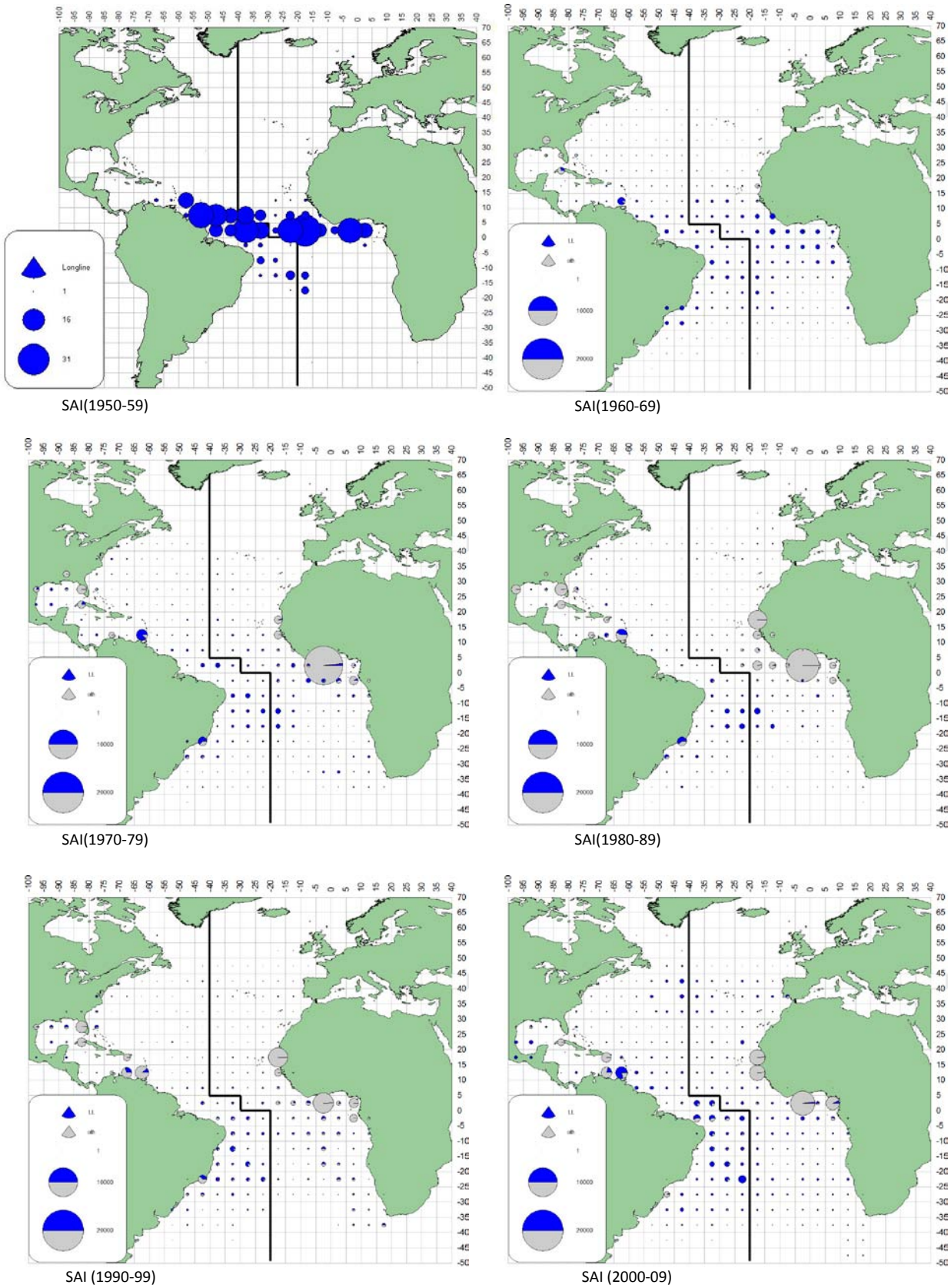
SAI-Table 1A. Estimated catches (t) of Atlantic sailfish (*Istiophorus albicans*) by area, gear and flag.

			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
TOTAL			3276	3699	3180	2673	3475	2591	3105	3093	2231	2358	2923	2500	2709	2724	3543	4124	3968	3574	3688	3400	2754	3668	3437	3187	3396
	ATE		2065	2553	2109	1710	2315	1476	1780	1815	1172	1234	1881	1337	1362	1342	1722	2405	1987	2256	2292	1965	1658	2438	1945	1752	2771
	ATW		1212	1146	1071	963	1160	1115	1325	1278	1059	1124	1041	1163	1346	1382	1820	1719	1981	1318	1397	1435	1096	1230	1492	1435	625
Landings	ATE	Longline	99	99	93	112	109	47	104	256	151	189	196	206	275	273	195	269	354	322	261	294	566	620	596	553	1722
		Other surf.	1394	1870	1479	1153	1249	1000	983	1111	954	910	1504	644	859	883	976	1369	1535	1653	1811	1527	1047	1629	1237	619	606
		Sport (HL+RR)	571	584	537	445	957	429	692	448	67	135	182	488	228	186	551	767	98	282	219	143	46	189	113	580	443
	ATW	Longline	420	425	334	316	316	159	357	484	346	338	260	323	499	533	1097	1245	1265	873	747	1062	646	765	1015	963	523
		Other surf.	295	187	208	238	514	521	599	498	468	410	482	433	553	615	602	402	603	440	642	368	442	452	459	457	92
		Sport (HL+RR)	496	491	472	352	267	371	333	233	217	348	230	350	267	163	76	60	106	0	0	0	2	6	7	4	5
Discards	ATW	Longline	0	42	57	57	62	64	36	63	28	29	69	57	27	72	45	11	7	5	7	3	5	8	9	10	4
		Other surf.	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
Landings	ATE	Benin	25	32	40	8	21	20	21	20	20	20	19	6	4	5	5	12	2	2	5	3	3	4	0	0	
		Cape Verde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		China P.R.	0	0	0	0	0	0	0	0	3	3	3	3	5	9	4	5	11	4	4	8	16	8	1	4	5
		Chinese Taipei	0	1	2	3	5	4	80	157	38	58	24	56	44	66	45	50	62	49	15	25	36	109	121	78	30
		Cuba	55	50	22	53	61	184	200	77	83	72	533	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Côte D'Ivoire	40	40	66	55	58	38	69	40	54	66	91	65	35	80	45	47	65	121	73	93	78	52	448	74	
		EU.España	9	19	28	14	0	13	3	42	8	13	42	38	15	20	8	150	210	183	148	177	200	257	206	280	327
		EU.Portugal	0	0	0	0	0	0	1	2	1	2	1	2	27	53	11	3	8	13	19	31	136	43	49	103	151
		EU.United Kingdom	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
		Gabon	0	0	0	0	0	0	0	3	3	110	218	2	0	0	0	0	0	4	0	0	0	0	0	0	
		Ghana	925	1392	837	465	395	463	297	693	450	353	303	196	351	305	275	568	592	566	521	542	282	420	342	358	417
		Honduras	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	32	16	26	26	31	6	15	27	45	52	47	19	58	16	26	6	20	22	70	50	62	144	199	94	136
		Korea Rep.	2	8	11	12	12	22	2	2	5	5	11	4	0	0	0	0	0	0	0	0	0	0	0	1	
		Liberia	0	0	0	0	0	0	0	0	0	33	85	43	136	122	154	56	133	127	106	122	118	115	0	0	
		Maroc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	1100
		Mixed flags (FR+ES)	403	394	408	432	595	174	150	182	160	128	97	110	138	131	98	44	39	44	41	35	32	36	0	0	
		NEI (BIL)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	269	408	213	55	1	105	43	20	11	
		NEI (ETRO)	0	0	0	0	0	0	0	27	51	57	69	86	127	120	77	43	3	2	16	7	8	10	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	
		Russian Federation	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**
		S. Tomé e Príncipe	0	0	78	86	97	84	78	81	88	92	96	139	141	141	136	136	136	136	515	346	292	384	114	119	121
		Senegal	572	596	587	552	1040	466	860	462	162	167	240	560	260	238	786	953	240	673	567	463	256	737	446	630	484
		South 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
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	1	5	0	0	
		Togo	0	0	0	0	0	0	0	0	0	0	0	9	22	36	23	62	55	95	135	47	31	71	0	0	
		U.S.A.	0	0	0	0	0	2	4	1	1	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
		U.S.S.R.	2	5	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	ATW	Aruba	30	23	20	16	13	9	5	10	10	10	10	10	10	10	10	0	0	0	0	0	0	0	0	0	
		Barbados	0	0	0	69	45	29	42	50	46	74	25	71	58	44	44	42	26	27	26	42	58	42	0	0	18
		Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	12	0	0	76
		Brasil	292	174	152	147	301	90	351	243	129	245	310	137	184	356	598	412	547	585	534	416	139	123	222	432	71
		China P.R.	0	0	0	0	0	0	0	0	3	3	3	3	3	9	4	3	1	0	1	0	0	0	1	2	1
		Chinese Taipei	20	9	92	86	42	37	17	112	117	19	19	2	65	17	11	33	31	13	8	21	5	14	10	10	7
		Cuba	50	171	78	55	126	83	70	42	46	37	37	40	28	196	208	68	32	18	50	72	47	56	0	0	
		Curaçao	10	10	10	10	10	10	10	15	15	15	15	15	15	15	15	0	0	0	0	0	0	0	0	0	
		Dominica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	3	0	1	0	3	3	4	2	
		Dominican Republic	18	40	44	44	40	31	98	50	90	40	40	101	89	27	67	81	260	91	144	165	133	147	0	0	
		EU.España	0	0	0	0	0	8	13	13	19	36	5	30	42	7	14	354	449	196	181	113	148	184	393	451	154
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	2	12	12	110	19	53	101	48	15
		Grenada	211	104	114	98	218	316	310	246	151	119	56	83	151	148	164	187	151	171	112	147	159	174	216	183	
		Japan	8	2	5	12	12	27	0	1	8	2	4	17	3	10	12	3	3	10	5	22	4	1	33	43	40
		Korea Rep.	10	1	1	12	16	1	2	3	4	4	12	4	0	0	0	0	0	0	0	0	0	0	0	1	
		Mexico	0	0	0	0	0	0	0	2	19	19	10	9	65	40	118	36	34	45	51	55	41	46	45	48	34
		NEI (BIL)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	297	268	0	0	0	0	68	81	252	17	
		NEI (ETRO)	0	0	0	0	0	0	0	15	27	30	36	46	67	64	41	23	1	1	9	4	4	6	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	
		Seychelles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	
		St. Vincent and Grenadines	0	0	0	0	2	1	4	4	4	2	1	3	0	1	0	2	164	3	86	73	59	18	13	8	7
		Sta. Lucia	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
		Trinidad and Tobago	25	35	24	10	7	3	3	1	2	1	4	10	25	37	3	7	6	8	10	9	17	13	32	16	16
		U.S.A.	462	454	451	324	242	343	294	202	179	345	231	349	267	163	76	58	103	0	0	0	0	0	3	3	4
		UK.British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Venezuela	77	80	22	24	24	65	71	206	162	93	155	175	248	169	83	126	159	133	158	178	184	248	154	162	178
Discards	ATW	Brasil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
		Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		U.S.A.	0	42	57	57	62	64	36	63	28	29	69	57	27	72	45	11	7	5	7	4	5	7	10	10	4

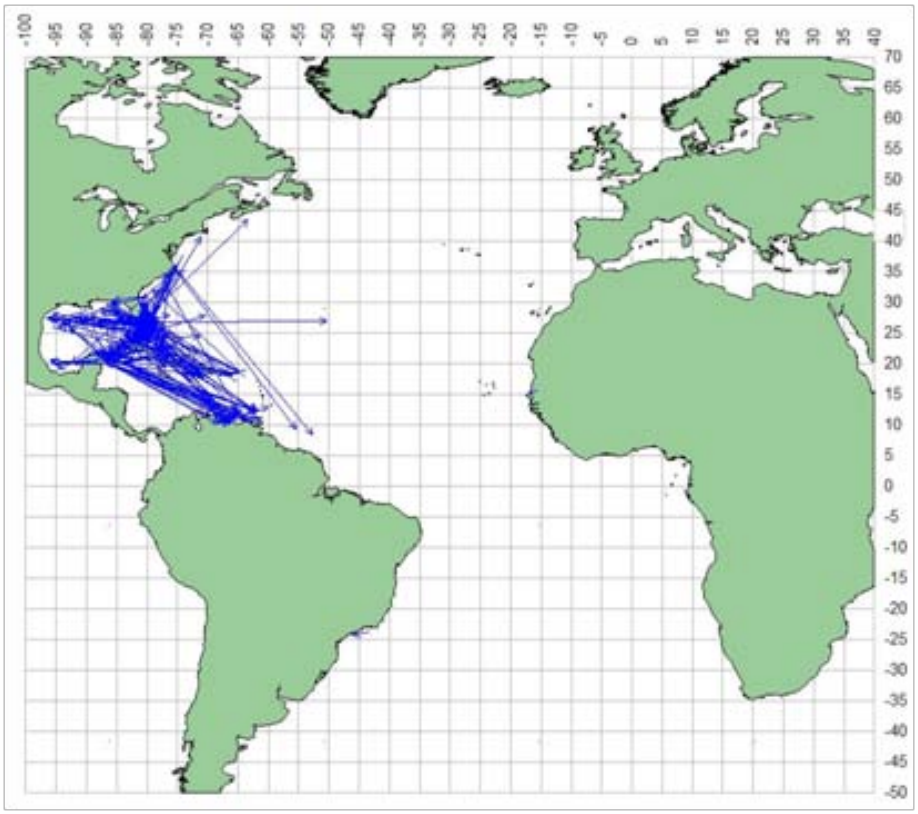
Maroc 2010 catches of 1,100 t (reported by mistake as SAI) will be revised to 0 t.

Table 1B. Estimated catches (t) of longbill spearfish (*Tetrapturus pfluegeri*) by area, gear and flag.

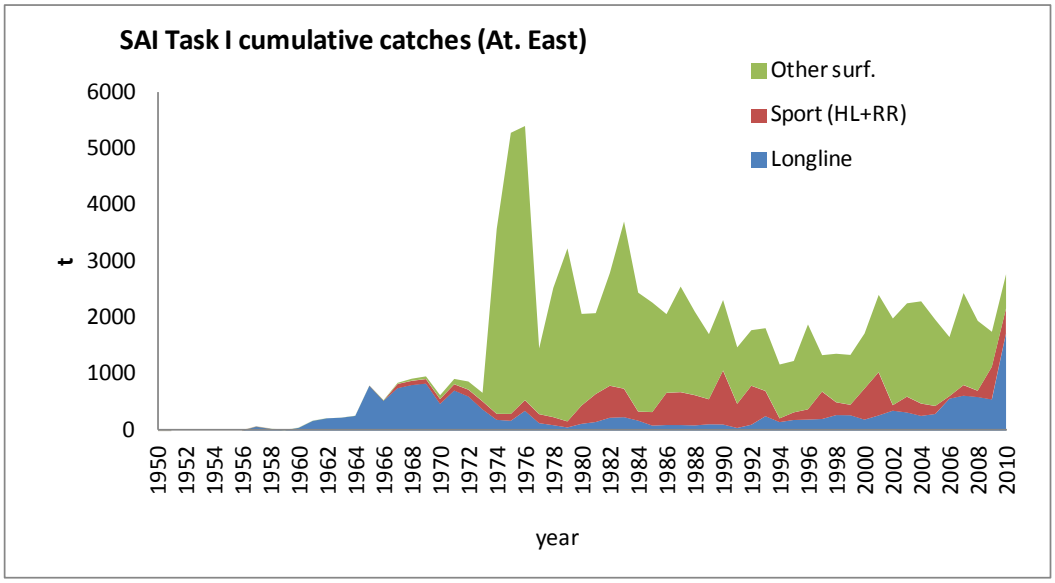
			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
TOTAL			415	384	532	418	481	214	273	540	320	240	165	201	266	306	278	189	180	133	188	218	340	168	166	143	245
	ATE		293	284	295	310	417	131	255	419	198	207	128	194	192	255	178	80	86	50	51	117	75	66	60	78	114
	ATW		123	100	236	108	64	83	19	121	122	33	37	7	74	51	100	110	95	84	137	101	265	102	106	65	131
Landings	ATE	Longline	41	37	39	40	44	24	163	307	100	129	69	126	106	174	118	79	86	50	51	98	75	66	60	78	114
		Other surf.	252	247	256	270	373	107	92	112	98	78	59	68	86	81	60	0	0	0	0	17	0	0	0	0	
		Sport (HL+RR)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
	ATW	Longline	123	100	236	108	64	83	19	121	122	26	34	7	74	51	100	110	95	84	137	101	265	102	106	65	131
		Other surf.	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Sport (HL+RR)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Discards	ATW	Longline	0	0	0	0	0	0	0	0	0	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
Landings	ATE	China P.R.	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	
		Chinese Taipei	1	4	4	4	8	6	135	263	63	97	41	94	73	112	75	52	62	25	15	25	37	22	2	6	3
		EU.España	0	0	0	0	0	0	0	12	0	5	1	1	9	29	14	8	7	0	0	3	3	0	2	7	29
		EU.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	
		EU.Italy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	49	0	0	0	0	
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	8	2	6	25
		Japan	39	21	31	31	32	10	27	31	36	26	25	30	22	33	29	20	16	25	36	40	21	36	53	59	51
		Korea Rep.	0	12	4	5	4	8	1	1	1	1	3	1	0	0	0	0	0	0	0	0	0	0	0	0	
		Mixed flags (FR+ES)	252	247	256	270	373	107	92	112	98	78	59	68	86	81	60	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	0	0	6
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	ATW	Belize	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
		Brasil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27	56	39	3	0	0	5	4	0	0	
		Chinese Taipei	44	22	208	85	41	36	16	111	116	19	18	2	64	16	11	24	39	12	11	20	17	20	0	3	8
		EU.España	0	0	0	0	0	0	0	5	0	1	0	0	0	24	50	22	5	25	0	5	14	0	2	5	3
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	15	44	10	10
		Japan	20	4	17	10	13	46	1	1	2	3	4	1	8	11	11	3	12	40	41	58	54	25	45	26	65
		Korea Rep.	4	0	2	5	9	0	1	2	4	4	10	4	0	0	0	0	0	0	0	0	0	0	0	0	
		Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	82	0	135	23	13	7	8
		Trinidad and Tobago	54	75	10	7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		U.S.A.	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Venezuela	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	4	0	3	3	17	5	15	3	14	24
Discards	ATW	U.S.A.	0	0	0	0	0	0	0	0	0	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	

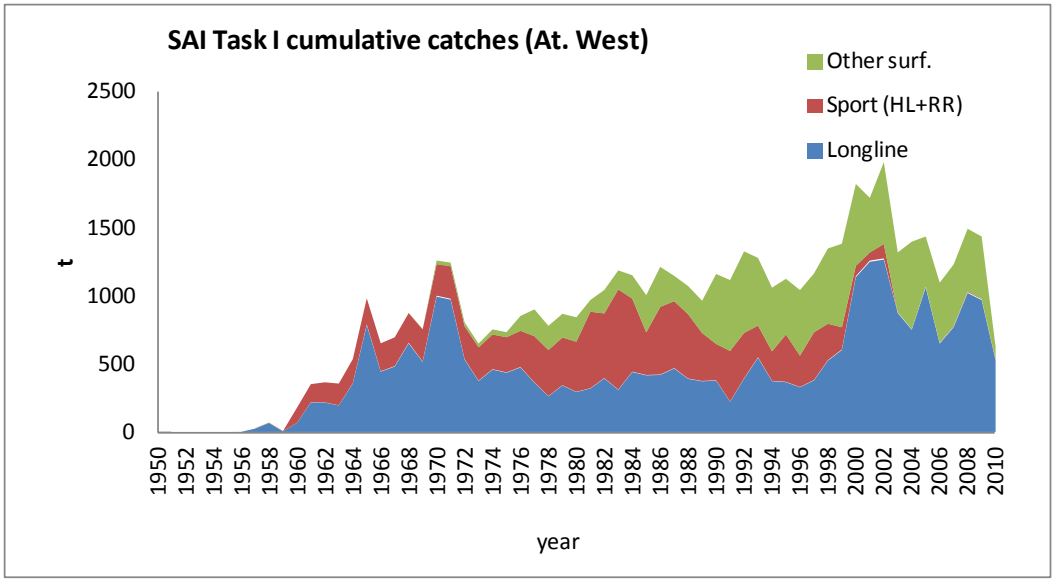


SAI-Figure 1. Geographic distribution of mean sailfish catch by major gears and by decade. The dark line denotes the separation between stocks. The symbols for the 1950s information (top left) are scaled to the maximum catch observed during the 1950s, whereas the remaining plots are scaled to the maximum catch observed from 1960 to 2009.

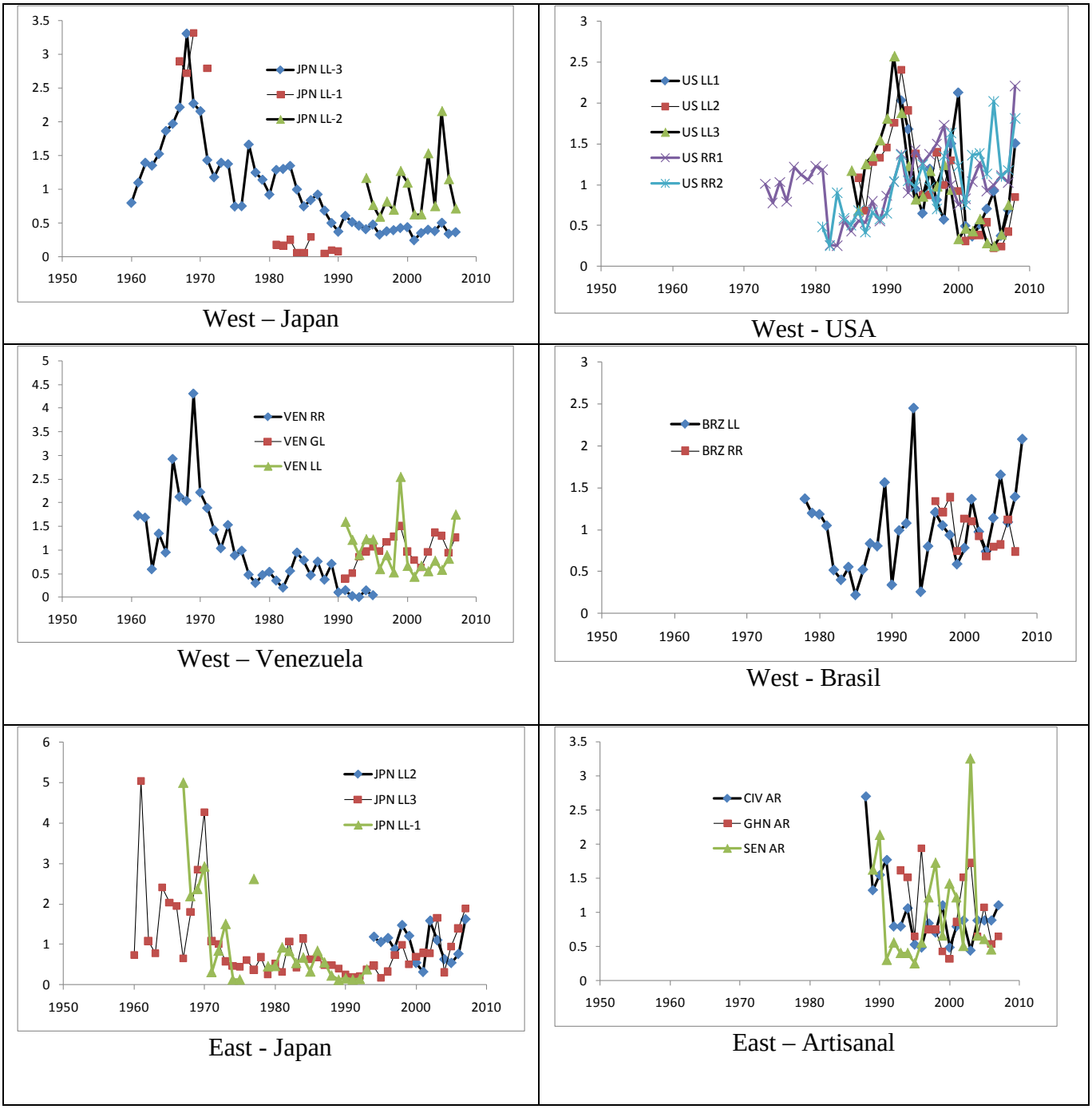


SAI-Figure 2. Conventional tag returns for Atlantic sailfish. Lines join the locations of release and recapture.





SAI-Figure 3. Task I catches of sailfish for each of the two Atlantic stocks, East and West.



SAI-Figure 4. Relative abundance indices obtained by standardizing CPUE data for various fleets. All indices were scaled to the mean of each series prior to graphing.

8.8 SWO-ATL-ATLANTIC SWORDFISH

The last assessment for Atlantic swordfish was conducted in 2009 (Anon. 2010c). Other information relevant to Atlantic swordfish is presented in the Report of the Sub-Committee on Statistics, included as **Appendix 7** to this SCRS Report, and recommendations pertinent to Atlantic swordfish are presented in Section 17.

SWO-ATL-1. Biology

Swordfish *(Xiphias gladius)* are members of the family *Xiphiidae* and are in the suborder *Scombroidei.* They can reach a maximum weight in excess of 500 kg. They are distributed widely in the Atlantic Ocean and Mediterranean Sea. In the ICCAT Convention area, the management units of swordfish for assessment purposes are a separate Mediterranean group, and North and South Atlantic groups separated at 5°N. This stock separation is supported by recent genetic analyses. However, the precise boundaries between stocks are uncertain, and mixing is expected to be highest at the boundary in the tropical zone. Swordfish feed on a wide variety of prey including groundfish, pelagic fish, deep-water fish, and invertebrates. They are believed to feed throughout the water column, and from recent electronic tagging studies, undertake extensive diel vertical migrations. SCRS 2011/134 provided new information on the food habits of South Atlantic swordfish. A Bayesian analysis of stomach contents of swordfish caught off the southern coast of Brazil indicated that the diet consisted primarily of cephalopods, and secondarily of fish. The authors noted, however, that the diet of swordfish is known to vary considerably, both geographically and seasonally.

Swordfish mostly spawn in the western warm tropical and subtropical waters throughout the year, although seasonality has been reported in some of these areas. They are found in the colder temperate waters during summer and fall months. Young swordfish grow very rapidly, reaching about 140 cm LJFL (lower-jaw fork length) by age three, but grow slowly thereafter. Females grow faster than males and reach a larger maximum size. Tagging studies have shown that some swordfish can live up to 15 years. Swordfish are difficult to age, but about 50% of females were considered to be mature by age five, at a length of about 180cm. However, the most recent information indicates a smaller length and age at maturity.

SWO-ATL-2. Fishery indicators

Due to the broad geographical distribution of Atlantic swordfish **(SWO ATL-Figure 1)** in coastal and off-shore areas (mostly ranging from 50ºN to 45ºS), this species is available to a large number of fishing countries **(SWO ATL-Figure 2)**. Directed longline fisheries from Canada, EU-Spain, and the United States have operated since the late 1950s or early 1960s, and harpoon fisheries have existed at least since the late 1800s. Other directed swordfish fisheries include fleets from Brazil, Morocco, Namibia, EU-Portugal, South Africa, Uruguay, and Venezuela. The primary by-catch or opportunistic fisheries that take swordfish are tuna fleets from Chinese Taipei, Japan, Korea and EU-France. The tuna longline fishery started in 1956 and has operated throughout the Atlantic since then, with substantial catches of swordfish that are produced as a by-catch of tuna fisheries. The largest proportion of the Atlantic catches is made using surface-drifting longline. However, many additional gears are used, including traditional gillnets off the coast of western Africa.

Total Atlantic

The total Atlantic estimated catch (landings plus dead discards) of swordfish (North and South, including reported dead discards) in 2010 (24,720 t) is close to the reported catch in 2009 (24,761 t). As a small number of countries have not yet reported their 2010 catches and because of unknown unreported catches, this value should be considered provisional and subject to further revision.

In an effort to quantify possible unreported catches in the Convention area during the 2009 stock assessment, the ICCAT Statistical Document data base was examined. The use of this information was complicated because of the lack of conversions factors available for products such as loin, fillet, and gilled/gutted swordfish. The comparison between the swordfish Statistical Document System (s.SDS) data from 2003 through 2007 and the reported Task I by flag indicates that Task I catches might not represent the total landed catch of Convention area swordfish, although the extent to which this occurs was highly uncertain. The largest discrepancy between the data sources is for flags with an unknown area of capture, and amounts to nearly 21,000 t over the 2003-2007 time period. Considering only the s.SDS data classified as coming from the Convention area, the discrepancy amounts to an estimate of less than 1,000 t over the time period. The comparison implies that international trade of Convention Area landed swordfish might represent less than 13% of the landed catch recorded in Task I and that a surprisingly low number of Contracting Parties engage in export of Convention area swordfish.

North Atlantic

For the past decade, the North Atlantic estimated catch (landings plus dead discards) has averaged about 11,523 t per year (**SWO-ATL-Table 1** and **SWO-ATL-Figure 3**). The catch in 2010 (12,154 t) represents a 40% decrease since the 1987 peak in North Atlantic landings (20,236 t). These reduced landings have been attributed to ICCAT regulatory recommendations and shifts in fleet distributions, including the movement of some vessels in certain years to the South Atlantic or out of the Atlantic. In addition, some fleets, including at least the United States, EU-Spain, EU-Portugal and Canada, have changed operating procedures to opportunistically target tuna and/or sharks, taking advantage of market conditions and higher relative catch rates of these species previously considered as by-catch in some fleets. Recently, socio-economic factors may have also contributed to the decline in catch.

Trends in nominal catch rates by fleets contributing to the production model are shown in **SWO-ATL-Figure 4**. Most of the series have an increasing trend since the late 1990s, but the U.S. catch rates remained relatively flat. There have been some recent changes in United States regulations that may have impacted catch rates, but these effects remain unknown.

The 2011 Swordfish Species Group reviewed new information from Canada, which provided updated age and sex-specific nominal catch rate series for its pelagic longline fishery (SCRS/2011/186) for the period from 2002 to 2011. The trend in CPUE indicates that relative abundance has continued to increase since the series low in 2006 and is near the historical high observed in 1990. Reports from the USA also indicate relatively high recent catch rates.

The most frequently occurring ages in the catch include ages 2 and 3 (**SWO-ATL-Figure 5**). There were reports of increasing average size of the catch in USA fisheries.

South Atlantic

The historical trend of catch (landings plus dead discards) can be divided in two periods: before and after 1980. The first one is characterized by relatively low catches, generally less than 5,000 t (with an average value of 2,300 t). After 1980, landings increased continuously up to a peak of 21,930 t in 1995, levels that are comparable to the peak of North Atlantic harvest (20,236 t). This increase of landings was, in part, due to progressive shifts of fishing effort to the South Atlantic, primarily from the North Atlantic, as well as other waters. Expansion of fishing activities by southern coastal countries, such as Brazil and Uruguay, also contributed to this increase in catches. The reduction in catch following the peak in 1995 resulted from regulations and partly due to a shift to other oceans and target species. In 2010, the 12,566 t reported catches were about 43% lower than the 1995 reported level (**SWO-ATL-Figure 3**). The SCRS received reports from Brazil and Uruguay that those CPCs have reduced their fishing effort directed towards swordfish in recent years.

In 2010, the SCRS noted that there was a considerable decline in the magnitude of the catch by Namibia in 2009 compared with 2008 (25 and 518 t, respectively) that appeared inconsistent with recent developments in capacity. In particular, the 2008 value appears to be low, compared with information from other sources such as compliance tables. While Namibian authorities were contacted with a request for an explanation for this apparent anomaly, a response has not yet been received

As observed in the 2006 assessment, the CPUE trend from targeted and non-targeted fisheries show different trends and high variability which indicates that at least some are not depicting trends in the abundances of the stock (**SWO-ATL-Figure 6**). It was noted that there was little overlap in fishing area and strategies between the by-catch and targeted fleets used for estimating CPUE pattern, and therefore the by-catch and targeted fisheries CPUE trends could be tracking different components of the population.

Discards

Since 1991, several fleets have reported dead discards (see **SWO-ATL-Table 1**). The volume of Atlantic-wide reported discards since then has ranged from 151 t to 1,139 t per year. Reported annual dead discards (in tonnes) have been declining in recent years.

SWO-ATL-3. State of the stocks

North Atlantic

Results from the base case production model are shown in **SWO-ATL-Figure 7.** The estimated relative biomass trend shows a consistent increase since 2000. The current results indicate that the stock is at or above B_{MSY}. The relative trend in fishing mortality shows that the level of fishing peak in 1995, followed by a decrease until 2002, followed by small increase in the 2003-2005 period and downward trend since then. Fishing mortality has been below F_{MSY} since 2005. The results suggest that there is greater than 50% probability that the stock is at or above B_{MSY}, and thus the Commission's rebuilding objective [Rec. 99-02] has been achieved (**SWO-ATL-Figure 8**). However, it is important to note that since 2003 the catches have been below the TAC's greatly increasing the chances for a fast recovery. Overall, the stock was estimated to be somewhat less productive than the previous assessment, with the intrinsic rate of increase, *r*, estimated at 0.44 compared to 0.49 in 2006.

Other analyses conducted by the SCRS (Bayesian surplus production modeling, and Virtual Population Analyses) generally support the results described for the base case surplus production model above.

South Atlantic

The results of the base case production model indicated that there were conflicting signals for several of the indices used. The model estimated overall index was relatively stable until the early 1980s when it started declining until the late 1990s and it reversed that trend about 2003. Estimated relative fishing mortality (F_{2008}/F_{MSY}) was 0.75 indicating that the stock is not being overexploited. Estimated relative biomass (B_{2009}/B_{MSY}) was 1.04 (**SWO-ATL-Figure 9**), indicating that the stock was not overexploited.

Because of the high level of uncertainty associated with the south Atlantic production models results, the SCRS conducted catch-only modeling analysis, including two explorations using different assumptions concerning the intrinsic rate of population increase. The distribution for MSY was skewed for both runs (**SWO-ATL-Figure 10)**. The median of MSY estimated for Run 1 was 18,130 t and for Run 2 was 17,934 t. **SWO-ATL-Figure 11** summarizes recent stock status, as determined from the catch-only model.

SWO-ATL-4. Outlook

North Atlantic

The base production model was projected to the year 2018 under constant TAC scenarios of 10, 11, 12, 13, 14 and 15 thousand tones. Catch in year 2009 was assumed to be the average of the last three years (2006-08) (11,515 t). The actual reported landings in 2009 were 12,655 t. Median trajectories for biomass and fishing mortality rate for all of the future TAC scenarios are plotted in **SWO-ATL-Figure 12**.

Future TACs above MSY are projected to result in 50% or lower probabilities of the stock biomass remaining above B_{MSY} over the next decade (**SWO-ATL-Figure 13**) as the resulting probability of F exceeding F_{MSY} for these scenarios would trend above 50% over time. A TAC of 13,000 t would provide approximately a 75% probability of maintaining the stock at a level consistent with the Convention objective over the next decade.

South Atlantic

Projections for the base case production model were performed for catch levels from 10,000 t to 16,000 t by increments of 1,000 t for 2010-2020. For 2009, all projection scenarios assumed a catch equal to the average catch for 2006-2008 (13,658 t). **SWO-ATL-Figure 14** shows the results of the projections. Because the SCRS considers that the production model estimated benchmarks are poorly estimated, the projections are shown as biomass changes rather than relative biomass. In general, catches of 14,000 t or less will result in increases in the biomass of the stock; catches on the order of 15,000 will maintain the biomass of the stock at approximately stable levels during the period projected. Catches on the order of 16,000 t or more will result in biomass decrease. The current TAC is 15,000 t.

For the catch only model projections, constant catch scenarios were evaluated ranging from 10,000 to 17,000 t, incremented by 1,000 t for a period of 10 years. For 2009, all projection scenarios assumed a catch equal to the average catch for 2006-2008 (13,658 t). In general, catches of 15,000 t will result in the biomasses being higher than B_{MSY} 80% of the time. **SWO-ATL-Figure 15** summarizes the probability of $B>B_{MSY}$ and $F<F_{MSY}$ for the

constant catch scenarios indicated over time. Catches on the order of 17,000 will result in a probability of 0.67 of the biomass being above B_{MSY} in ten years.

SWO-ATL-5. Effects of current regulations

In 2006, the Committee provided information on the effectiveness of existing minimum size regulations. New catch regulations were implemented on the basis of Rec. 06-02, which entered into effect in 2007 (Rec. 08-02 extended the provisions of Rec. 06-02 to include 2009). Rec. 09-02 came into effect in 2010 and extended most of the provisions of Rec. 06-02 for one year only. Rec. 10-02 came into effect in 2011, and again extended those provisions for one year only, but with a slight reduction in total allowable catch (TAC).

For the South Atlantic, the most recent recommendation can be found in Rec. 09-03, which establishes a three year management plan for that stock.

Catch limits

The total allowable catch in the North Atlantic during the 2007 to 2009 period was 14,000 t per year. The reported catch during that period averaged 11,969 t and did not exceed the TAC in any year. In 2010, the TAC was reduced to 13,700 t, compared with catches of 12,154 t. Reports for 2010 are considered provisional and subject to change.

The total allowable catch in the South Atlantic for the years 2007 through 2009 was 17,000 t. The reported catch during that period averaged 13,482 t, and did not exceed the TAC in any year. In 2010, the TAC was reduced to 15,000 t, and the catch in that year was 12,566 t. Reports for 2010 are considered provisional and subject to change.

Minimum size limits

There are two minimum size options that are applied to the entire Atlantic: 125 cm LJFL with a 15% tolerance, or 119 cm LJFL with zero tolerance and evaluation of the discards.

For the 2006-2008 period, the estimate of the percentage of swordfish reported landed (throughout the Atlantic) less than 125 cm LJFL was about 24% (in number) overall for all nations fishing in the Atlantic (28% in the northern stock and 20% in southern stock). If this calculation is made using reported landings plus estimated dead discards, then the percentage less than 125 cm LJFL would be of the same order given the relatively small amount of discards reported. These estimates are based on the overall catch at size, which have high levels of substitutions for a significant portion of the total catch.

Other implications

The Committee is concerned that in some cases national regulations have resulted in the unreported discarding of swordfish caught in the North stock and, to a certain extent, could have influenced similar behavior of the fleet that fishes the South Atlantic swordfish stock. The Committee considers that these regulations may have had a detrimental effect on the availability and consistency of scientific data on catches, sizes and CPUE indices of the Atlantic fleet. The Committee expressed its serious concern over this limitation on data for future assessments.

SWO-ATL-6. Management recommendations

North Atlantic

The Committee continues to note that the allowable country-specific catch levels agreed in [Recs. 06-02, 08-02, and 10-02] continue to exceed the TAC adopted by the Commission and the scientific recommendations. Such potential catches could compromise the rebuilt state of this stock.

ATLANTIC SWORDFISH SUMMARY

	North Atlantic	**South Atlantic**
Maximum Sustainable Yield[1]	13,730 t (13,020-14,182)[3]	~15,000 t
Current (2010) TAC	13,700 t	15,000 t
Current (2010) Yield[2]	12,154 t	12,566 t
Yield in last year used in assessment (2008)	11,188 t[5]	12,363 t[5]
B_{MSY}	61,860 (53,280-91,627)	47,700
F_{MSY}	0.22 (0.14-0.27)	0.31
Relative Biomass (B_{2009}/B_{MSY})	1.05 (0.94-1.24)	1.04 (0.82-1.22)
Relative Fishing Mortality (F_{2008}/F_{MSY}[1])	0.76 (0.67-0.96)	0.75 (0.60-1.01)
Stock Status	Overfished: NO Overfishing: NO	Overfished: NO Overfishing: NO
Management Measures in Effect:	Country-specific TACs [Rec. 10-02]; 125/119cm LJFL minimum size	Country-specific TACs [09-03] 125/119cm LJFL minimum size

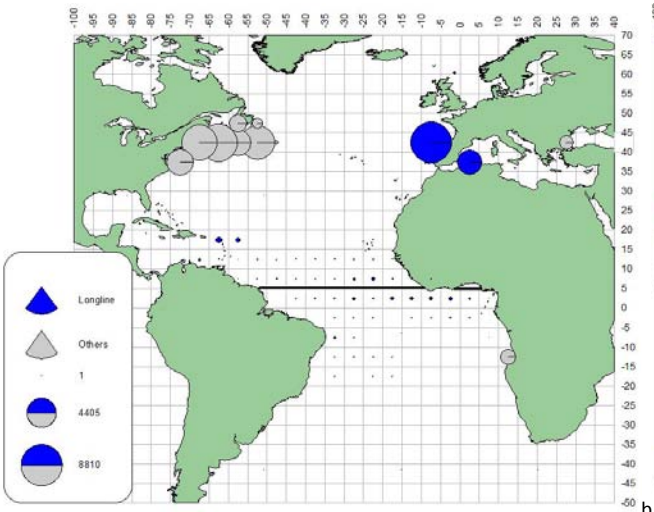
[1] Base Case production model (Logistic) results based on catch data 1950-2008.
[2] Provisional and subject to revision.
[3] 80% bias corrected confidence intervals are shown.
[4] Provisional and preliminary, based on production model results that included catch data from 1970-2008.
[5] As of 29 September 2010.

SWO-ATL-Table 1. Estimated catches (t) of Atlantic swordfish (*Xiphias gladius*) by gear and flag.

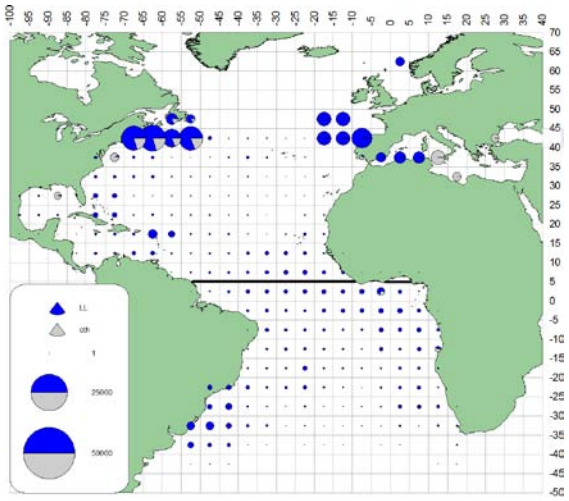
			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
TOTAL			24380	26266	32685	34305	32976	28826	29207	32868	34459	38803	33511	31567	26251	27123	27180	25139	23758	24075	25252	25643	25718	27997	23596	24761	24720
	ATN		18486	20236	19513	17250	15672	14934	15394	16738	15501	16872	15222	13025	12223	11622	11453	10011	9654	11442	12175	12480	11473	12444	11188	12276	12154
	ATS		5894	6030	13172	17055	17304	13893	13813	16130	18958	21930	18289	18542	14027	15502	15728	15128	14104	12633	13077	13162	14245	15553	12408	12484	12566
Landings	ATN	Longline	18269	20022	18927	15348	14026	14208	14288	15641	14309	15764	13808	12181	10778	10449	9642	8425	8664	9997	11406	11527	10840	11617	10473	11341	11458
		Other surf.	217	214	586	1902	1646	511	723	689	484	582	826	393	961	643	672	685	374	822	449	620	409	546	471	778	550
	ATS	Longline	4951	5446	12404	16398	16705	13287	13176	15547	17387	20806	17799	18239	13748	14823	15448	14302	13576	11712	12485	12915	13723	14890	11623	11911	11832
		Other surf.	943	584	768	657	599	606	637	583	1571	1124	489	282	269	672	278	825	527	920	591	248	522	572	779	574	587
Discards	ATN	Longline	0	0	0	0	0	215	383	408	708	526	562	439	476	525	1137	896	607	618	313	323	215	273	235	151	141
		Other surf.	0	0	0	0	0	0	0	0	0	0	26	12	9	4	1	6	8	5	7	10	8	8	9	7	5
	ATS	Longline	0	0	0	0	0	0	0	0	0	0	1	21	10	6	1	0	0	0	1	0	0	91	6	0	147
		Other 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	
Landings	ATN	Barbados	0	0	0	0	0	0	0	0	0	0	33	16	16	12	13	19	10	21	25	44	39	27	39	20	13
		Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	1	112	106
		Brasil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	117	0	0	0	0	0	0	0	0	0	**0**
		Canada	1059	954	898	1247	911	1026	1547	2234	1676	1610	739	1089	1115	1119	968	1079	959	1285	1203	1558	1404	1348	1334	1300	1346
		China P.R.	0	0	0	0	0	0	0	73	86	104	132	40	337	304	22	102	90	316	56	108	72	85	92	92	73
		Chinese Taipei	157	52	23	17	270	577	441	127	507	489	521	509	286	285	347	299	310	257	30	140	172	103	82	89	88
		Cuba	636	910	832	87	47	23	27	16	50	86	7	7	7	7	0	0	10	3	3	2	2	0	0	0	
		Côte D'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	30
		Dominica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	
		EU.Denmark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.España	9719	11135	9799	6648	6386	6633	6672	6598	6185	6953	5547	5140	4079	3996	4595	3968	3957	4586	5376	5521	5448	5564	4366	4949	4147
		EU.France	4	0	0	0	75	75	75	95	46	84	97	164	110	104	122	0	74	169	102	178	92	46	14	15	35
		EU.Ireland	0	0	0	0	0	0	0	7	0	0	15	15	132	81	35	17	5	12	1	1	3	2	2	1	1
		EU.Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Poland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Portugal	468	994	617	300	475	773	542	1961	1599	1617	1703	903	773	777	732	735	766	1032	1320	900	949	778	747	898	1054
		EU.United Kingdom	0	0	0	0	0	0	0	2	3	1	5	11	0	2	1	0	0	0	0	0	0	0	0	2	0
		FR.St Pierre et Miquelon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	3	36	48	0	82	48	17	90
		Faroe Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	5	4	0	0	0	0	0	0	0	0	0	
		Grenada	0	0	56	5	1	2	3	13	0	1	4	15	15	42	84	0	54	88	73	56	30	26	43	0	
		Iceland	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**
		Japan	807	413	621	1572	1051	992	1064	1126	933	1043	1494	1218	1391	1089	161	0	0	0	575	705	656	889	935	778	1047
		Korea Rep.	68	60	30	320	51	3	3	19	16	16	19	15	0	0	0	0	0	0	0	51	65	175	157	3	
		Liberia	16	30	19	35	3	0	7	14	26	28	28	28	28	28	0	0	0	0	0	0	0	0	0	0	
		Libya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	
		Maroc	181	197	196	222	91	110	69	39	36	79	462	267	191	119	114	523	223	329	335	334	341	237	430	724	963
		Mexico	0	0	0	0	0	0	0	6	14	0	22	14	28	24	37	27	34	32	44	41	31	35	34	32	35
		NEI (ETRO)	0	0	76	112	529	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		NEI (MED)	14	3	131	190	185	43	35	111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Norway	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	
		Philippines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	44	5	0	8	0	22	28	
		Rumania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Russian Federation	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**
		Senegal	0	0	0	1	0	6	6	0	0	0	0	0	0	0	0	0	0	0	108	108	0	180	138	223	191
		Seychelles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	
		Sierra Leone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	
		St. Vincent and Grenadines	0	0	0	0	3	0	3	23	0	4	3	1	0	1	0	22	22	7	7	7	0	51	7	34	13
		Sta. Lucia	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	3	0	0	2	0	0
		Trinidad and Tobago	45	151	42	79	66	71	562	11	180	150	158	110	130	138	41	75	92	78	83	91	19	29	48	30	21
		U.S.A.	5210	5247	6171	6411	5519	4310	3852	3783	3366	4026	3559	2987	3058	2908	2863	2217	2384	2513	2380	2160	1873	2463	2387	2730	2714
		U.S.S.R.	18	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		UK.Bermuda	0	0	0	0	0	0	0	0	0	1	1	5	5	3	3	2	0	0	1	1	0	3	4	3	3
		UK.British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	7	0	3	0	
		UK.Turks and Caicos	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	29	14	0	0	0	13
		Venezuela	84	86	2	4	9	75	103	73	69	54	85	20	37	30	44	21	34	45	53	55	22	30	11	13	24
	ATS	Angola	815	84	84	84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	
		Argentina	31	351	198	175	230	88	88	14	24	0	0	0	0	38	0	5	10	8	0	0	0	0	0	0	
		Belize	0	0	0	0	0	0	0	0	0	1	0	0	0	17	8	0	0	0	0	0	0	120	32	111	121

			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		Benin	39	13	19	26	28	28	26	28	25	24	24	10	0	3	0	0	0	0	0	0	0	0	0	0	
		Brasil	753	947	1162	1168	1696	1312	2609	2013	1571	1975	1892	4100	3847	4721	4579	4082	2910	2920	2998	3785	4430	4153	3407	3386	2926
		Cambodia	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	
		China P.R.	0	0	0	0	0	0	0	0	0	0	0	0	29	534	344	200	423	353	278	91	300	473	470	291	296
		Chinese Taipei	216	338	798	610	900	1453	1686	846	2829	2876	2873	2562	1147	1168	1303	1149	1164	1254	745	744	377	671	727	612	410
		Cuba	95	173	159	830	448	209	246	192	452	778	60	60	0	0	0	0	0	0	0	0	0	0	0	0	
		Côte D'Ivoire	10	10	12	7	8	18	13	14	20	19	26	18	25	26	20	19	19	43	29	31	39	17	159	100	114
		EU.Bulgaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.España	66	0	4393	7725	6166	5760	5651	6974	7937	11290	9622	8461	5832	5758	6388	5789	5741	4527	5483	5402	5300	5283	4073	5183	5801
		EU.Lithuania	0	0	0	0	0	0	0	0	794	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Portugal	0	0	0	0	0	0	1	0	0	380	389	441	384	381	392	393	380	354	345	493	440	428	271	367	232
		EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	49	0	0	3	
		Gabon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	
		Ghana	13	123	235	156	146	73	69	121	51	103	140	44	106	121	117	531	372	734	343	55	32	65	177	132	116
		Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	
		Honduras	0	0	0	0	0	0	3	0	0	6	4	5	2	8	0	0	0	0	0	0	0	0	0	0	
		Japan	2913	2620	4453	4019	6708	4459	2870	5256	4699	3619	2197	1494	1186	775	790	685	833	924	686	480	1090	2155	1600	1340	1405
		Korea Rep.	369	666	1012	776	50	147	147	198	164	164	7	18	7	5	10	0	2	24	70	36	94	176	223	10	
		Mixed flags (FR+ES)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	
		NEI (ETRO)	0	0	0	856	439	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Namibia	0	0	0	0	0	0	0	0	22	0	0	0	0	730	469	751	504	191	549	832	1118	1038	518	25	417
		Nigeria	0	0	0	0	0	0	3	0	0	0	9	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	29	105	0	0	0	0	0	0	0	0	0	0	
		Philippines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	1	8	1	1	4	58	41	49	14
		S. Tomé e Príncipe	0	0	216	207	181	179	177	202	190	178	166	148	135	129	120	120	120	120	126	147	138	138	183	188	193
		Seychelles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	
		South Africa	5	5	4	0	0	5	9	4	1	4	1	1	240	143	328	547	649	293	295	199	186	207	142	170	145
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	7	16	4
		Togo	32	1	0	2	3	5	5	8	14	14	64	0	0	0	0	0	0	0	9	10	2	0	0	0	
		U.S.A.	0	0	0	0	0	0	0	0	0	0	171	396	160	179	142	43	200	21	15	0	0	0	0	0	0
		U.S.S.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		UK.Sta Helena	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	4	0	0	0	0	0	0	0	
		Uruguay	537	699	427	414	302	156	210	260	165	499	644	760	889	650	713	789	768	850	1105	843	620	464	370	501	222
		Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	26	6	3	0	4
Discards	ATN	Canada	0	0	0	0	0	0	0	0	0	0	0	5	52	35	50	26	33	79	45	106	38	61	39	9	15
		Japan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	598	567	319	263	0	0	0	0	0	0	**0**
		Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		U.S.A.	0	0	0	0	0	215	383	408	708	526	588	446	433	494	490	308	263	282	275	227	185	220	205	148	131
	ATS	Brasil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	91	6	0	
		Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	147
		U.S.A.	0	0	0	0	0	0	0	0	0	0	1	21	10	6	1	0	0	0	1	0	0	0	0	0	0

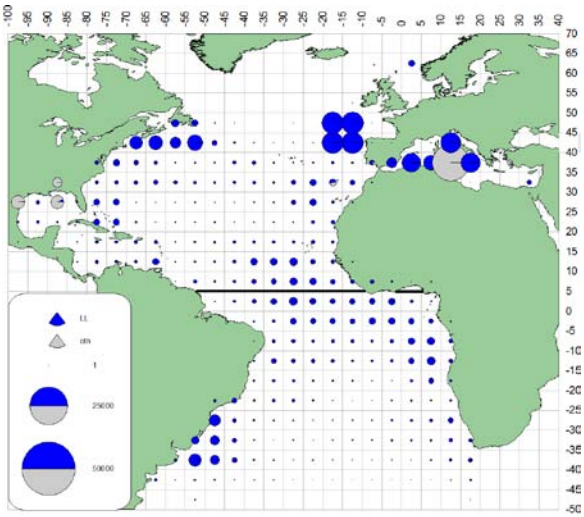
Korea also reported for 2010 an additional quantity of 10.2 t of swordfish live discards.



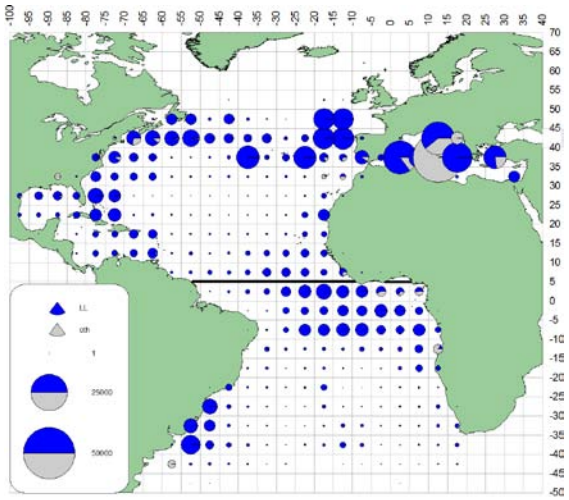
a. SWO(1950-59)



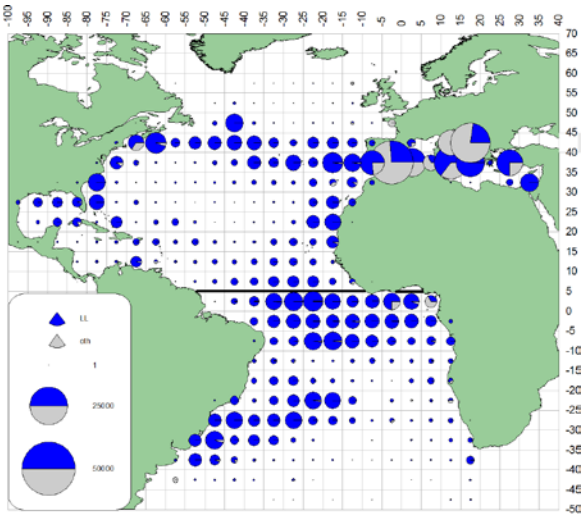
b. SWO(1960-69)



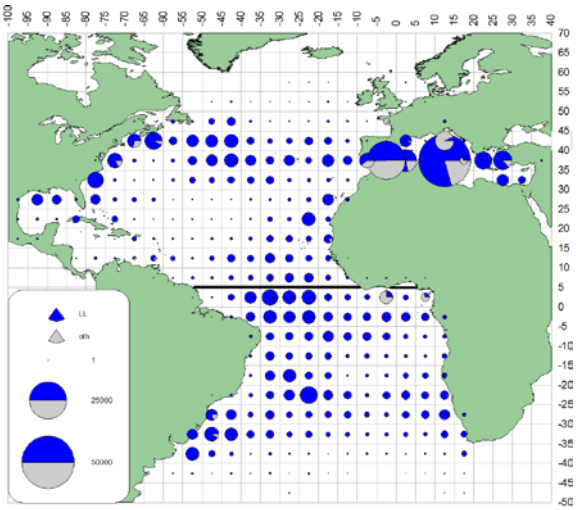
c. SWO(1970-79)



d. SWO(1980-89)

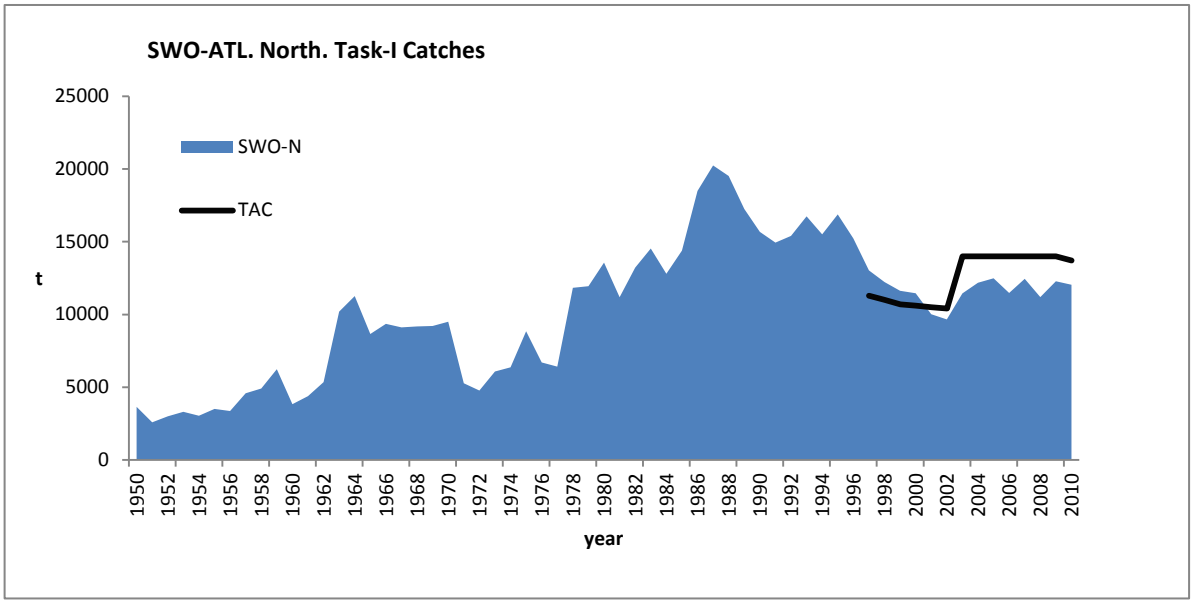


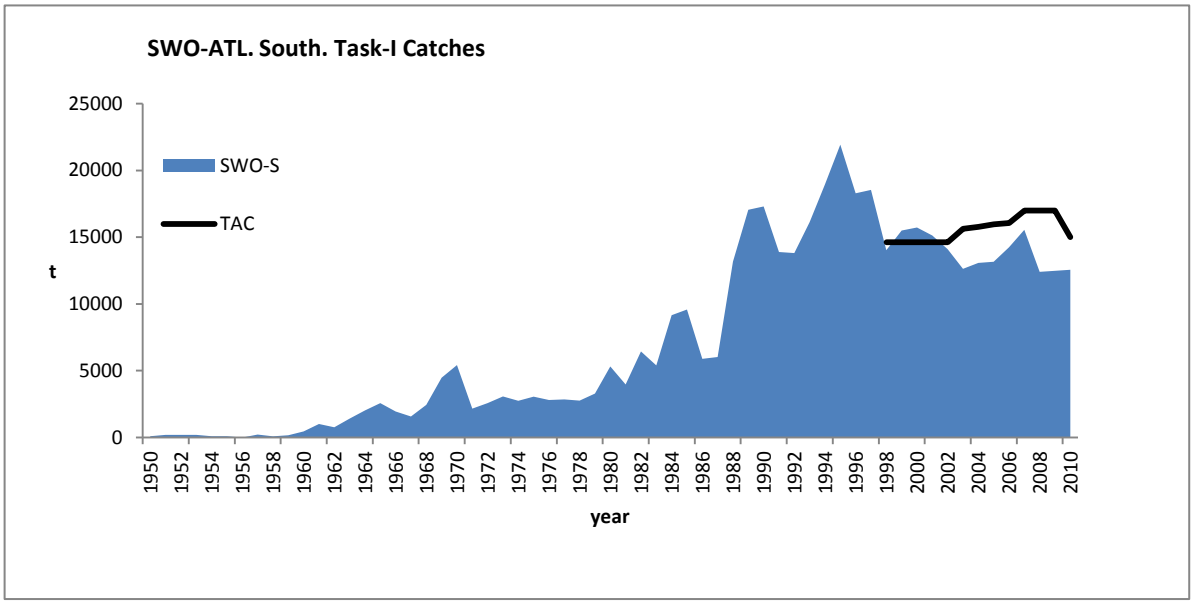
e. SWO (1990-99)



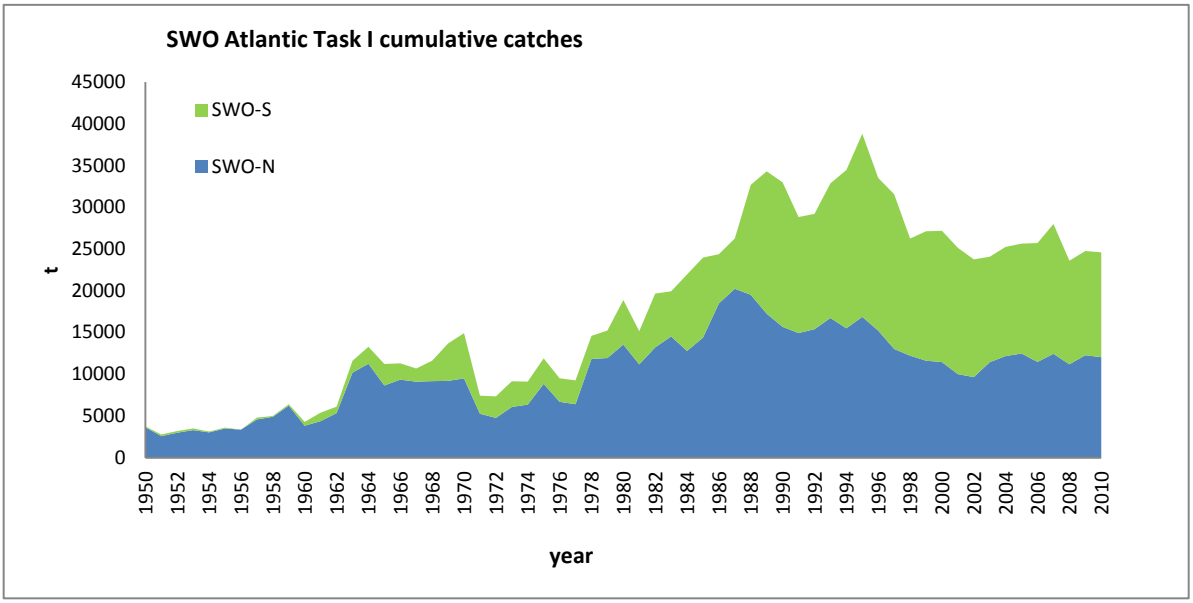
f. SWO (2000-09)

SWO-ATL-Figure 1. Geographic distribution of swordfish cumulative catch (t) by gear, in the Convention area, shown on a decadal scale. The more contemporary period (2000 to 2009) is shown on the bottom left. The symbols for the 1950s information (top left) are scaled to the maximum catch observed during the 1950s, whereas the remaining plots are scaled to the maximum catch observed from 1960 to 2009.

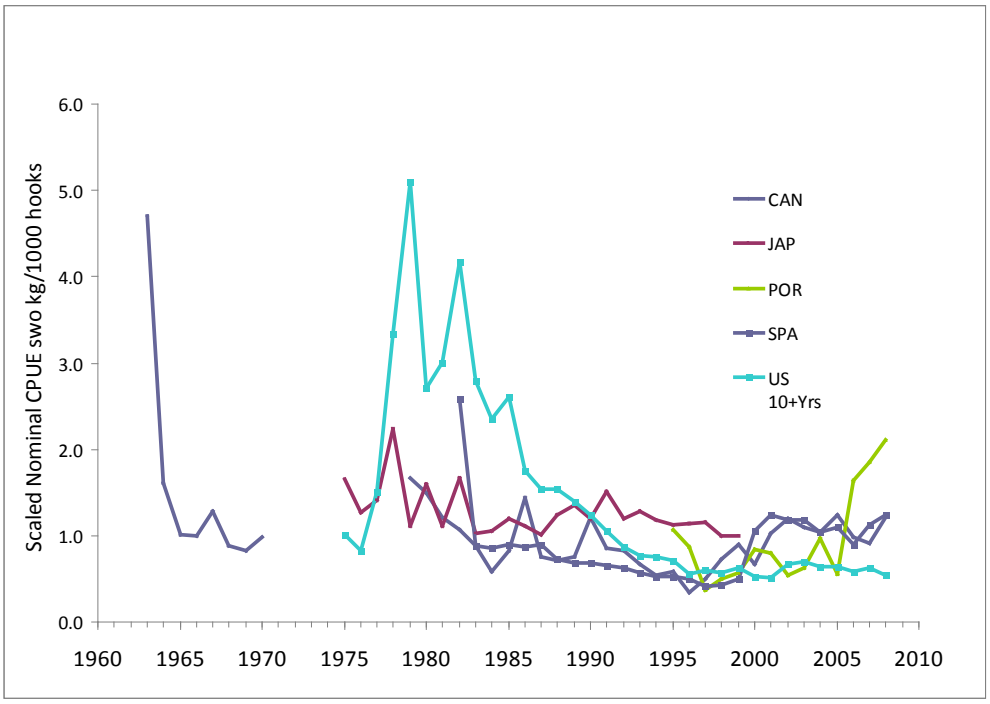




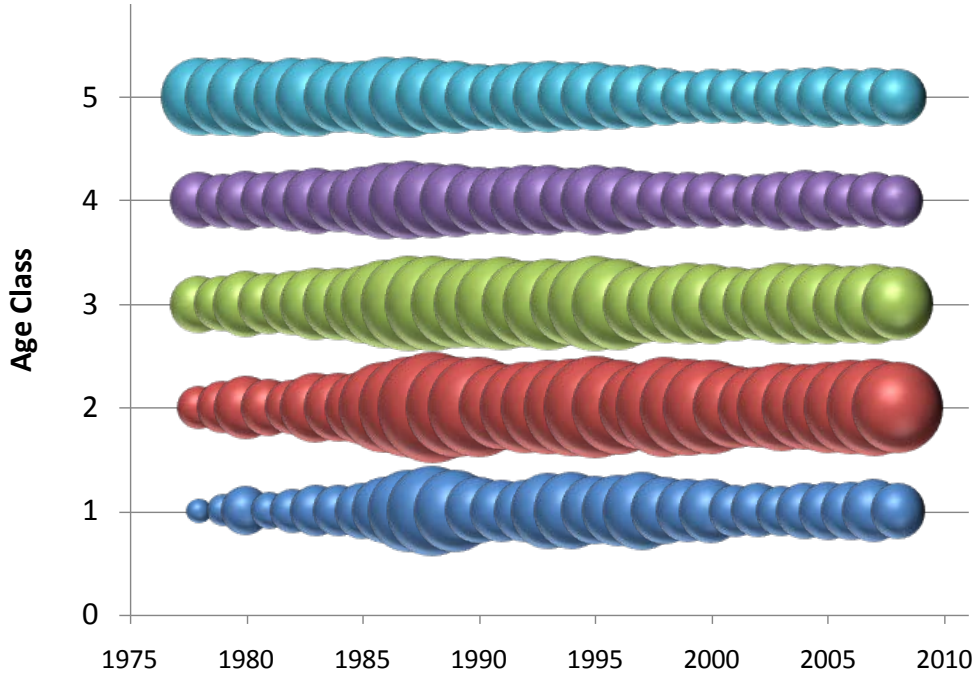
SWO-ATL-Figure 2. North and South Atlantic swordfish catch (t) by flag.



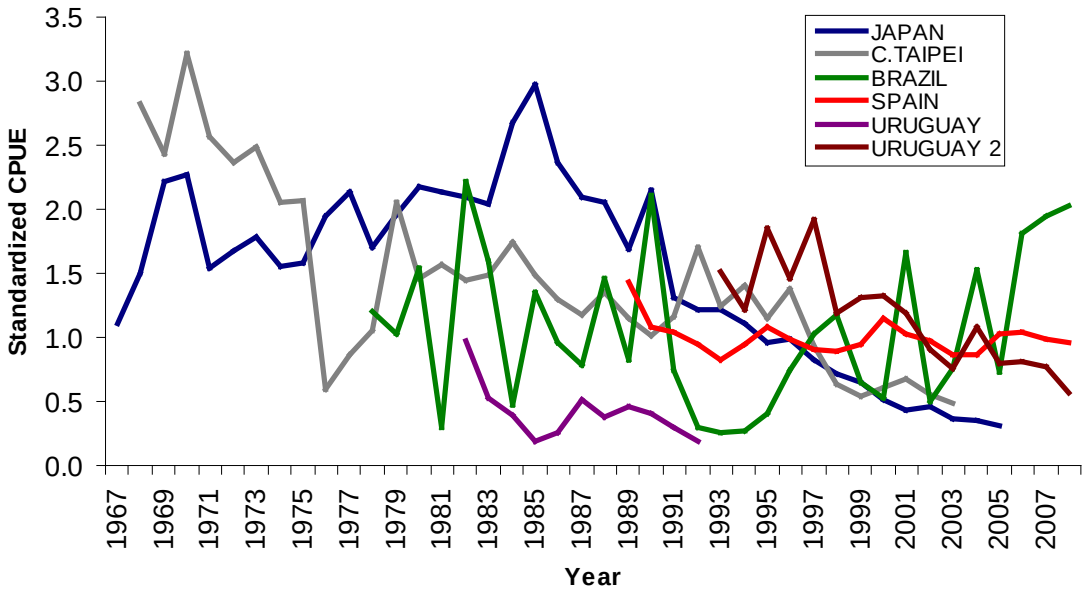
SWO-ATL-Figure 3. Swordfish reported catches (t) for North and South Atlantic, for the period 1950-2009 and the corresponding TAC.



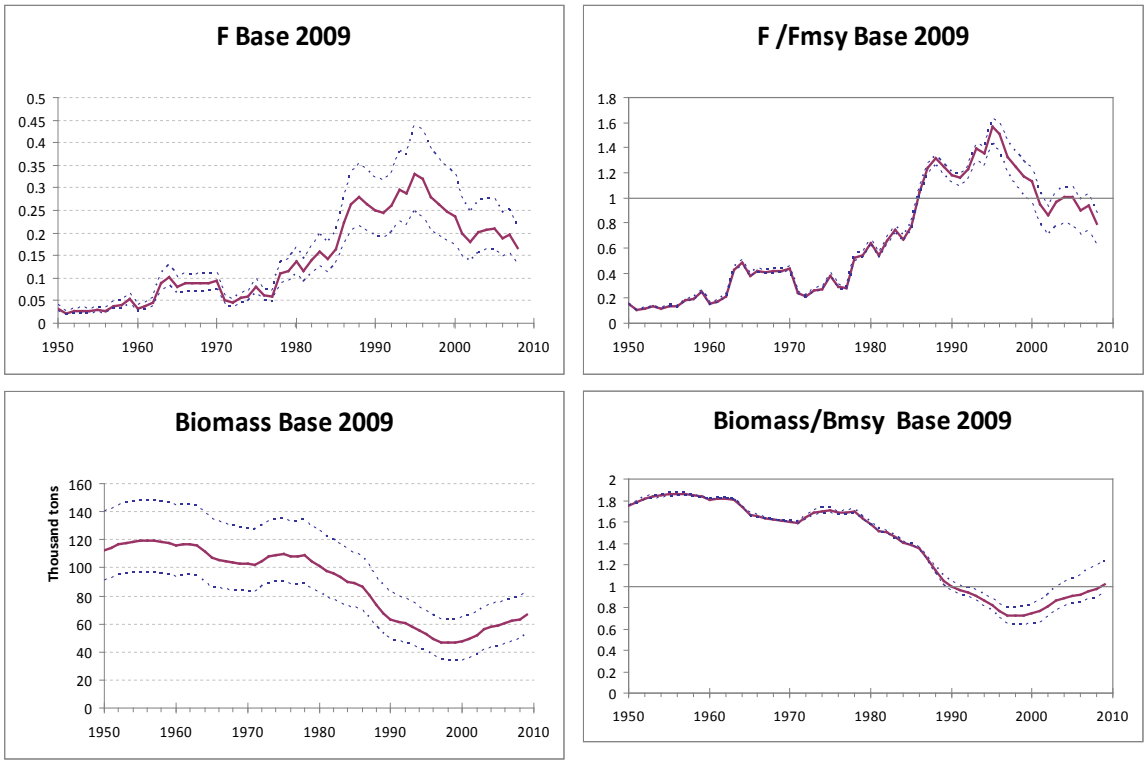
SWO-ATL-Figure 4. North Atlantic swordfish scaled nominal catch rate series used as input in the combined index of the base production model.



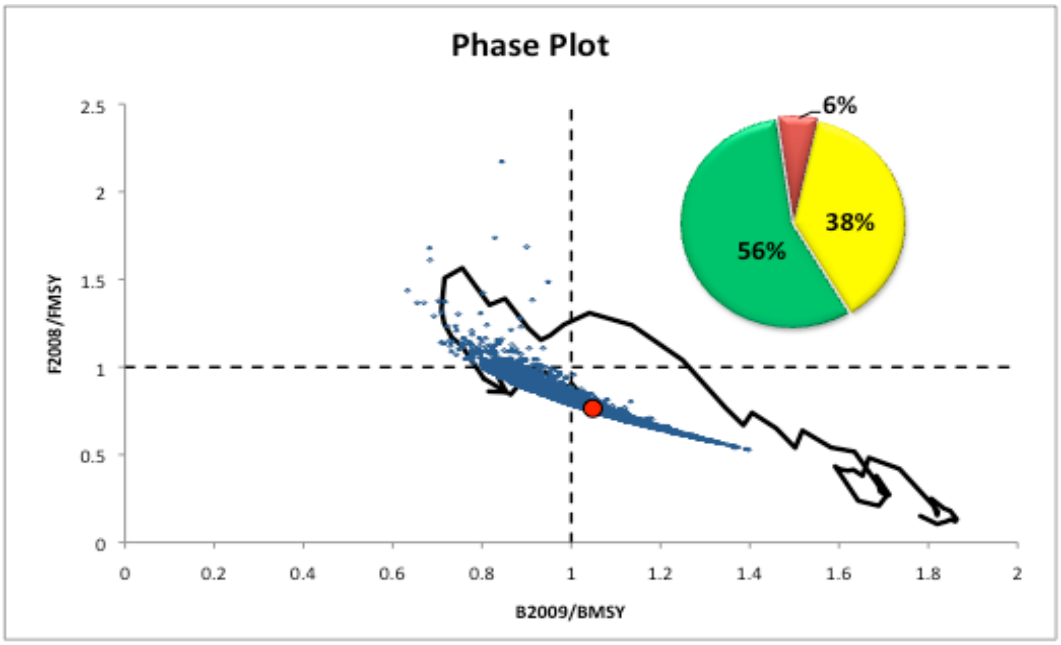
SWO-ATL-Figure 5. North Atlantic swordfish, catch at age (numbers) converted from catch at size. The area of the filled circle shows the proportional catch at age. Note: Age 5 is a plus group.



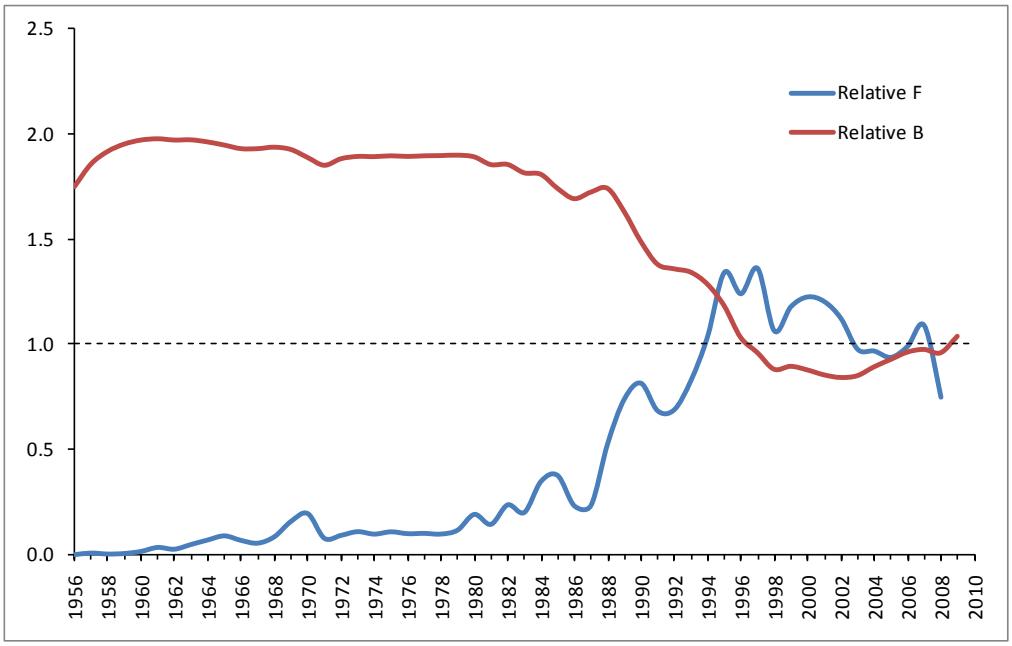
SWO-ATL-Figure 6. South Atlantic swordfish, standardized CPUE series for the production model (ASPIC) for characterizing the status of southern Atlantic swordfish (Scaled relative to mean of overlap).The series for Uruguay was treated as two series.



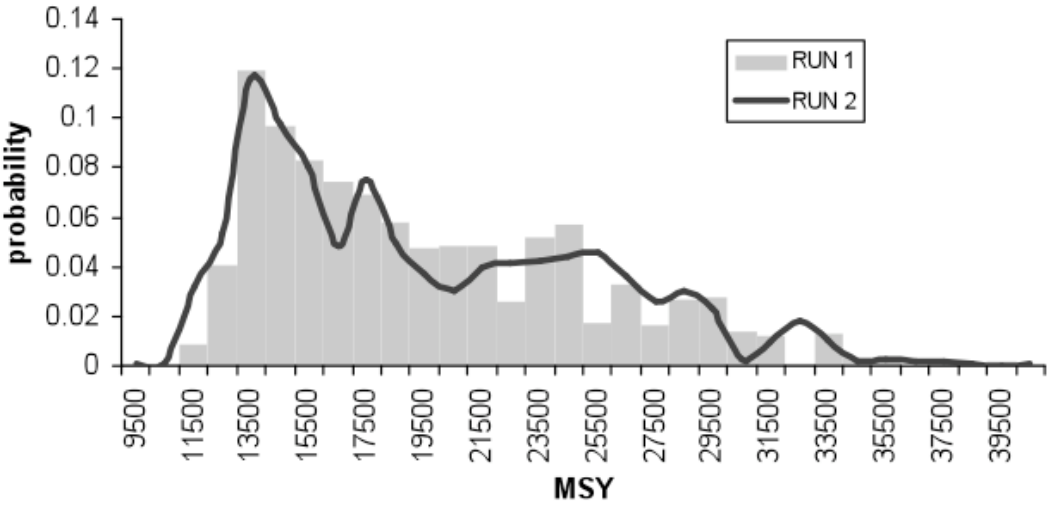
SWO-ATL-Figure 7. North Atlantic swordfish, biomass, fishing mortality and relative ratio trends for the base production model. The solid lines represent point estimates and broken lines represent estimated 80% bias corrected confidence intervals.



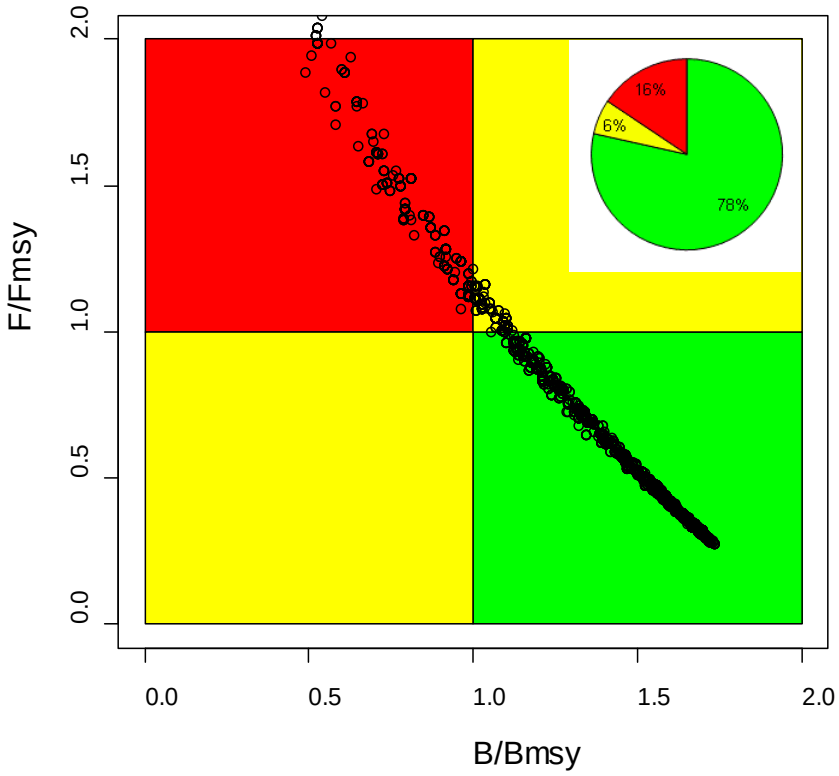
SWO-ATL-Figure 8. Summary figure of the current northern Atlantic swordfish stock status which includes different representation of the bootstraps results of the base ASPIC model: percentage, phase-plots (marked dot corresponds to the deterministic result) and stock status trajectories for the period 1950-2008. The x-axis represents relative biomass, and the y-axis relative exploitation rate.



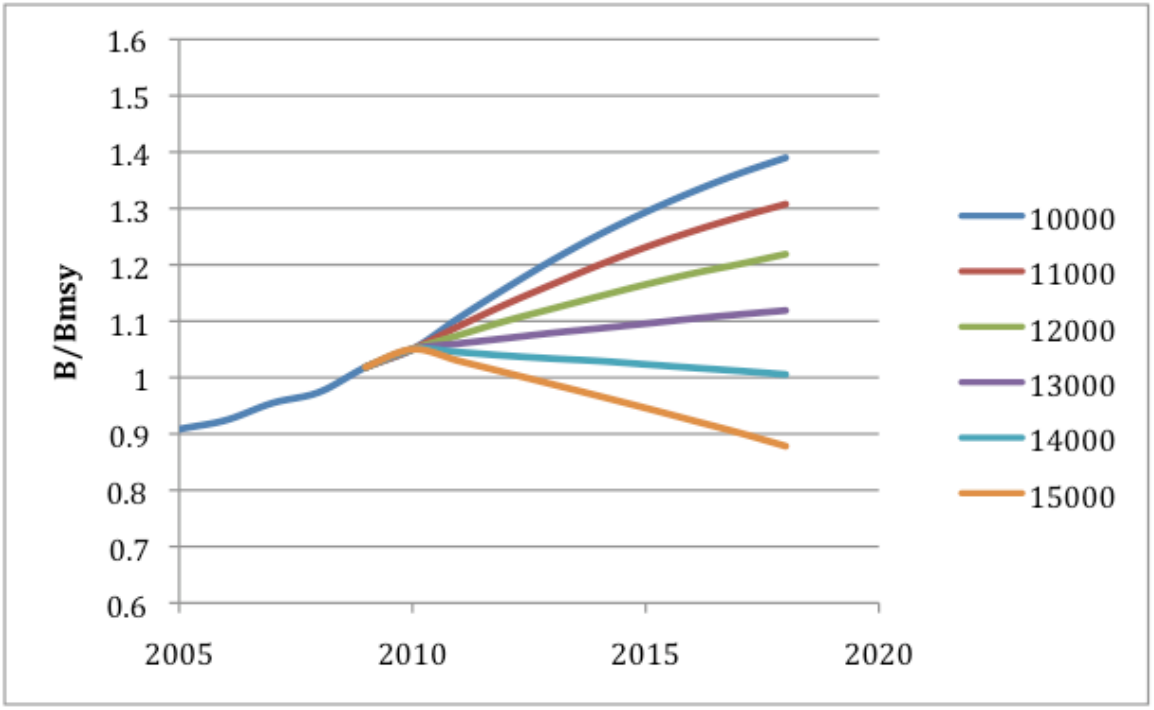
SWO-ATL Figure 9. South Atlantic, relative biomass (B/B_{MSY}) and relative fishing mortality (F/F_{MSY}) trajectories estimated by the base case production model.

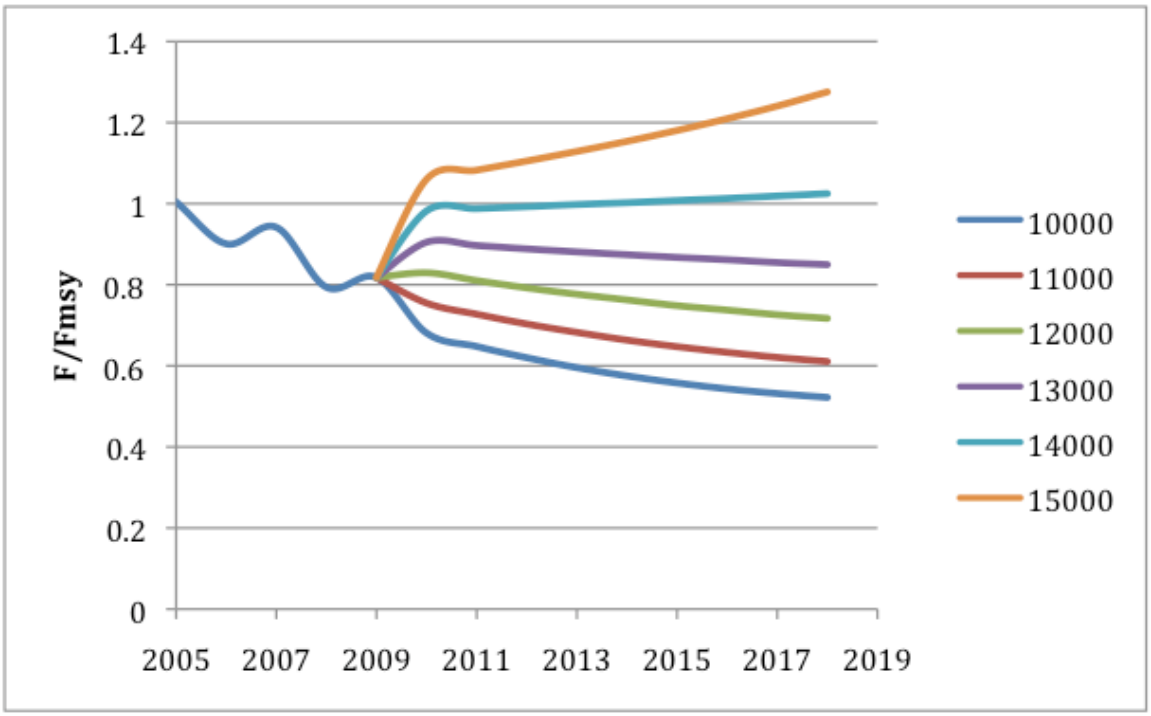


SWO-ATL-Figure 10. Posterior probability density estimates of MSY for South Atlantic swordfish from the catch-only model fitted to catch data from 1950 to 2009. Runs 1 and 2 refer to two scenarios with different assumptions for the intrinsic rate of population increase.

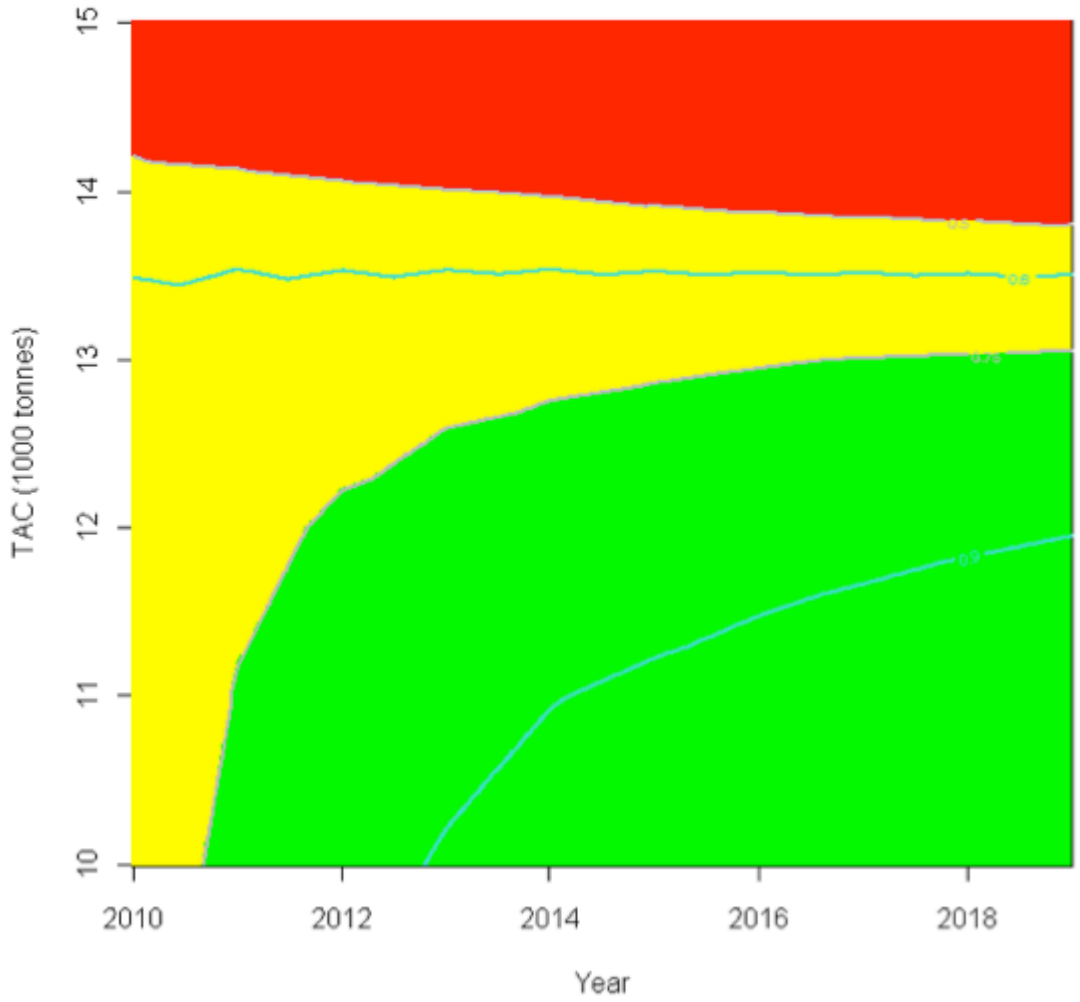


SWO-ATL-Figure 11. Summary figure of the current southern Atlantic swordfish stock status which includes the level of uncertainty on the knowledge of the state of the stock. Conditioned only on the catches**,** the model estimated a probability of 0.78 that the stock is not overfished and it is not undergoing overfishing.

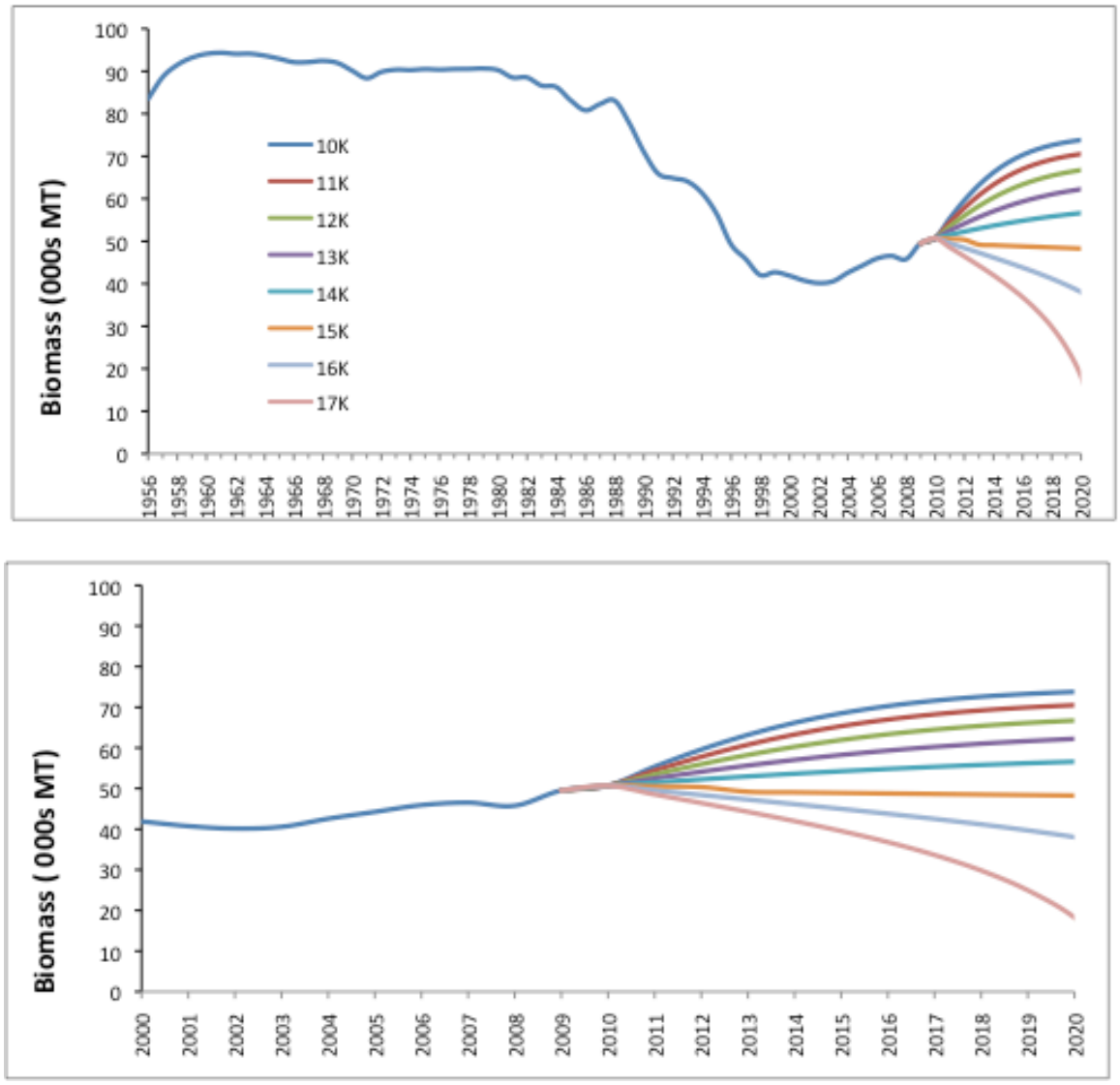




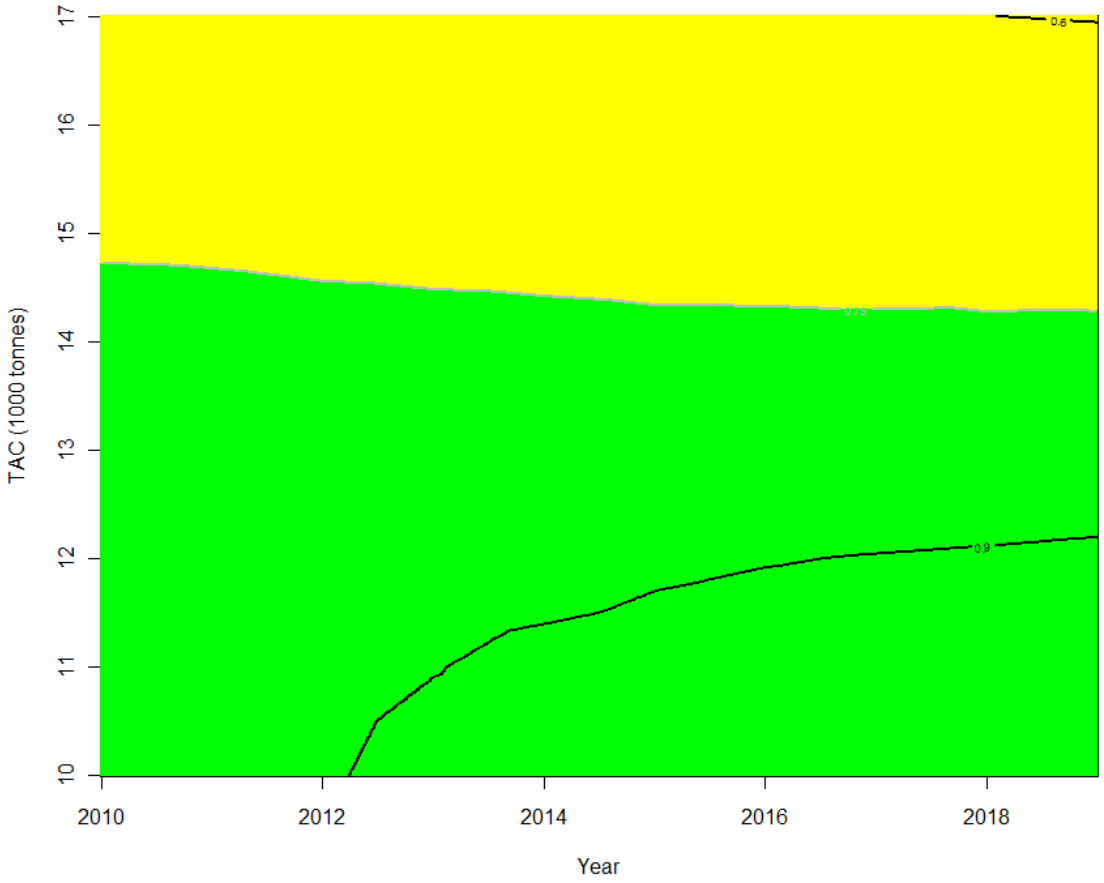
SWO-ATL-Figure 12. Projections of median relative North Atlantic swordfish stock biomass and F from the base ASPIC model under different constant catch scenarios (10\15 thousand tons) North Atlantic swordfish stock.



SWO-ATL-Figure 13. North Atlantic swordfish, probability contours of $B>B_{MSY}$ and $F<F_{MSY}$ for the constant catch scenarios indicated over time. Red areas represent probabilities less than 50%, yellow from 50-75%, and green above 75%. The 90th, 75th, 60th, and 50th probability contours are also depicted.



SWO-ATL-Figure 14. South Atlantic, projected biomass levels under various catch scenarios. The bottom panel provides the details of the projections over a reduced time interval.



SWO-ATL-Figure 15. South Atlantic swordfish, probability contours of $B>B_{MSY}$ and $F<F_{MSY}$ (from the catch only model, both runs combined) for the constant catch scenarios indicated over time. Yellow areas represent probabilities from 50-75%, and green above 75%. The 90th, 75th, probability contours are also depicted. No probabilities were below 50%.

8.9 SWO-MED-MEDITERRANEAN SWORDFISH

In the last 15 years Mediterranean swordfish production has fluctuated without any specific trend at levels higher than those observed for bigger areas such as the North and South Atlantic. The most recent assessment was conducted in 2010 (Anon. 2011f), making use of catch and effort information through 2008. The present report summarizes assessment results and readers interested in more detailed information on the state of the stock should consult the report of the latest stock assessment session.

SWO-MED-1. Biology

Research results based on genetic studies have demonstrated that Mediterranean swordfish compose a unique stock separated from the Atlantic ones, although there is incomplete information on stock mixing and boundaries. However, mixing between stocks is believed to be low and generally limited to the region around the Straits of Gibraltar.

According to previous knowledge, the Mediterranean swordfish have different biological characteristics compared to the Atlantic stock, The growth parameters are different, and the sexual maturity is reached at younger ages than in the Atlantic, although more recent information for the Atlantic indicates that these differences may smaller than was previously thought. In the Mediterranean, mature females as small as 110 cm LJFL have been observed and the estimated size at which 50% of the female population is mature occurs at about 140 cm. According to the growth curves used by SCRS in the past for Mediterranean swordfish, these two sizes correspond to 2 and 3.5 year-old fish, respectively. Males reach sexual maturity at smaller sizes and mature specimens have been found at about 90 cm LJFL. Based on the fish growth pattern and the assumed natural mortality rate of 0.2, the maximum yield would be obtained through instantaneous fishing at age 6, while current catches are dominated, in terms of number, by fish less than 4 years old.

SWO-MED-2. Fishery indicators

Annual catch levels fluctuate between 12,000-16,000 t. in the last 15 years without any specific trend. Those levels are relatively high and similar to those of bigger areas such as the North Atlantic. This could be related to higher recruitment levels in the Mediterranean than in the North Atlantic, different reproduction strategies (larger spawning areas in relation to the area of distribution of the stock) and the lower abundance of large pelagic predators (e.g. sharks) in the Mediterranean. Updated information on Mediterranean swordfish catch by gear type is provided in **SWO-MED-Table 1** and **SWO-MED-Figure 1**. The total 2010 catch was 13,430 t, which is close to the mean of the 2006-2009 period. Gillnet catches show a declining trend in the last years due to the enforcement of a Mediterranean-wide driftnet ban. A complete closure of the Moroccan driftnet fishery is expected by the end of 2011. The biggest producers of swordfish in the Mediterranean Sea in the recent years are EU-Italy, Morocco, EU-Spain and EU-Greece. Also, Algeria, EU-Cyprus, EU-Malta, EU-Portugal, Tunisia and Turkey have fisheries targeting swordfish in the Mediterranean. Minor catches of swordfish have also been reported by Albania, Croatia, EU-France, Japan, and Libya. The Committee recognized that there may be additional fleets taking swordfish in the Mediterranean, for example, Egypt, Israel, Lebanon, Monaco and Syria, but the data are not reported to ICCAT or FAO.

Mediterranean swordfish landings showed an upward trend from 1965-1972, stabilized between 1973-1977, and then resumed an upward trend reaching a peak in 1988 (20,365 t; **SWO-MED-Table 1, SWO-MED-Figure 1**). The sharp increase between 1983 and 1988 may be partially attributed to improvement in the national systems for collecting catch statistics. Since 1988, the reported landings of swordfish in the Mediterranean Sea have declined fluctuating mostly between 12,000 to 16,000 t.

The main fishing gears used are surface longline and gillnets. Minor catches are also reported from harpoon, trap and recreational fisheries. Surface longlines are used all over the Mediterranean, while gillnets are still used in some areas and there are also countries known to be fishing with gillnets but not reporting their catches. However, following ICCAT recommendations for a general ban of driftnets in the Mediterranean, the gillnet fleet has been decreasing, although the total number of vessels cannot be determined from ICCAT statistics.

Preliminary results of experimental fishing surveys presented during the 2006 SCRS meeting indicated that selectivity of the surface longline targeting swordfish was more affected by the type and size of the bait, the depth of the set and the distance between branch lines rather than the type (circular vs. J-shaped) and the size of the hook. In general, American-style longlines capture less juvenile fish than the traditional Mediterranean longline gear, while a significant reduction of swordfish catches was found when using circle hooks.

A study based on fisheries data from the eastern Mediterranean presented during the 2009 SCRS suggested that there are no major differences in the age selection pattern among American and traditional longlines and confirmed previous findings regarding the higher catch efficiency of the American gear. It has been noted, however, that further studies in other Mediterranean areas are needed to verify that the estimated selection curves are independent of the stock distribution pattern.

Standardised CPUE series from the main longline and gillnet fisheries targeting swordfish, which were presented during the 2010 stock assessment session (Spanish longliners, Italian longliners, Greek longliners and Moroccan gillnetters), did not reveal any trend over time (**SWO-MED-Figure 2)**. CPUE series, however, covered only the last 10-20 years and not the full time period of reported landings. Similarly to CPUE, not any trend over the past 20 years was identified regarding the mean fish weight in the catches (**SWO-MED-Figure 3)**.

SWO-MED-3. State of the stocks

Two forms of assessment (production modelling and age-structured analysis - XSA), indicated that current SSB levels are much lower than those in the early 80's, although not any trend appears in the last 15 years. The extent of the decline differ among models, with the production model suggesting a decline of about 30%, while XSA results indicate that current SSB level is about 1/4 of that in the middle 80's **(SWO-MED-Figure 4)**. Results indicate that the fishery underwent a rapid expansion in the late 1980s resulting in Fs and catches above those that could support MSY. Estimates of population status from production modeling indicated that current stock level is slightly lower (~5%) to the optimum needed to achieve the ICCAT Convention objective, but these estimates have a high degree of uncertainty (CV~30%). Additionally, it should be noted that production model biomass estimates are very sensitive to the assumption made about the initial stock biomass ratio. In general, the low contrast in the available catch-effort series affects the reliability of biomass estimates, as well as, the predictions of effort changes on future catch levels.

Results of yield-per-recruit analyses based on the analytical age-structured assessment in which we have more confidence indicated that the stock is in overfished condition and slight overfishing is taking place. Current (2008) SSB is 46% lower than the value that would maximize yield per-recruit. Current F is slightly higher to the estimated F_{MSY} **(SWO-MED-Figure 5)**. Note, however, that these conclusions are based on deterministic analyses of the available data. The level of uncertainty in these estimates has not been evaluated.

The Committee again noted the large catches of small size swordfish, i.e., less than 3 years old (many of which have probably never spawned) and the relatively low number of large individuals in the catches. Fish less than three years old usually represent 50-70% of the total yearly catches in terms of numbers and 20-35% in terms of weight **(SWO-MED-Figure 6)**. A reduction of the volume of juvenile catches would improve yield per recruit and spawning biomass per recruit levels.

SWO-MED-4. Outlook

The assessment of Mediterranean swordfish indicates that the stock is below the level which can support MSY and that current fishing mortality slightly exceeds $F_{MSY.}$ Overall results suggest that fishing mortality (and near-term catches) needs to be reduced to move the stock toward the Convention objective of biomass levels which could support MSY and away from levels which could allow a rapid stock decline. A reduction of current F to the $F_{0.1}$ level would result to a substantial (about 40%) long-term increase in SSB **(SWO-MED-Figure 7)**.

Seasonal closure projections based on highly-aggregated data derived from the age-structured assessment and which assume no compensation in effort, no interaction with other management actions in place, and an improvement in recruitment with increasing spawning stock biomass (SSB), are forecast to be beneficial in moving the stock condition closer to the Convention objective, resulting in increased catch levels in the medium term, and reductions in the volume of juvenile catches. Although simulations suggest that the stock can be rebuild to the mid-1980s SSB levels only in the case of six month closures, SSB increases up to the optimum levels suggested by the yield-per-recruit analysis can be achieved within 2-3 generations (8-12 years) even under the current management status (2-month closure), provided that fishing mortality is kept on 2008 levels, which were quite lower than the previous years. Risk analysis, however, indicates that a small probability (<5%) of stock collapse still exists in this case. Benefits from seasonal closures would be diminished if closure is applied in months of low fishing activity (December-January). It should be noted that seasonal closures, especially the longer ones, would result in significant catch reductions within the first few years after their application. Capacity reductions of 20% assuming no compensation in effort, or quotas equal to the 80% of the mean yield of

the last decade assuming no change in the selection pattern, could also result to stock rebuilt to optimum SSB levels. Results of the seasonal closure projections are summarized in **SWO-MED-Figure 8**.

SWO-MED-5. Effects of current regulations

ICCAT imposed a Mediterranean-wide one month fishery closure for all gears targeting swordfish in 2008, followed by a two-month closure since 2009. Several countries have imposed technical measures, such as closed areas and seasons, minimum landing size regulations and license control systems. The EC introduced a driftnet ban in 2002 and in 2003 ICCAT adopted a recommendation for a general ban of this gear in the Mediterranean [Rec. 03-04]. Rec. 04-12 forbids the use of various types of nets and longlines for sport and recreational fishing for tuna and tuna-like species in the Mediterranean.

In past meetings, the Committee has reviewed the various measures taken by member countries and noted the difficulties in implementing some of the management measures, particularly that of minimum landing size.

SWO-MED-6. Management recommendations

The Commission should adopt a Mediterranean swordfish fishery management plan which ensures that the stock will be rebuilt and kept in levels that are consistent with the ICCAT Convention objective. Given the uncertainties on optimum SSB level estimates and the rapid fishery expansion in the 1980s, which resulted in severe stock biomass declines, the SSB levels in the late 1980s may be also considered as a good B_{MSY} proxy for the stock. These levels, are around to 60,000-70,000 t, not very far however, from the currently estimated B_{MSY} value (~62, 000 t). Analysis has suggested that the seasonal closures have beneficial effects and can move the stock condition to the level which will support MSY, but the effect of the recently employed two-month closure could not be evaluated during the 2010 assessment session due to incomplete 2009 data.

Given that the current capacity in the Mediterranean swordfish fishery exceeds that needed to efficiently extract MSY, management measures aimed at reducing this capacity should also be considered part of a Mediterranean swordfish management plan adopted by the Commission.

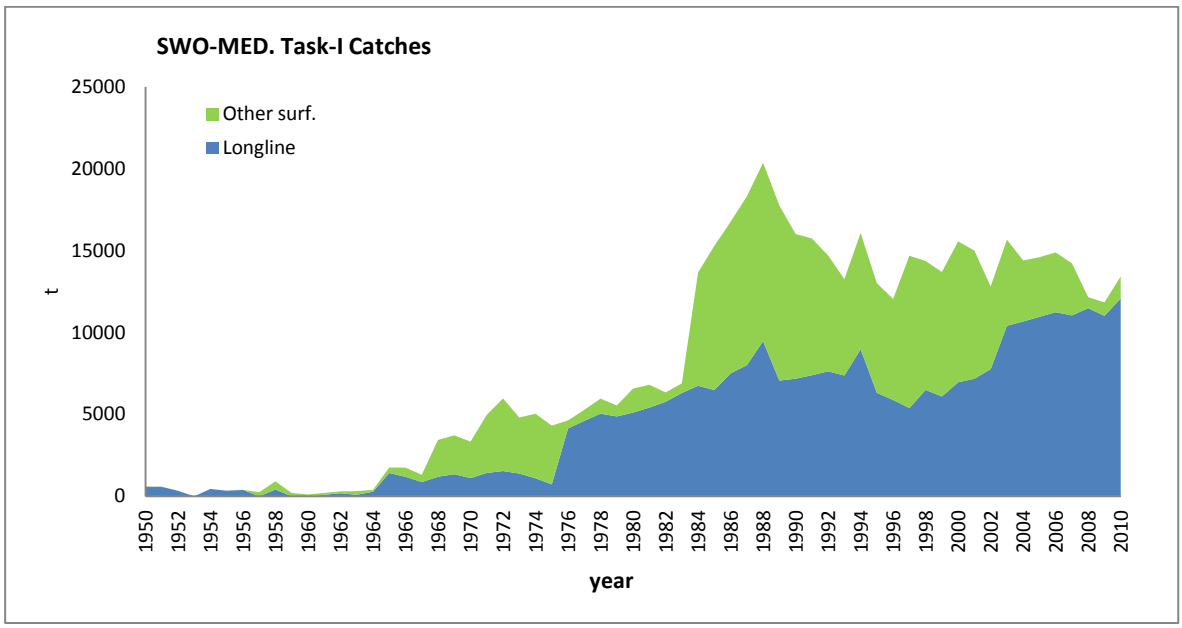
MEDITERRANEAN SWORDFISH SUMMARY

Maximum Sustainable Yield	~14,600 [1]
Current (2010) Yield	13, 430 t
Current (2008) Replacement Yield	~12,100 t[1]
Relative Biomass (B_{2008}/B_{MSY})	0.54 [1]
Relative Fishing Mortality	
F_{2008}/F_{MSY}	1.03 [1]
F_{2008}/F_{MAX}	0.91[1]
$F_{2008}/F_{0.1}$	1.52 [1]
$F_{2008}/F_{30\%SPR}$	1.32 [1]
Management measures in effect	Driftnet ban [Rec. 03-04] Two month fishery closure [2]

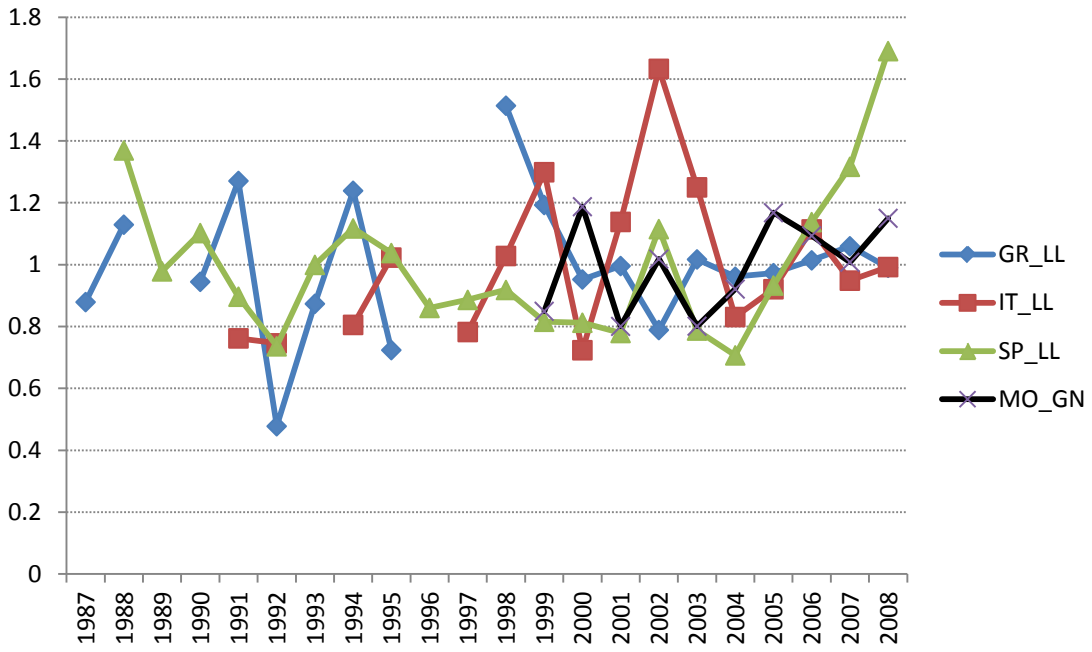
[1] Based on the age-structured analysis.
[2] Various technical measures, such as closed areas, minimum size regulations and effort controls are implemented at the national level.

SWO-MED-Table 1. Estimated catches (t) of swordfish (*Xiphias gladius*) in the Mediterranean by gear and flag.

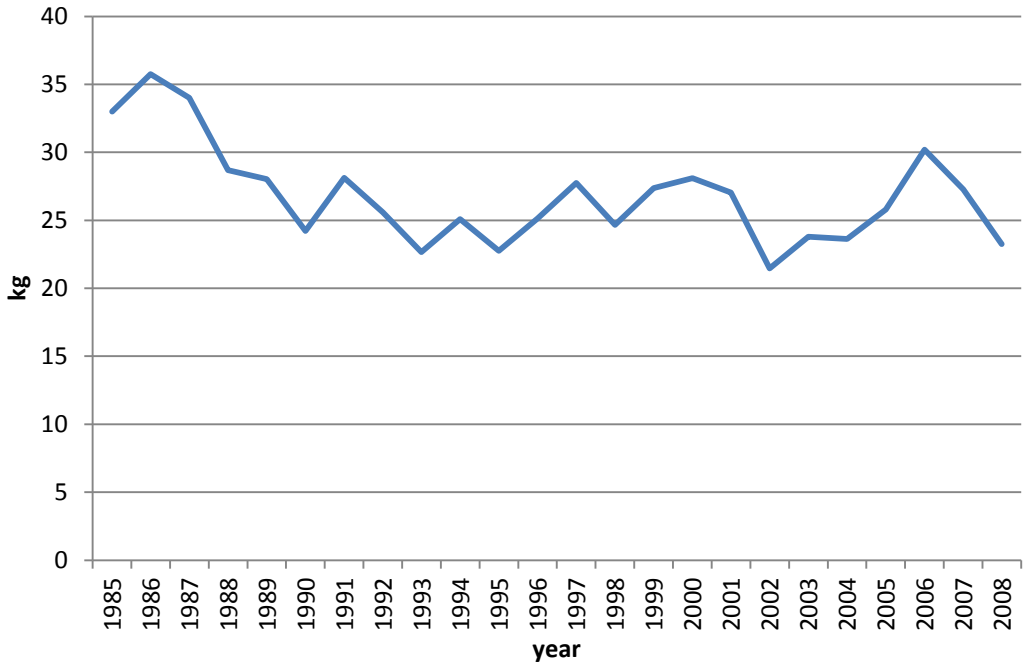
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
TOTAL		16765	18320	20365	17762	16018	15746	14709	13265	16082	13015	12053	14693	14369	13699	15569	15006	12814	15674	14405	14600	14893	14227	12164	11840	13430
Landings	Longline	7505	8007	9476	7065	7184	7393	7631	7377	8985	6319	5884	5389	6496	6097	6963	7180	7767	10415	10667	10848	11228	11028	11465	11020	12083
	Other surf.	9260	10313	10889	10697	8834	8353	7078	5888	7097	6696	6169	9304	7873	7602	8606	7826	5047	5259	3729	3639	3649	3179	672	819	1347
Discards	Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	113	16	19	27	0	
Landings	Albania	0	0	0	0	0	0	0	0	0	0	13	13	13	13	0	0	0	0	0	0	0	0	0	0	
	Algerie	847	1820	2621	590	712	562	395	562	600	807	807	807	825	709	816	1081	814	665	564	635	702	601	802	468	624
	Chinese Taipei	0	0	0	0	0	0	0	1	1	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	
	Croatia	0	0	0	0	0	0	0	0	0	0	0	0	10	20	0	0	0	0	0	0	0	0	4	3	6
	EU.Cyprus	154	84	121	139	173	162	56	116	159	89	40	51	61	92	82	135	104	47	49	53	43	67	67	38	31
	EU.España	1337	1134	1762	1337	1523	1171	822	1358	1503	1379	1186	1264	1443	906	1436	1484	1498	1226	951	910	1462	1697	2095	2000	1792
	EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	27	0	19	0	0	14	14	16	78
	EU.Greece	1714	1303	1008	1120	1344	1904	1456	1568	2520	974	1237	750	1650	1520	1960	1730	1680	1230	1120	1311	1358	1887	962	1132	1494
	EU.Italy	11413	12325	13010	13009	9101	8538	7595	6330	7765	7310	5286	6104	6104	6312	7515	6388	3539	8395	6942	7460	7626	6518	4549	5016	6022
	EU.Malta	144	163	233	122	135	129	85	91	47	72	72	100	153	187	175	102	257	163	195	362	239	213	260	266	423
	EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	115	8	1	120	14	16	0	0	0	
	Japan	7	3	4	1	2	1	2	4	2	4	5	5	7	4	2	1	1	0	2	4	0	3	1	1	
	Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
	Libya	0	0	0	0	0	0	0	0	0	0	0	0	11	0	8	6	0	10	2	0	14	0	0	0	
	Maroc	92	40	62	97	1249	1706	2692	2589	2654	1696	2734	4900	3228	3238	2708	3026	3379	3300	3253	2523	2058	1722	1957	1587	1610
	NEI (MED)	767	828	875	979	1360	1292	1292	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Syria Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37	28	0	
	Tunisie	64	63	80	159	176	181	178	354	298	378	352	346	414	468	483	567	1138	288	791	791	949	1024	1011	1012	1016
	Turkey	226	557	589	209	243	100	136	292	533	306	320	350	450	230	370	360	370	350	386	425	410	423	386	301	334
Discards	EU.Greece	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	113	16	19	27	0	



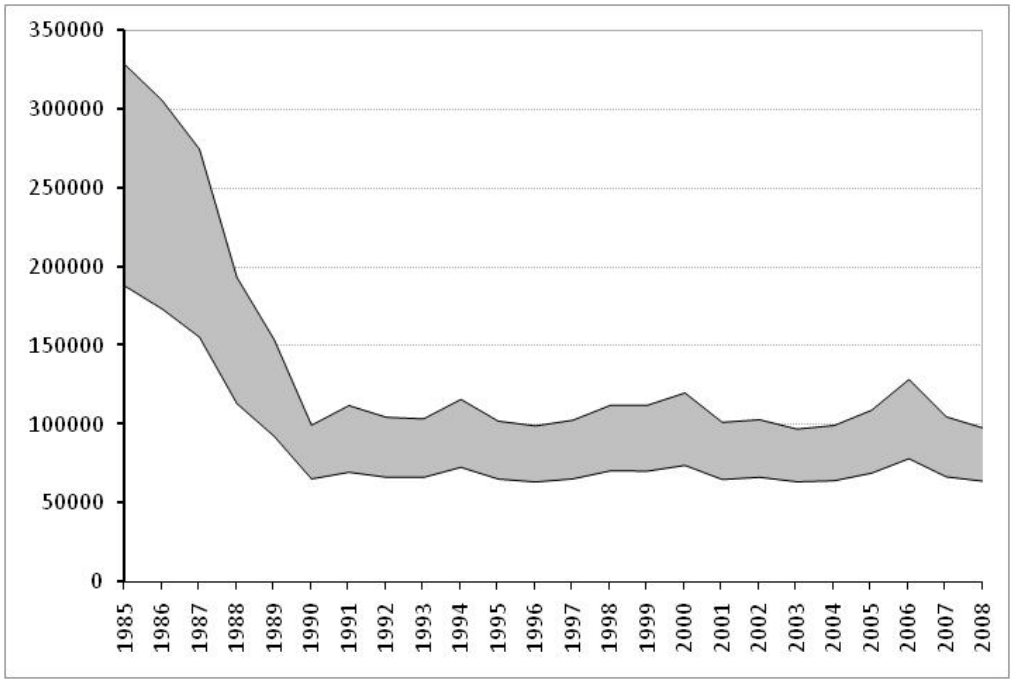
SWO-MED-Figure 1. Cumulative estimates of swordfish catches (t) in the Mediterranean by major gear types, for the period 1950-2010 (the 2010 data are provisional).



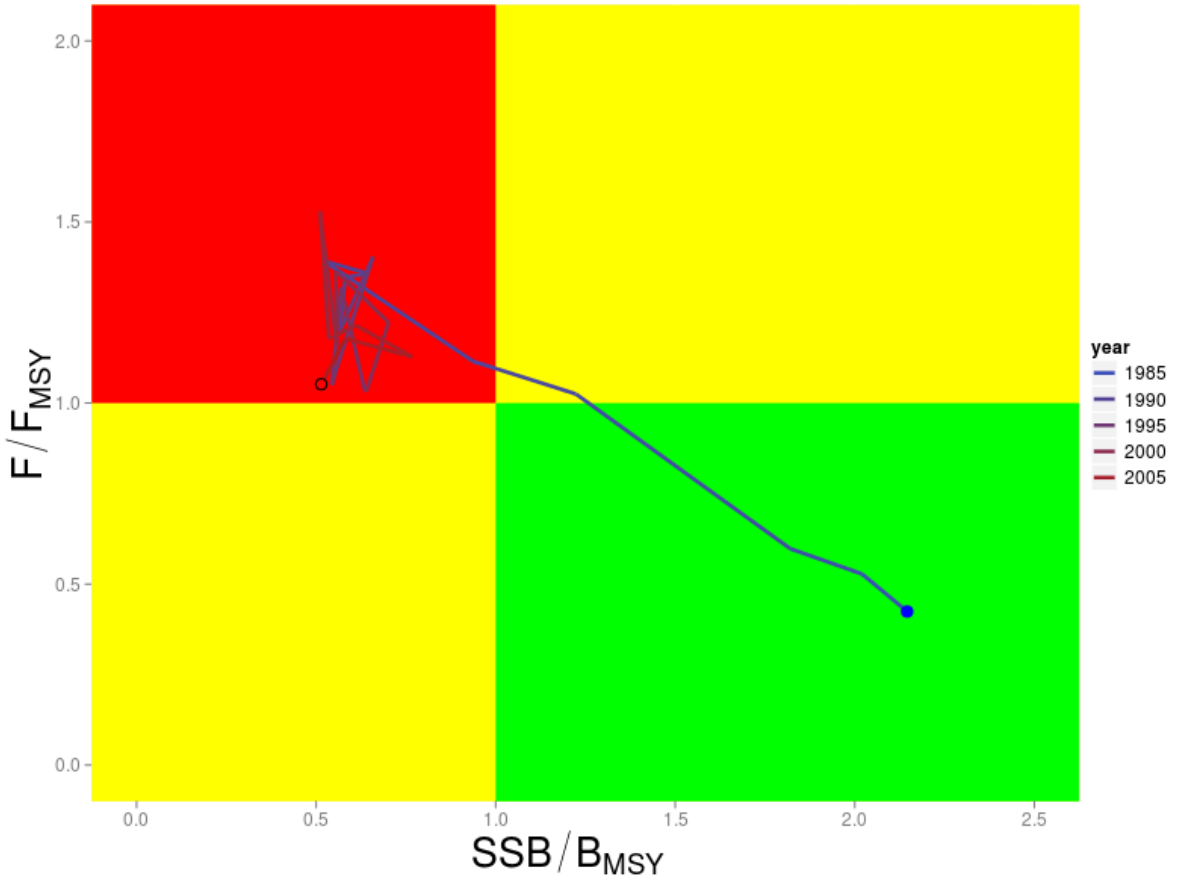
SWO-MED-Figure 2. Time series of standardized CPUE rates scaled to the corresponding mean value for the Spanish longliners (SP_LL), Italian longliners (IT_LL), Greek longliners (GR_LL), and Moroccan gillnetters (MO_GN).



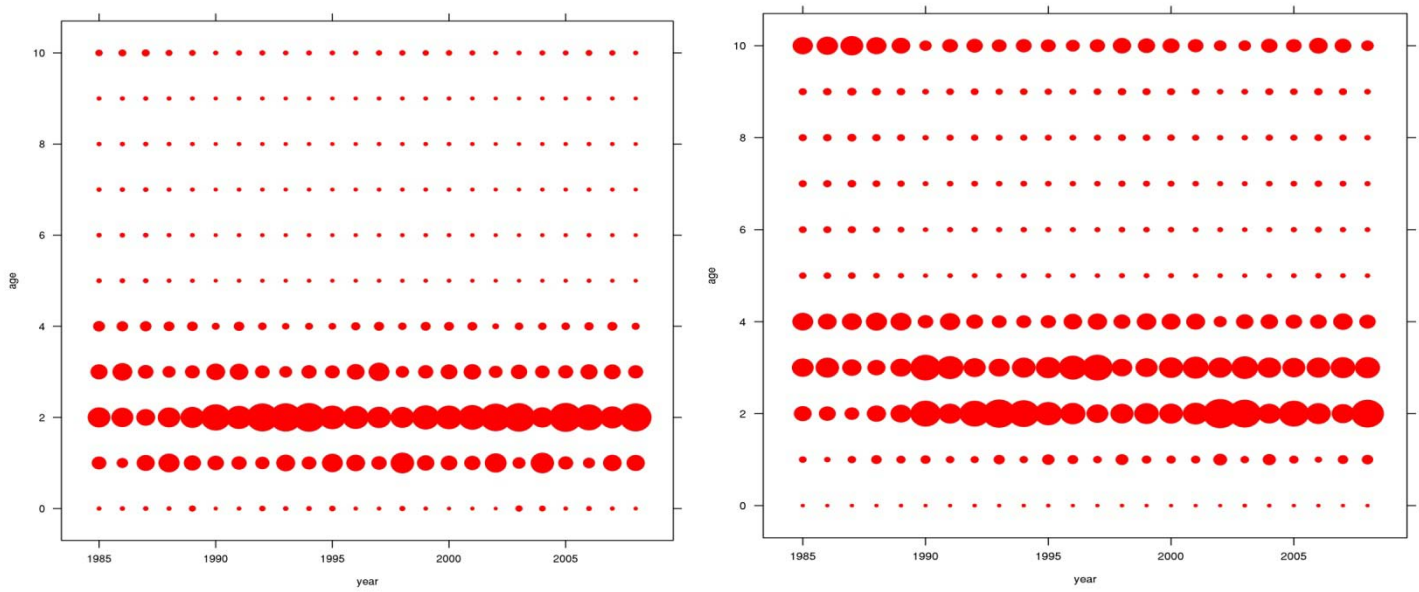
SWO-MED-Figure 3. Time series of mean fish weight in the catches.



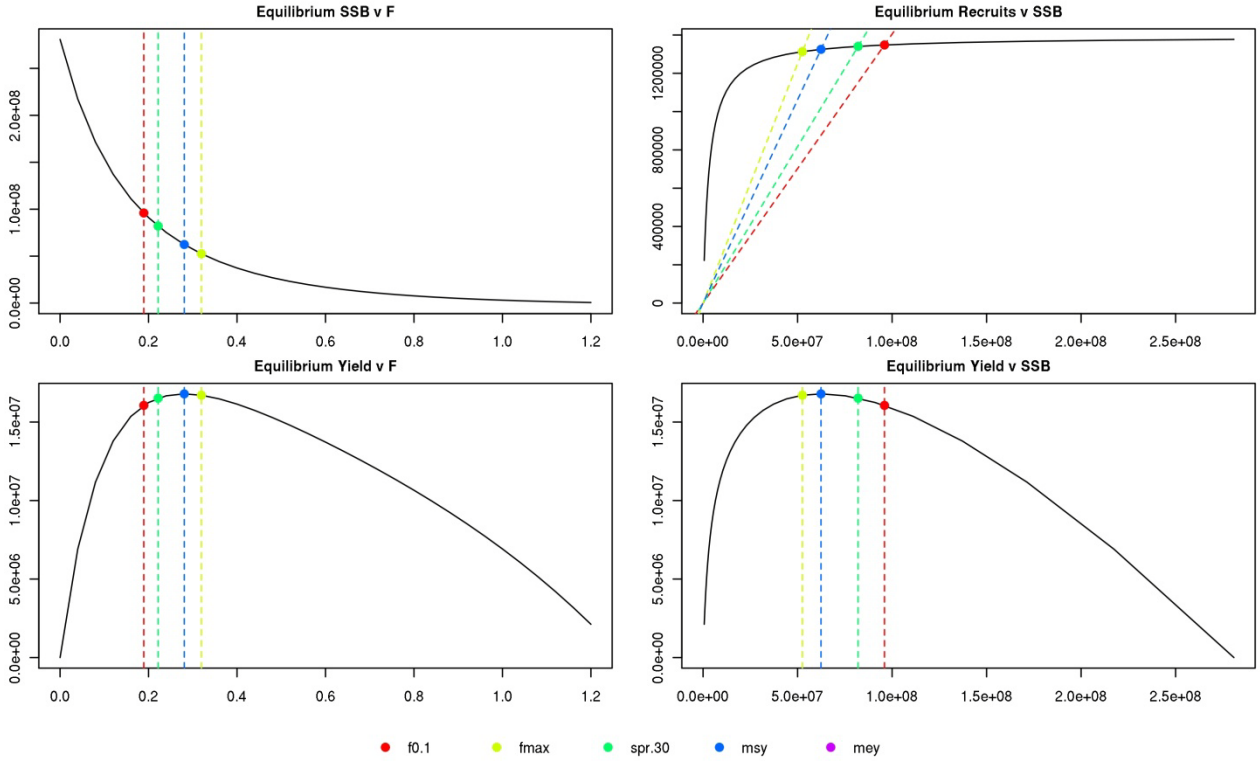
SWO-MED-Figure 4. Total and spawning stock biomass (SSB) estimates (grey color) obtained from the age-structured analysis.



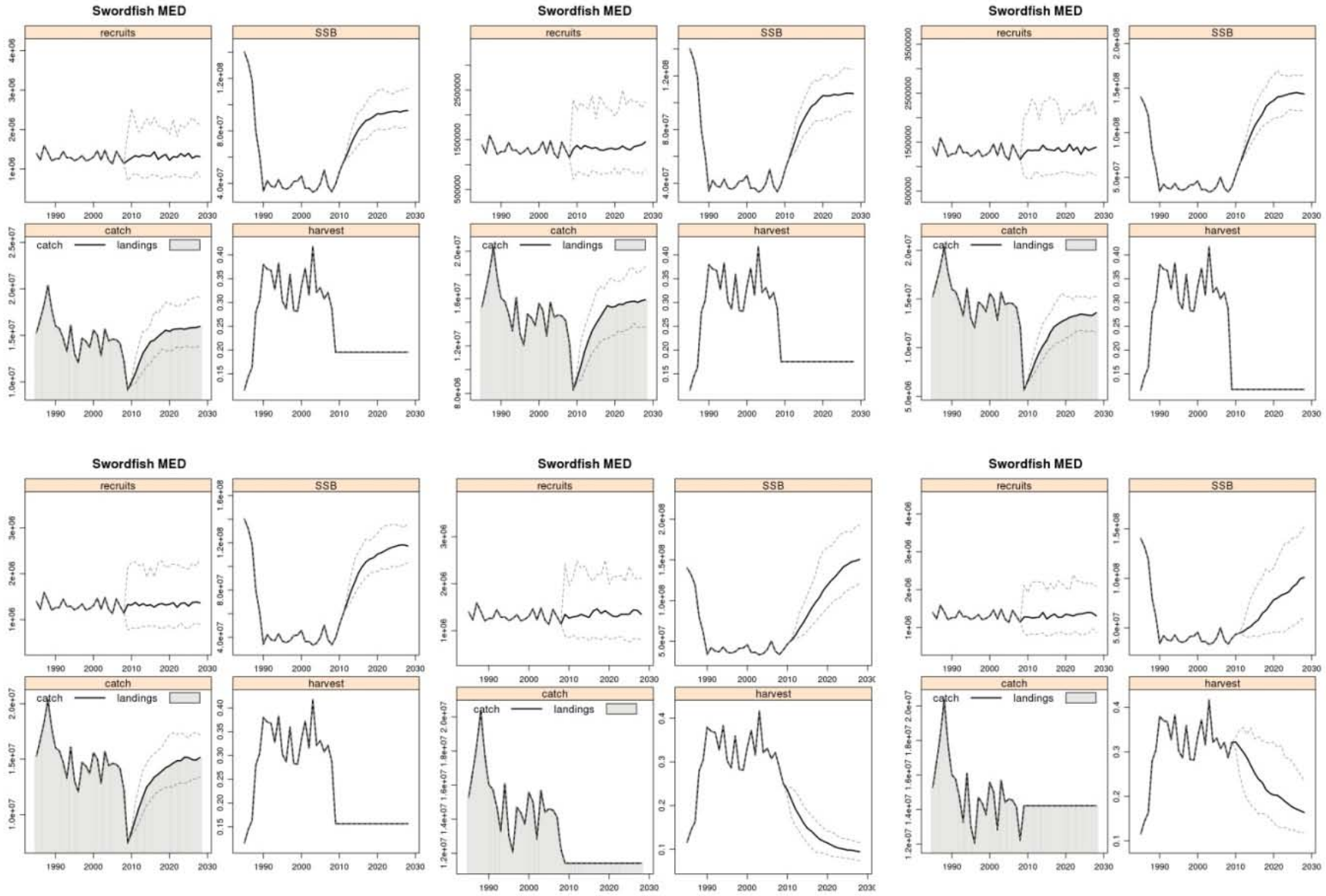
SWO-MED-Figure 5. Time trends for stock status (B/B_{MSY} and F/F_{MSY}) derived from the age-structured analysis. The open circle indicates the ratio estimates for the last assessment year (2008).



SWO-MED-Figure 6. Proportion of catch numbers (left) and catch weight (right) at age by year.



SWO-MED-Figure 7. Equilibrium curves estimated from the yield per recruit analysis.



SWO-MED-Figure 8. Scenario estimates assuming a Beverton-Holt stock/recruitment model. From left to right and top to bottom: current management, 4-month closure, 6-month closure, 20% capacity reduction, quota equal to 80% of the mean catch of the last decade, quota equal to the mean catch of the last decade.

8.10 SBF – SOUTHERN BLUEFIN TUNA

The Commission for the Conservation of Southern Bluefin Tuna (CCSBT) is charged with assessing the status of southern bluefin tuna. The reports are available from CCSBT.

8.11 SMT - SMALL TUNAS

SMT-1. Generalities

Small tunas include the following species:

- BLF Blackfin tuna (*Thunnus atlanticus*)
- BLT Bullet tuna (*Auxis rochei*)
- BON Atlantic bonito (*Sarda sarda*)
- BOP Plain bonito (*Orcynopsis unicolor*)
- BRS Serra Spanish mackerel (*Scomberomorus brasiliensis*)
- CER Cero (*Scomberomorus regalis*)
- FRI Frigate tuna (*Auxis thazard*)
- KGM King mackerel (*Scomberomorus cavalla*)
- KGX Scomberomorus unclassified (*Scomberomorus spp*.)
- LTA Little tunny (*Euthynnus alletteratus*)
- MAW West African Spanish mackerel (*Scomberomorus tritor*)
- SSM Atlantic Spanish mackerel (*Scomberomorus maculatus*)
- WAH Wahoo (*Acanthocybium solandri*)
- DOL Dolphinfish (*Coryphaena hippurus*)

Knowledge on the biology and fishery of small tunas is very fragmented in several areas. Furthermore, the quality of the knowledge is very different according to the species concerned. This is due in large part because many of these species are often perceived to have little economic importance compared to other tuna and tuna-like species, and owing to the difficulties in conducting sampling of the landings from artisanal fisheries, which constitute a high proportion of the fisheries exploiting small tuna resources. The large industrial fleets often discard small tuna catches at sea or sell them on local markets mixed with other by-catches, especially in Africa (SCRS/2009/147). The amount caught is rarely reported in logbooks; however observer programs from purse seine fleets have recently provided estimates of catches of small tunas (Amandé *et al.* 2010).

Small tuna species have a very high relevance from a socio-economic point of view, because they are important for many coastal communities in all areas and are a main source of food. The socio-economic value is often not evident because of the underestimation of the total figures, due to the above mentioned difficulties in data collection. Several statistical problems are also caused by misidentification. The small tuna species can reach high levels of catches and values in some years.

Scientific collaboration among ICCAT, RFOs and countries in the various regions is imperative to advance understanding of the distribution, biology and fishery of these species.

SMT-2. Biology

These species are widely distributed in the tropical and subtropical waters of the Atlantic Ocean and several are also distributed in the Mediterranean Sea and the Black Sea. Some species extend their range even to colder waters, like the North and South Atlantic Ocean. They often form large schools with other small sized tunas or related species in coastal and high seas waters.

Generally, the small tuna species have a varied diet with a preference for small pelagics (e.g., clupeids, mullets, carangids, etc.). These species feed also on crustaceans, mollusks and cephalopods. Many of these species are also prey of large tunas, marlins and sharks. The reproduction period varies according to species and areas and spawning generally takes place near the coast in oceanic areas, where the waters are warmer. The growth rate currently estimated for these species is very rapid for the first two or three years, and then slows as these species reach size-at-first maturity. Studies about the migration patterns of small tuna species are very rarely available, due to the practical difficulties in manipulating and tagging these species.

In general, there is a lack of information on biological parameters for these species, especially for West Africa and the Caribbean and South America. A new document regarding the length -weight relationship of dolphinfish (*Coryphaena hippurus*) as bycatch in the longline fisheries of the Western Mediterranean was presented to the species group meeting (SCRS/2011/183).

SMT-3. Description of the fisheries

Small tunas are exploited mainly by coastal fisheries and artisanal fisheries, although substantial catches are also made as target species and as by-catch by purse seine, mid-water trawlers (i.e., pelagic fisheries of West Africa-Mauritania), handline and small scale gillnets. Unknown quantities of small tuna also comprise the incidental catches of some longline fisheries. The increasing importance of FAD fisheries in the eastern Caribbean and in other areas has improved the efficiency of artisanal fisheries in catching small tunas. Various species are also caught by the sport and recreational fisheries. A new document describing the Venezuelan industrial surface fleets and small scale fisheries catching the blackfin tuna was presented to this species group (SCRS/2011/122).

Despite of the scarce monitoring of various fishing activities in some areas, all the small tuna fisheries have a high socio-economic relevance for most of the coastal countries concerned and for many local communities, particularly in the Mediterranean Sea, in the Caribbean region and in West Africa.

SMT-Table 1 shows historical landings of small tunas for the 1986 to 2010 period although the data for the last years are preliminary. This table does not include species reported as "mixed" or "unidentified", as was the case in the previous years, since these categories include large tuna species. There are more than 10 species of small tunas, but only five of these account for about 88% of the total reported catch by weight. These five species are: Atlantic bonito *(Sarda sarda)*, frigate tuna *(Auxis thazard)* which may include some catches of bullet tuna *(Auxis rochei)*, little tunny *(Euthynnus alletteratus)*, king mackerel *(Scomberomorus cavalla)*, and Atlantic Spanish mackerel *(Scomberomorus maculatus)* **(SMT-Figure 2)**. In 1980, there was a marked increase in reported landings compared to previous years, reaching a peak of about 147,202 t in 1988 **(SMT-Figure 1)**. Reported landings for the 1989-1995 period decreased to approximately 91,907 t, and then an oscillation in the values in the following years, with a minimum of 59,148 t in 2008 and a maximum of 129,353 t in 2005. Overall trends in the small tuna catch may mask declining trends for individual species because annual landings are often dominated by the landings of a single species. These fluctuations seem to be related to unreported catches, as these species generally comprise part of the by-catch and are often discarded, and therefore do not reflect the real catch.

A preliminary estimate of the total nominal landings of small tunas in 2010 is 72,195 t. The Small Tunas Species Group pointed out the relative importance of small tuna fisheries in the Mediterranean and the Black Sea, which account for about 28% of the total reported catch in the ICCAT area for the period 1980-2010.

Despite the recent improvements in the statistical information provided to ICCAT by several countries, the Committee also noted that uncertainties remain regarding the accuracy and completeness of reported landings in all areas. There is a general lack of information on the mortality of these species as by-catch, exacerbated by the confusion regarding species identification.

SMT-4. State of the stocks

There is little information available to determine the stock structure of many small tuna species. The Committee suggests that countries be requested to submit all available data to ICCAT as soon as possible, in order to be used in future meetings of the Committee.

Generally, current information does not allow the Committee to carry out an assessment of stock status of the majority of the species. Some analyses will be possible in future if data availability improves with the same trend of the latest years. Nevertheless, few regional assessments have been carried out. Assessments of stocks of small tunas are also important because of their position in the trophic chain where they are the prey of large tunas, marlins and sharks and they are predators of small pelagic. It may therefore be best to approach assessments of small tunas from the ecosystem perspective.

SMT-5. Outlook

Although there are some improvement in the availability of catch and biological data for small tuna species particularly in the Mediterranean and the Black Sea, biological information, catch and effort statistics for these species remain incomplete for many of the coastal and industrial fishing countries. Given that, many of these species are of a high socio-economic importance to coastal communities, therefore the Committee recommends that further studies be conducted on small tuna species due to the small amount of information available.

SMT-6. Effects of current regulations

There are no ICCAT regulations in effect for small tunas. Several regional and national regulations are in place.

SMT-7. Management recommendations

No management recommendations have been made.

SMT-Table 1. Reported landings (t) of small tuna species, by area and flag.

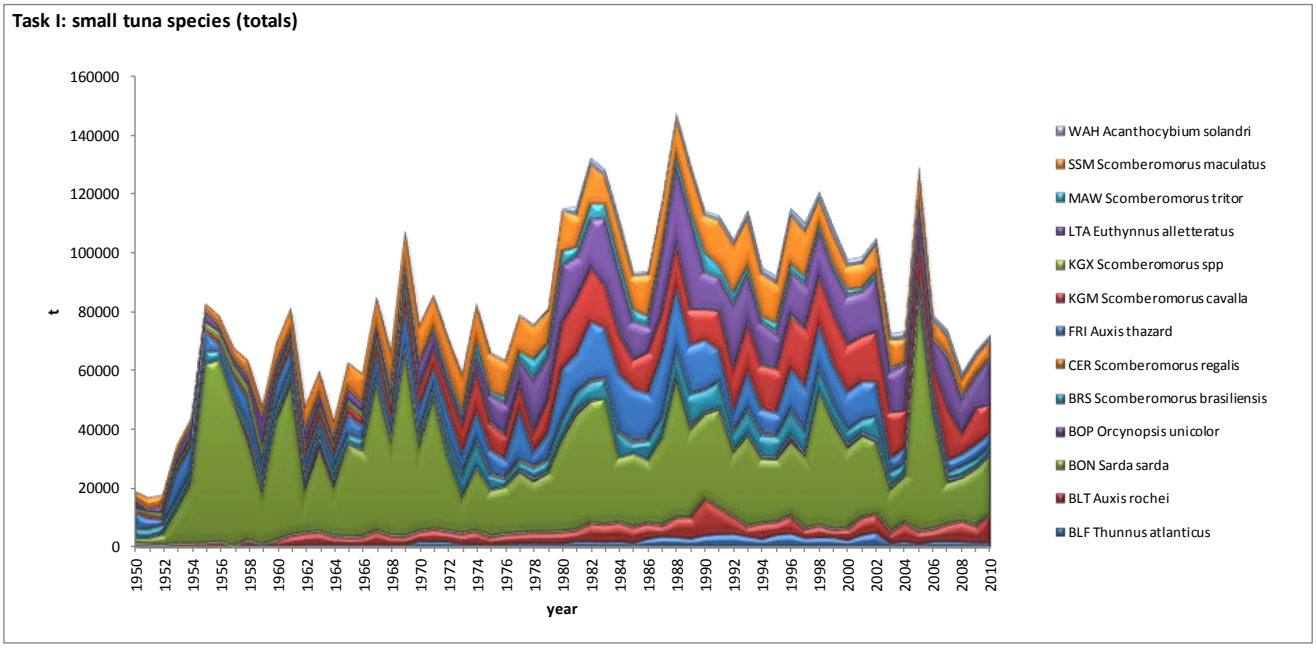
			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
BLF	TOTAL		2822	3462	3322	2834	3888	4202	4353	3535	2719	4051	4488	3027	3238	3185	2358	4034	4756	1303	1926	1031	1937	1927	1793	1504	1609
	A+M	Brasil	172	254	229	120	335	130	49	22	38	153	649	418	55	55	38	149	1669	1	118	91	242	233	266	10	9
		Cuba	486	634	332	318	487	318	196	54	223	156	287	287	0	0	0	0	0	0	0	0	0	0	0	0	
		Curaçao	60	60	70	70	70	60	60	65	60	50	45	45	45	45	45	45	45	0	0	0	0	0	0	0	
		Dominica	0	0	1	4	19	10	14	15	19	30	0	0	0	79	83	54	78	42	20	38	47	29	37	45	41
		Dominican Republic	123	199	4	564	520	536	110	133	239	892	892	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.España	0	0	0	0	0	0	307	46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.France	729	669	816	855	865	1210	1170	1140	1330	1370	1040	1040	1040	1040	1040	1040	1040	0	0	0	0	0	0	0	
		Grenada	256	141	220	134	293	195	146	253	189	123	164	126	233	94	164	223	255	335	268	306	371	291	290	291	291
		Jamaica	0	0	0	0	0	0	0	0	0	0	148	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Liberia	0	0	229	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	10	9	10	10	12	6	7	6
		NEI (ETRO)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	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	124	62	93
		St. Vincent and Grenadines	0	0	19	15	38	11	7	53	19	20	18	22	17	15	23	24	24	0	0	0	0	0	0	0	
		Sta. Lucia	0	2	1	1	17	14	13	16	82	47	35	40	100	41	45	108	96	169	96	126	182	151	179	165	203
		Trinidad and Tobago	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	5	5	5	5	5	5
		U.S.A.	32	44	154	87	81	112	127	508	492	582	447	547	707	617	326	474	334	414	675	225	831	422	649	619	621
		UK.Bermuda	17	11	7	14	13	8	6	5	7	4	5	4	6	6	5	4	5	9	4	5	8	7	6	7	9
		UK.British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	
		Venezuela	947	1448	1240	652	1150	1598	2148	1224	21	624	758	498	1034	1192	589	1902	1210	319	732	225	237	777	231	293	331
		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
BLT	TOTAL		5059	3740	6483	7110	11994	8777	5715	3421	5300	4301	5909	3070	3986	2646	3924	5819	6049	3798	6217	4438	4079	5701	6837	5557	9307
	A+M	Algerie	0	0	0	0	0	174	270	348	306	230	237	179	299	173	225	230	481	0	391	547	586	477	1134	806	970
		Croatia	0	0	0	0	0	24	21	52	22	28	26	26	26	26	0	0	0	0	0	0	0	0	0	0	8
		EU.España	1555	631	2669	2581	2985	2226	1210	648	1124	1472	2296	604	487	669	1024	861	493	495	1009	845	1101	3083	3389	726	3812
		EU.France	0	0	0	0	0	8	4	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		EU.Greece	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1426	1426	0	0	196	125	120	246	226	180	274	157	620	506	169
		EU.Italy	1344	906	609	509	494	432	305	379	531	531	229	229	229	462	462	462	2452	1463	1819	866	0	0	342	732	574
		EU.Malta	13	5	8	18	21	20	11	10	1	2	3	6	6	3	1	0	0	0	0	0	0	4	12	7	11
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	28	263	494	208	166	231	300	791	867	849	322	436	654
		Maroc	175	178	811	1177	2452	1289	1644	170	1726	621	1673	562	1140	682	763	256	621	246	326	50	199	35	83	336	525
		Russian Federation	0	0	0	0	0	2171	814	70	100	0	0	0	1672	0	420	1053	468	128	102	139	22	5	23	48	67
		Serbia & Montenegro	0	0	0	0	0	13	1	0	0	2	6	6	6	7	8	8	0	0	0	0	0	0	0	0	
		Sta. Lucia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Syria Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	99	75	87	81
		Tunisie	538	606	588	660	985	985	35	20	13	14	13	32	93	45	15	2300	932	989	1760	0	0	0	0	0	
		Turkey	0	0	0	0	0	35	0	324	77	0	0	0	0	316	316	316	316	0	284	1020	1031	993	836	1873	2436
		U.S.A.	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		U.S.S.R.	0	0	357	723	3634	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Yugoslavia Fed.	32	14	41	42	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BON	TOTAL		21320	29712	46382	29721	28908	33334	21992	30595	21719	21219	25134	24519	45253	35702	27151	27637	24580	14424	15828	78766	38506	14174	14735	19483	19889
	ATL	All gears	5892	7395	22354	17766	6811	8079	6881	4598	6037	6030	7939	10441	15523	7532	5179	5400	8864	3307	4580	4391	6766	5542	4694	9461	7305
	MED	All gears	15428	22317	24028	11955	22097	25255	15111	25997	15682	15189	17195	14078	29730	28170	21972	22236	15716	11117	11247	74375	31740	8632	10042	10021	12584
	ATL	Angola	101	144	180	168	128	102	4	49	20	9	39	32	0	2	118	118	118	0	0	138	0	931	0	1979	990
		Argentina	699	1607	2794	1327	1207	1794	1559	434	4	138	108	130	12	68	19	235	1	129	269	110	0	0	0	0	
		Barbados	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	0	0	0	0	0	0	
		Benin	6	3	4	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Brasil	523	345	214	273	226	71	86	142	142	137	0	0	0	0	0	0	0	0	0	90	0	0	0	0	
		Cuba	0	23	173	26	28	0	0	0	0	0	0	0	230	0	0	0	0	0	0	0	0	0	0	0	
		Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	539
		Côte D'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	755
		Dominica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	16	16	9	4	
		EU.Bulgaria	2	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.España	145	41	91	57	18	8	39	5	3	2	2	1	0	12	12	10	5	23	9	2	15	14	13	36	45
		EU.Estonia	0	0	668	859	187	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.France	431	331	395	427	430	820	770	1052	990	990	610	610	610	24	32	0	18	0	0	0	0	122	59	25	208
		EU.Germany	0	0	0	0	53	0	0	0	0	0	714	0	0	0	0	0	38	0	0	0	0	0	0	0	
		EU.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	
		EU.Ireland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48	0	0	0	0	56	125
		EU.Latvia	0	0	1191	1164	221	7	4	0	3	19	301	887	318	0	416	396	639	0	0	0	0	0	0	0	
		EU.Lithuania	0	0	1041	762	162	11	10	0	0	0	0	0	0	0	0	0	793	0	0	0	0	0	0	0	
		EU.Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	344	539	539	
		EU.Poland	0	0	0	0	0	0	0	0	0	0	225	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Portugal	168	371	377	80	202	315	133	145	56	78	83	49	98	98	162	47	61	40	50	38	318	439	212	124	476
		EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	287	0	0	0	0	0	0	0	0	0	35	0	0	30	71

			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		Gabon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	58	0	0	0	0	0	0	0	
		Georgia	0	0	39	54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Germany Democratic Rep.	23	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Ghana	0	943	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Grenada	0	0	0	0	0	0	0	0	0	0	24	6	14	16	7	10	10	0	0	0	0	0	0	0	
		Jamaica	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Maroc	251	241	589	566	492	794	1068	1246	584	699	894	1259	1557	1390	2163	1700	2019	928	989	1411	1655	1053	1419	2523	109
		Mexico	241	391	356	338	215	200	657	779	674	1144	1312	1312	1632	1861	1293	1113	1032	1238	1066	654	1303	1188	1113	1063	1046
		Norway	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	
		Rumania	71	3	255	111	8	212	84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Russian Federation	0	0	0	0	0	948	29	0	0	0	0	0	4960	0	0	574	1441	461	16	79	316	259	52	368	1042
		Senegal	510	463	2066	869	525	597	345	238	814	732	1012	1390	2213	948	286	545	621	195	182	484	729	1020	1154	2545	1768
		Sierra Leone	10	10	10	10	10	4	6	0	0	0	0	0	0	0	11	245	44	0	0	0	0	0	0	0	
		South 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
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	18	0	16	23	27	15	6
		Sta. Lucia	0	0	1	0	3	3	3	4	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	
		Togo	138	245	400	256	177	172	107	311	254	145	197	197	197	197	0	0	0	0	1583	1215	2298	0	0	0	
		Trinidad and Tobago	0	0	0	0	0	0	0	17	703	169	266	220	30	117	117	56	452	188	280	81	7	16	38	68	68
		U.S.A.	84	130	90	278	299	469	498	171	128	116	156	182	76	83	142	120	139	44	70	68	40	97	47	50	46
		U.S.S.R.	1085	1083	8882	7363	706	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		UK.British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		UK.Turks and Caicos	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Ukraine	0	0	1385	985	0	0	25	0	0	0	342	2786	1918	1114	399	231	1312	30	0	0	0	0	0	0	
		Uruguay	3	0	0	0	0	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Venezuela	1401	1020	1153	1783	1514	1518	1454	5	1661	1651	1359	1379	1659	1602	2	0	61	13	0	16	18	19	12	38	10
	MED	Albania	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Algerie	459	203	625	1528	1307	261	315	471	418	506	277	357	511	475	405	350	597	0	609	575	684	910	1042	976	1009
		Croatia	0	0	0	0	0	49	128	6	70	0	0	0	25	120	0	0	0	0	0	0	0	0	0	0	59
		EU.Bulgaria	0	13	0	0	17	17	20	8	0	25	33	16	51	20	35	35	35	0	0	0	0	0	0	0	16
		EU.Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	10	10	6	4	3	0	0	0	
		EU.España	729	51	962	609	712	686	228	200	344	632	690	628	333	433	342	349	461	544	272	215	429	531	458	247	518
		EU.France	0	0	10	0	1	10	5	6	0	0	0	0	0	0	0	0	27	0	0	0	0	15	34	20	23
		EU.Greece	1027	1848	1254	2534	2534	2690	2690	2690	1581	2116	1752	1559	945	2135	1914	1550	1420	1538	1321	1390	845	1123	587	476	531
		EU.Italy	1437	2148	2242	1369	1244	1087	1288	1238	1828	1512	2233	2233	2233	4159	4159	4159	4579	2091	2009	1356	0	0	1323	1131	964
		EU.Malta	0	0	0	0	0	0	0	0	0	0	2	7	2	2	1	0	0	0	0	0	0	2	7	5	6
		Egypt	68	35	17	358	598	574	518	640	648	697	985	725	724	1442	1442	1128	1128	0	0	0	0	0	0	0	
		Libya	0	0	0	0	0	0	71	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Maroc	51	127	108	28	69	69	31	25	93	37	67	45	39	120	115	5	61	85	78	38	89	87	142	131	57
		NEI (MED)	359	537	561	342	311	311	311	300	300	300	300	75	0	0	0	0	0	0	0	0	0	0	0	0	
		Rumania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Serbia & Montenegro	0	0	0	0	0	45	0	3	2	6	10	12	12	14	17	17	0	0	0	0	0	0	0	0	
		Tunisie	504	500	600	422	488	305	643	792	305	413	560	611	855	1350	1528	1183	1112	848	1251	0	0	0	0	0	
		Turkey	10756	16793	17613	4667	14737	19151	8863	19548	10093	8944	10284	7810	24000	17900	12000	13460	6286	6000	5701	70797	29690	5965	6448	7036	9401
		U.S.S.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Yugoslavia Fed.	38	62	36	98	79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BOP	TOTAL		87	564	1482	1116	473	608	641	630	791	703	2196	481	177	868	1207	1012	923	736	581	217	32	1047	533	449	289
	ATL	All gears	86	538	1474	1109	436	507	465	378	615	588	2064	254	47	651	1062	858	786	713	573	215	32	875	426	442	275
	MED	All gears	1	26	8	7	37	101	176	252	176	115	132	227	130	217	145	154	137	23	8	2	0	172	107	6	14
	ATL	Benin	3	1	2	1	1	1	1	1	1	1	1	3	1	1	0	0	0	0	0	0	0	0	0	0	
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	3	1	2	11	23
		Maroc	33	487	1422	1058	369	486	423	348	598	524	2003	246	28	626	1048	830	780	706	503	132	0	634	391	273	199
		Mauritania	50	50	50	50	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Senegal	0	0	0	0	16	20	41	29	16	63	60	5	18	24	14	28	6	7	70	78	29	240	33	158	53
	MED	Algerie	0	0	0	0	0	87	135	198	153	92	119	224	128	216	135	145	128	0	0	0	0	0	0	0	
		EU.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	
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
		Libya	0	0	0	0	0	0	40	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Maroc	1	26	8	7	37	14	1	14	23	23	13	3	2	1	10	9	9	20	7	1	0	172	107	6	14
		Tunisie	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	
BRS	TOTAL		6549	6212	9510	10778	7698	8856	6051	8049	7161	7006	8435	8004	7923	5754	4785	4553	7750	5137	3410	3712	3587	2253	3305	2681	3006
	A+M	Brasil	5011	4741	5063	5927	2767	1437	1149	842	1149	1308	3047	2125	1516	1516	988	251	3071	2881	814	471	1432	563	1521	1042	1281
		EU.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	
		Grenada	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	
		Guyana	0	0	0	0	0	0	0	0	0	0	211	571	625	1143	308	329	441	389	494	521	377	277	312	141	226
		Trinidad and Tobago	0	0	2704	2864	2471	2749	2130	2130	2130	1816	1568	1699	2130	1328	1722	2207	2472	1867	2103	2720	1778	1414	1472	1498	1498
		Venezuela	1538	1471	1743	1987	2460	4670	2772	5077	3882	3882	3609	3609	3651	1766	1766	1766	1766	0	0	0	0	0	0	0	

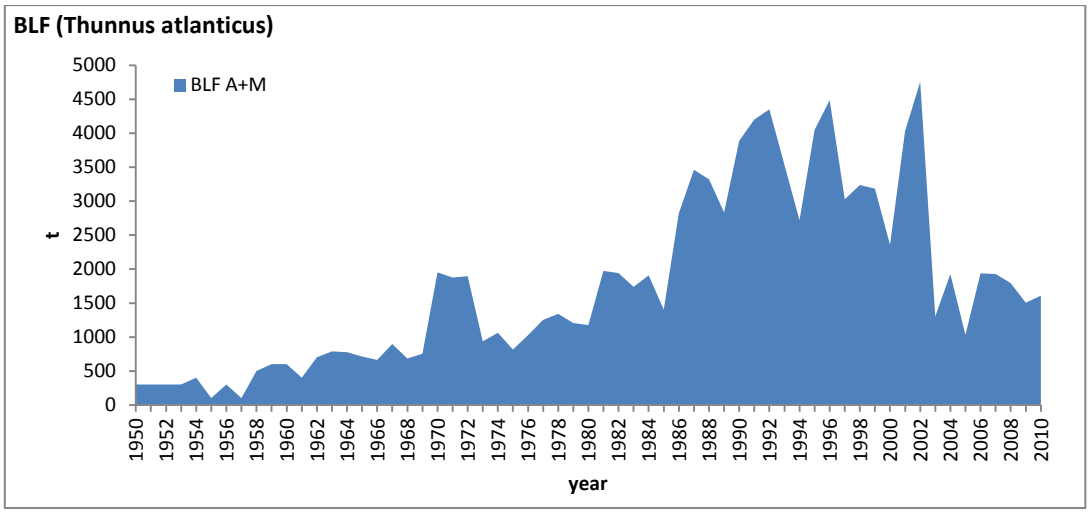
			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
CER	TOTAL		500	392	219	234	225	375	390	450	490	429	279	250	250	0	3	5	1	2	1	1	1	0	0	0	0
	A+M	Dominica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
		Dominican Republic	52	48	57	59	50	45	79	50	90	29	29	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.France	448	344	162	175	175	330	310	400	400	400	250	250	250	0	0	0	0	0	0	0	0	0	0	0	
		St. Vincent and Grenadines	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Sta. Lucia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5	1	2	0	1	0	0	0	0	0
FRI	TOTAL		15476	21193	20573	16411	16738	10356	6367	12678	8407	7535	13809	14954	14197	13004	12910	12762	11627	4521	5451	4247	5009	4080	4051	4931	4359
	ATL	Angola	21	115	20	70	28	1	0	4	6	21	29	12	31	2	38	38	38	0	0	0	0	95	0	46	23
		Argentina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Benin	1	3	6	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Brasil	941	1260	1904	700	592	746	291	608	906	558	527	215	162	166	106	98	1117	860	414	532	603	202	149	313	204
		Cape Verde	0	2	86	105	75	135	82	115	86	13	6	22	191	154	81	171	278	264	344	167	404	197	832	940	744
		Curaçao	0	0	0	0	0	0	0	0	0	0	590	1157	1030	1159	1122	989	710	505	474	0	150	106	485	364	
		Côte D'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	170	135	0	0	
		EU.Bulgaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.España	3164	4538	3938	1877	2240	541	228	362	297	386	947	581	570	23	17	722	438	635	34	166	73	278	631	1094	950
		EU.Estonia	0	0	0	0	0	198	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.France	1904	3392	3392	3008	3872	0	121	63	105	126	161	147	146	0	91	127	91	0	168	47	6	98	24	24	91
		EU.Latvia	0	0	0	0	0	243	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Lithuania	0	0	0	0	0	290	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Portugal	32	2	2	4	26	3	0	0	0	0	0	1	31	5	9	28	5	4	6	0	3	3	1	0	0
		EU.United Kingdom	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
		Germany Democratic Rep.	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Ghana	3256	4689	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	151	0	0	0	
		Grenada	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	
		Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	98	74	81	78
		Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	
		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	
		Maroc	302	465	194	599	1045	1131	332	274	122	645	543	2614	2137	494	582	418	441	184	542	61	48	135	179	9	19
		Mixed flags (FR+ES)	227	1526	1525	1350	1728	3633	4017	9674	3107	1919	7177	6063	6342	8012	9864	9104	7748	1623	1722	1527	1739	1072	614	1131	873
		NEI (ETRO)	0	17	381	155	237	1	4	32	68	70	180	120	309	491	291	420	186	71	180	297	149	140	0	0	
		Panama	0	0	0	0	0	243	57	118	341	328	240	91	0	0	0	0	0	0	394	975	970	1349	411	439	425
		Rumania	51	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Russian Federation	0	0	0	0	0	1078	627	150	405	456	46	500	761	477	0	0	300	50	56	63	6	1	12	113	270
		S. Tomé e Príncipe	0	0	23	32	35	41	39	33	37	48	79	223	197	209	200	200	200	200	234	215	290	0	275	282	290
		Senegal	0	0	810	784	1084	311	201	342	319	309	0	0	0	7	0	4	0	13	288	151	83	119	315	15	177
		Trinidad and Tobago	0	0	0	0	0	0	0	17	0	56	199	368	127	138	245	0	0	0	414	0	0	0	0	0	
		U.S.A.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		U.S.S.R.	3465	2905	5638	5054	2739	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Ukraine	0	0	0	0	0	0	0	0	0	0	0	0	0	36	48	0	43	0	0	0	0	0	0	0	
		Venezuela	2109	2264	2654	2670	3037	1762	368	886	2609	2601	3083	2839	2164	1631	215	444	32	113	182	42	165	52	48	54	215
KGM	TOTAL		13990	13792	14331	12153	10420	13241	14691	16331	14777	14930	17782	19660	16394	17717	16161	15360	17258	15863	12830	11766	8185	17936	7344	12533	9816
	A+M	Antigua and Barbuda	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Argentina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Brasil	2890	2173	2029	2102	2070	962	979	1380	1365	1328	2890	2398	3595	3595	2344	1251	2316	3311	247	202	316	33	0	0	1
		Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Dominica	0	0	0	0	0	0	0	0	0	0	0	0	0	36	35	2	0	0	0	0	0	0	0	0	
		Dominican Republic	0	0	20	29	33	34	47	52	0	0	0	589	288	230	226	226	226	0	0	0	0	0	0	0	
		Grenada	0	0	0	0	0	0	0	0	0	0	2	4	28	14	9	4	5	0	0	0	0	0	0	0	
		Guyana	0	0	0	0	0	0	0	0	0	0	0	270	440	398	214	239	267	390	312	245	168	326	174	91	132
		Jamaica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48	0	0	0	0	0	0	0	
		Mexico	2643	3067	3100	2300	2689	2147	3014	3289	3097	3214	4661	4661	3583	4121	3688	4200	4453	4369	4564	3447	4201	3526	3113	3186	3040
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	9
		Sta. Lucia	0	0	0	0	0	0	0	0	0	0	1	4	0	0	9	1	1	0	1	1	1	2	0	1	3
		Trinidad and Tobago	38	82	752	541	432	657	0	1192	0	471	1029	875	746	447	432	410	1457	802	578	747	661	567	1043	1001	1001
		U.S.A.	7486	7530	7100	5681	4127	8213	9344	9616	7831	7360	7058	8720	7373	6453	6780	6603	6061	6991	7129	7123	2837	13482	3013	8247	5630
		UK.British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
		Venezuela	933	940	1330	1500	1069	1228	1308	801	2484	2558	2140	2139	340	2424	2424	2424	2424	0	0	0	0	0	0	0	
KGX	TOTAL		149	261	491	105	131	225	266	301	508	512	824	156	251	1	229	48	0	15	0	1	26	16	0	2	20
	A+M	Barbados	138	159	332	68	51	45	51	55	36	42	49	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	0	
		Colombia	11	102	159	37	25	7	12	21	148	111	539	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Cuba	0	0	0	0	0	0	0	0	0	0	0	0	236	0	0	0	0	0	0	0	0	0	0	0	
		EU.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	
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	26	16	0	2	20
		Gabon	0	0	0	0	0	0	0	0	140	145	79	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Grenada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

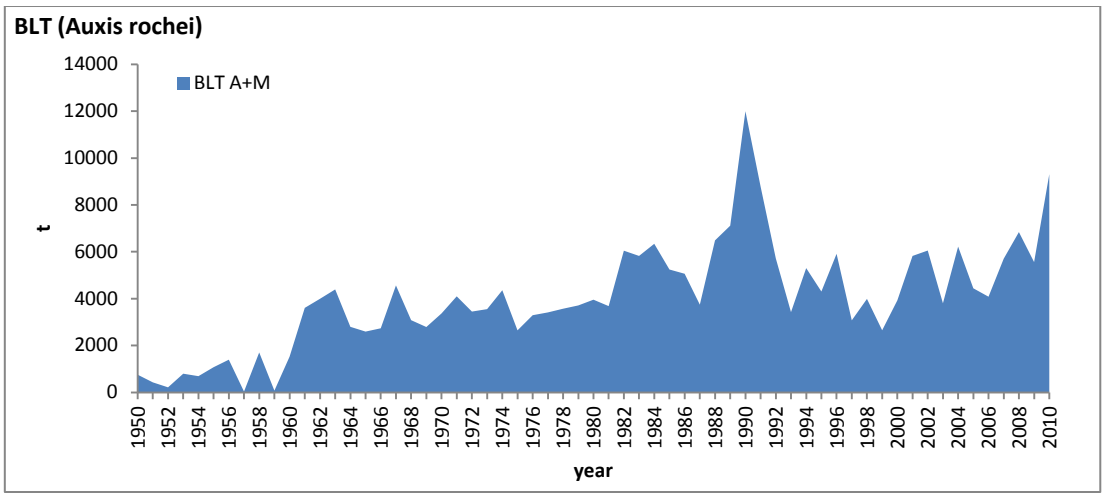
			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		Jamaica	0	0	0	0	0	0	0	0	0	0	0	155	0	0	44	48	0	0	0	0	0	0	0	0	
		Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Puerto Rico	0	0	0	0	0	0	53	84	86	134	106	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Russian Federation	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	15	0	0	0	0	0	0	
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	1	1	1	1	138	0	0	0	0	0	0	0	0	0	0
		Sta. Lucia	0	0	0	0	55	79	150	141	98	80	50	0	0	0	48	0	0	0	0	0	0	0	0	0	
		Trinidad and Tobago	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Ukraine	0	0	0	0	0	94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LTA	TOTAL		8960	20759	26182	30791	12622	11214	22045	16562	14182	11701	14257	15099	15750	15382	16483	15347	18392	13747	15785	12188	8849	17354	12323	11261	15819
	ATL	All gears	6794	18335	23777	28756	10005	8891	20289	15296	12977	9799	12138	13495	12836	12506	13189	12484	15750	13065	14347	11148	7248	15668	10064	9156	13649
	MED	All gears	2166	2424	2405	2035	2617	2323	1756	1266	1205	1902	2119	1604	2914	2875	3294	2863	2642	682	1438	1040	1602	1686	2259	2104	2170
	ATL	Angola	1167	1345	1148	1225	285	306	14	175	121	117	235	75	406	118	132	132	132	0	0	2	0	4365	0	1644	822
		Argentina	2	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Benin	90	14	7	43	66	61	49	53	60	58	58	196	83	69	69	69	69	0	0	0	0	0	0	0	
		Brasil	479	187	108	74	685	779	935	985	1225	1059	834	507	920	930	615	615	615	0	320	280	0	0	0	0	
		Canada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Cape Verde	29	14	1	18	65	74	148	17	23	72	63	86	110	776	491	178	262	143	137	40	160	348	518	498	402
		Cuba	24	55	53	113	88	63	33	13	15	27	23	23	0	0	0	0	0	0	0	0	0	0	0	0	
		Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	38
		Côte D'Ivoire	20	5300	38	4900	2800	100	142	339	251	253	250	114	108	0	108	0	0	0	0	270	298	404	1677	1041	1359
		Dominica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Bulgaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.España	12	11	7	11	55	81	1	0	0	10	55	27	110	6	2	22	8	1	489	50	16	0	38	35	136
		EU.Estonia	0	0	0	0	0	66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.France	0	0	0	195	0	74	13	8	54	59	22	215	21	696	631	610	613	0	10	27	12	0	1	50	35
		EU.Germany	0	0	0	0	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.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	
		EU.Latvia	0	0	0	0	0	65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Lithuania	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	69	8	
		EU.Poland	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Portugal	80	21	86	91	2	61	73	45	72	72	218	320	171	14	50	0	2	16	19	21	24	43	10	6	5
		EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	15
		Gabon	0	0	0	0	0	0	0	0	0	0	182	0	18	159	301	213	57	173	0	0	0	0	0	0	
		Germany Democratic Rep.	10	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Ghana	649	5551	11588	12511	323	201	11608	359	994	513	113	2025	359	306	707	730	4768	8541	7060	5738	216	4449	3188	1497	2343
		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	
		Maroc	47	108	49	14	367	57	370	44	43	230	588	195	189	67	101	87	308	76	91	33	0	40	2	63	5
		Mauritania	50	50	50	50	50	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Mixed flags (FR+ES)	151	1017	1017	900	1152	2422	2678	4975	2071	1279	3359	2836	2936	3846	4745	4238	3334	1082	1148	1018	1159	715	410	1181	795
		NEI (ETRO)	0	0	0	0	0	0	0	8	20	0	0	0	0	0	0	0	33	2	0	22	0	0	0	0	
		Panama	0	0	0	0	0	0	0	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Rumania	81	7	88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Russian Federation	0	0	0	0	0	617	306	265	189	96	49	0	88	0	0	0	74	13	0	0	0	0	0	0	268
		S. Tomé e Príncipe	0	0	30	36	52	46	48	41	40	43	40	50	39	37	33	33	33	33	178	182	179	0	183	188	193
		Senegal	2392	2985	6343	6512	1834	1603	1854	4723	4536	2478	1972	2963	2910	1607	1746	1857	1806	1430	3507	2694	3825	3885	2972	1691	6180
		South Africa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
		St. Vincent and Grenadines	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Sta. Lucia	0	0	0	0	0	0	0	0	0	0	0	2	2	2	0	1	10	1	0	0	1	0	0	0	0
		U.S.A.	104	118	204	129	173	228	597	1286	1142	1312	2230	2015	1546	1623	1209	1451	1366	1492	1382	765	1351	1401	963	1244	1048
		U.S.S.R.	271	61	1707	543	667	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		UK.Bermuda	13	13	17	14	8	10	11	5	6	6	7	6	5	4	2	1	5	4	5	7	5	5	4	3	4
		Venezuela	1123	1467	1236	1374	1294	1963	1409	1889	2115	2115	1840	1840	2815	2247	2247	2247	2254	50	0	0	0	0	30	0	2
	MED	Algerie	0	0	0	0	0	522	585	495	459	552	554	448	384	562	494	407	148	0	158	116	187	96	142	119	131
		Croatia	0	0	0	0	0	2	3	2	15	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
		EU.Cyprus	13	25	41	20	23	25	21	11	23	10	19	19	19	16	19	19	19	0	0	0	0	6	5	4	
		EU.España	5	0	5	0	0	0	0	0	0	15	18	9	15	0	8	82	32	0	41	262	116	202	212	86	299
		EU.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	1
		EU.Greece	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	132	0	0	112	69	72	183	148	165
		EU.Italy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	24	38	34	0	0	486	243	365
		EU.Malta	0	0	0	0	0	8	1	8	8	8	3	3	0	0	0	0	0	0	0	0	0	1	5	8	7
		Israel	284	273	135	124	129	108	126	119	119	215	119	119	119	119	119	119	119	0	0	0	0	0	0	0	
		Libya	0	0	0	0	0	0	0	0	0	0	0	45	52	0	5	4	4	0	0	0	0	0	0	0	
		Maroc	0	0	12	0	16	0	0	0	0	1	0	1	14	8	0	0	3	1	0	9	0	331	19	24	1
		NEI (MED)	200	200	200	200	200	200	200	200	200	200	200	200	200	200	0	0	0	0	0	0	0	0	0	0	
		Palestina	0	0	0	0	0	0	0	0	0	0	90	59	61	60	60	60	129	0	0	0	0	0	0	0	

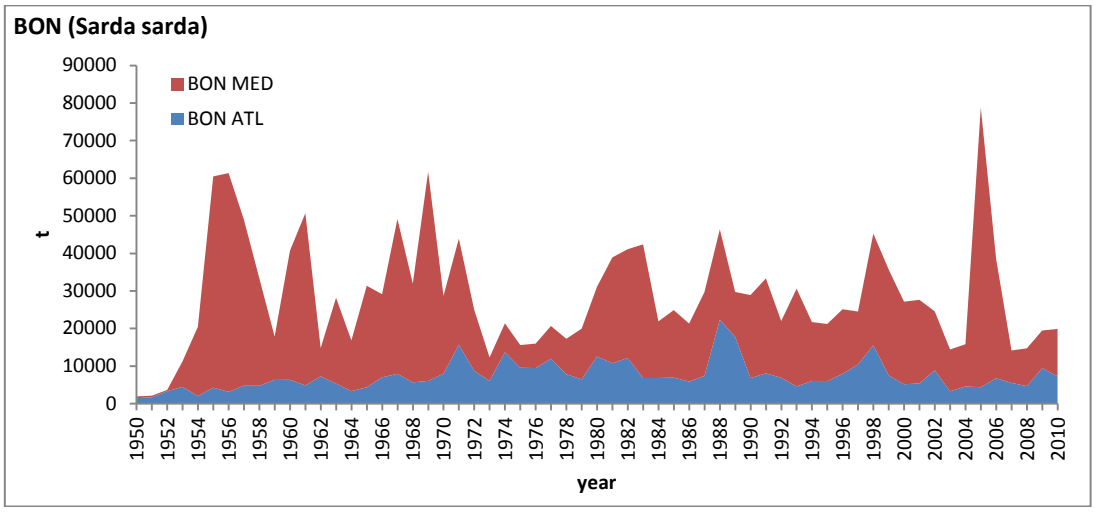
			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		Serbia & Montenegro	0	0	0	0	0	5	0	28	21	35	22	18	20	18	16	16	0	0	0	0	0	0	0	0	
		Syria Rep.	73	121	99	121	127	110	156	161	156	155	270	350	417	390	370	370	330	0	0	0	0	193	133	163	148
		Tunisie	1590	1803	1908	1566	2113	1343	664	242	204	696	824	333	1113	752	1453	1036	960	657	633	0	0	0	0	0	
		Turkey	0	0	0	0	0	0	0	0	0	0	0	0	500	750	750	750	750	0	568	507	1230	785	1074	1309	1046
		Yugoslavia Fed.	1	2	5	4	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MAW	TOTAL		3292	1799	3921	2938	6626	4160	3648	2741	2070	3414	2829	2249	2001	1397	1995	1236	1927	1072	528	824	389	845	281	399	337
	A+M	Angola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Benin	104	17	13	334	211	214	202	214	194	188	188	362	511	205	205	205	205	0	0	0	0	0	0	0	
		EU.Estonia	0	0	0	0	0	49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Ireland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
		EU.Latvia	0	0	0	0	208	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Lithuania	0	0	0	0	0	52	4	0	0	0	0	0	0	0	0	0	298	0	0	0	0	0	0	0	
		EU.Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	
		Gabon	0	0	0	0	0	0	0	0	0	0	0	0	85	0	0	0	0	0	0	0	0	0	0	0	
		Germany Democratic Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Ghana	1453	0	1457	1457	1500	2778	899	466	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Russian Federation	0	0	143	195	1032	0	0	19	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
		S. Tomé e Príncipe	0	0	6	4	6	5	3	5	6	6	8	7	8	5	6	6	6	6	21	12	13	0	91	94	96
		Senegal	1516	1754	2159	753	2429	1028	2450	2038	1870	3220	2633	1880	1397	1187	1763	1025	1376	1054	506	812	375	845	189	304	239
		U.S.S.R.	219	28	143	195	1240	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Ukraine	0	0	0	0	0	0	90	0	0	0	0	0	0	0	21	0	42	12	0	0	0	0	0	0	
SSM	TOTAL		14207	14461	12671	13845	12782	15318	16285	16317	14490	13697	16571	15403	8641	9837	8220	8383	9414	9793	8119	10470	6282	6102	5900	6197	5974
	A+M	Colombia	81	72	151	112	76	37	95	58	69	69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Cuba	621	1606	803	746	665	538	611	310	409	548	613	613	0	0	0	0	0	0	0	0	0	0	0	0	
		Dominica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Dominican Republic	1271	1321	1415	1401	1290	728	735	739	1330	2042	2042	231	191	125	158	158	158	0	0	0	0	0	0	0	
		EU.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	
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Gabon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	265	0	0	0	0	0	0	0	
		Grenada	17	0	0	1	3	0	0	1	2	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
		Mexico	6170	6461	5246	7242	8194	8360	9181	10066	8300	7673	11050	11050	5483	6431	4168	3701	4350	5242	3641	5723	3856	3955	4155	4251	4128
		Sta. Lucia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	27	0	0	0	0	0	0	0	0
		Trinidad and Tobago	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		U.S.A.	6047	5001	5056	4343	2554	5655	5663	5143	4380	3363	2866	3509	2968	3282	3893	4524	4613	4552	4477	4747	2425	2147	1746	1946	1846
WAH	TOTAL		1151	1235	1635	1527	1498	1721	1834	2670	2143	2408	2515	3085	2488	2957	2020	2296	2202	2049	2580	1692	1611	2201	2046	1680	1770
	A+M	Antigua and Barbuda	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Aruba	120	90	80	80	70	60	50	50	125	40	50	50	50	50	50	50	50	0	0	0	0	0	0	0	
		Barbados	138	159	332	51	51	60	51	91	82	42	35	52	52	41	41	0	0	34	45	26	41	36	27	17	30
		Benin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Brasil	141	133	58	92	52	64	71	33	26	1	16	58	41	0	0	0	0	405	519	449	111	75	76	70	19
		Cape Verde	205	306	340	631	458	351	350	326	361	408	503	603	429	587	487	578	500	343	458	45	537	454	811	273	470
		Curaçao	250	260	280	280	280	250	260	270	250	230	230	230	230	230	230	230	230	0	0	0	0	0	0	0	
		Dominica	0	0	0	0	38	43	59	59	59	58	58	58	58	50	46	11	37	10	6	8	15	14	16	10	13
		Dominican Republic	0	0	1	3	6	9	13	7	0	0	0	325	112	31	35	35	35	0	0	0	0	0	0	0	
		EU.España	9	9	32	18	23	28	32	22	20	15	25	25	29	28	32	38	46	48	305	237	110	66	38	73	53
		EU.France	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
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	0	4	3	9
		Grenada	82	54	137	57	54	77	104	96	46	49	56	56	59	82	51	71	59	44	0	0	0	0	0	0	
		Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	76
		Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	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	91	240	120	86	111
		S. Tomé e Príncipe	0	0	23	20	28	34	27	36	39	46	80	52	56	62	52	52	52	52	94	88	76	0	131	235	241
		Saint Kitts and Nevis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	6	7	0	0	0	0	
		Senegal	0	0	0	0	0	0	0	64	0	0	1	0	0	5	0	0	0	5	0	1	1	0	0	2	6
		St. Vincent and Grenadines	0	0	4	4	28	33	33	41	28	16	23	10	65	52	46	311	17	40	60	0	241	29	24	31	40
		Sta. Lucia	0	0	0	0	77	79	150	141	98	80	221	223	223	310	243	213	217	169	238	169	187	0	171	195	199
		Trinidad and Tobago	0	0	0	0	0	118	1	0	0	0	0	1	1	1	2	1	9	7	6	6	7	6	6	5	5
		U.S.A.	13	57	128	110	82	134	203	827	391	764	608	750	614	858	640	633	846	789	712	558	89	1123	495	522	371
		UK.Bermuda	65	43	61	63	74	67	80	58	50	93	99	105	108	104	61	56	91	87	88	83	86	124	117	101	81
		UK.British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	
		UK.Sta Helena	15	18	18	17	18	12	17	35	26	25	23	0	0	0	0	0	0	0	0	0	0	0	0	29	19
		UK.Turks and Caicos	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Venezuela	113	106	141	101	159	302	333	514	542	540	487	488	360	467	4	17	13	9	7	16	13	33	9	25	28



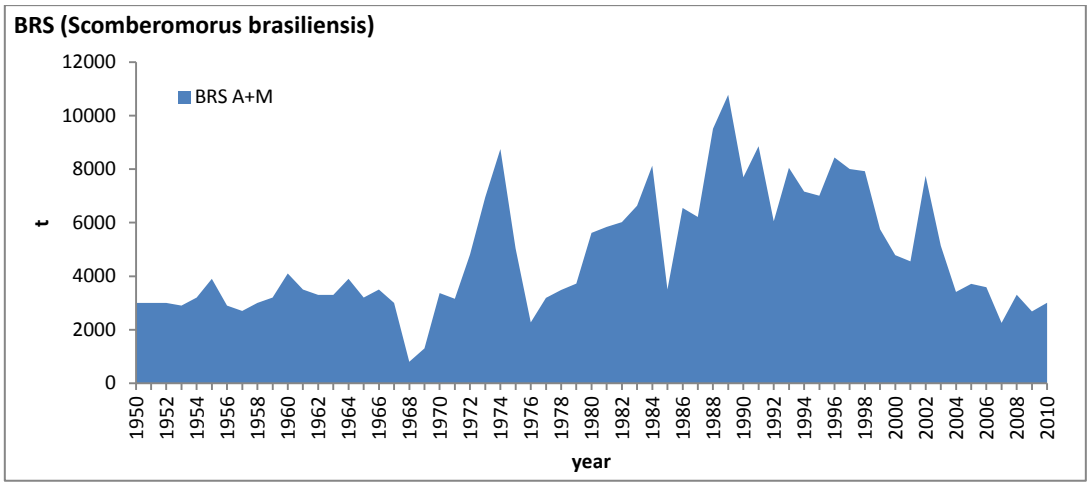
SMT-Figure 1. Estimated landings (t) of small tunas (combined) in the Atlantic and Mediterranean, 1950-2010. The data for the last three years are incomplete.

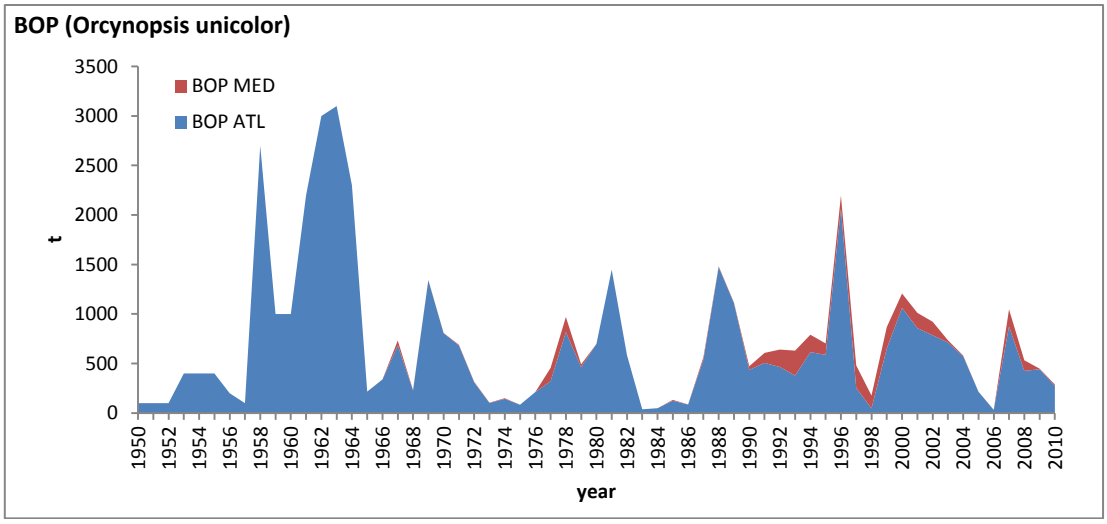


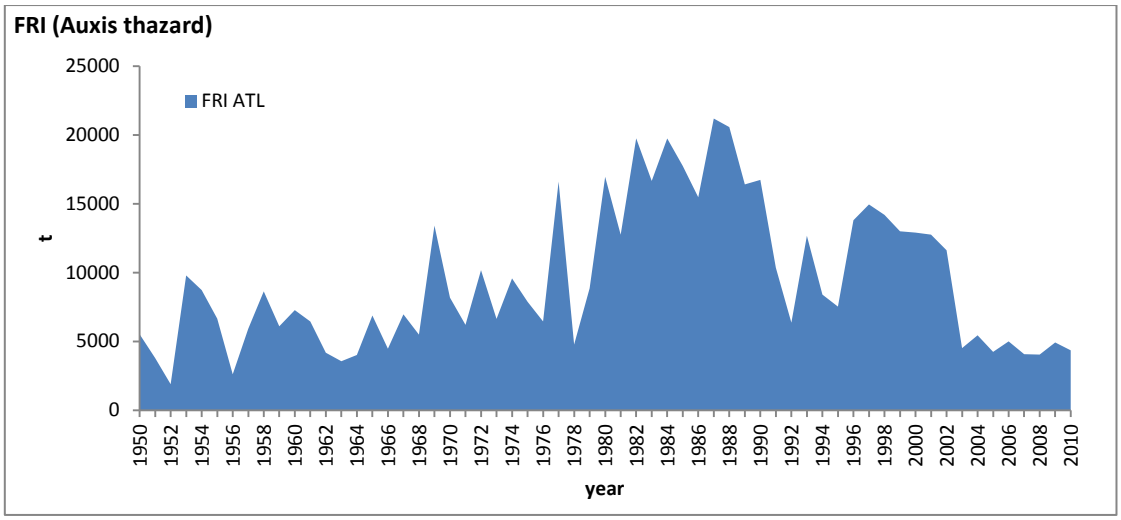




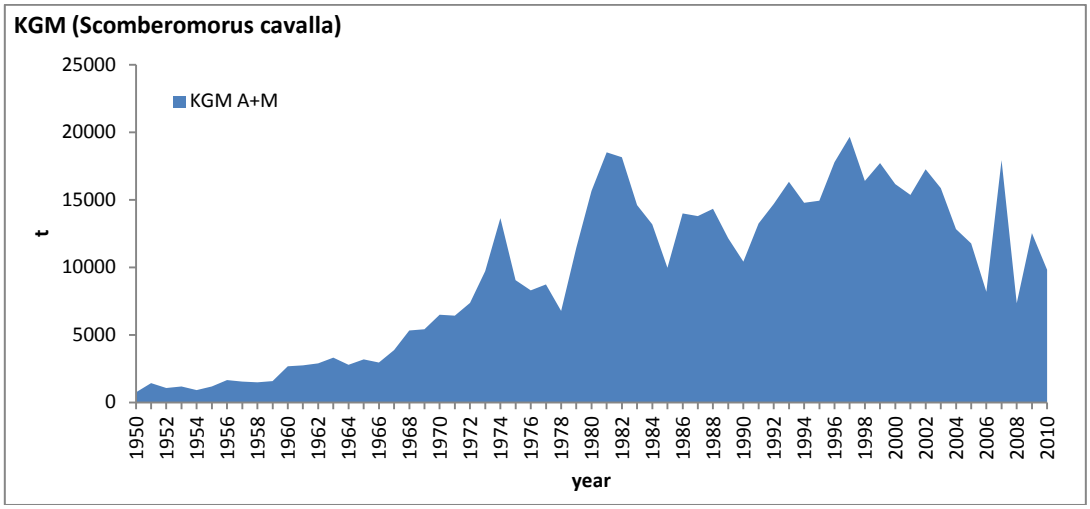
SMT-Figure 2. Estimated landings (t) of the major species of small tunas in the Atlantic and Mediterranean, 1950-2010. The data for the last years are incomplete.

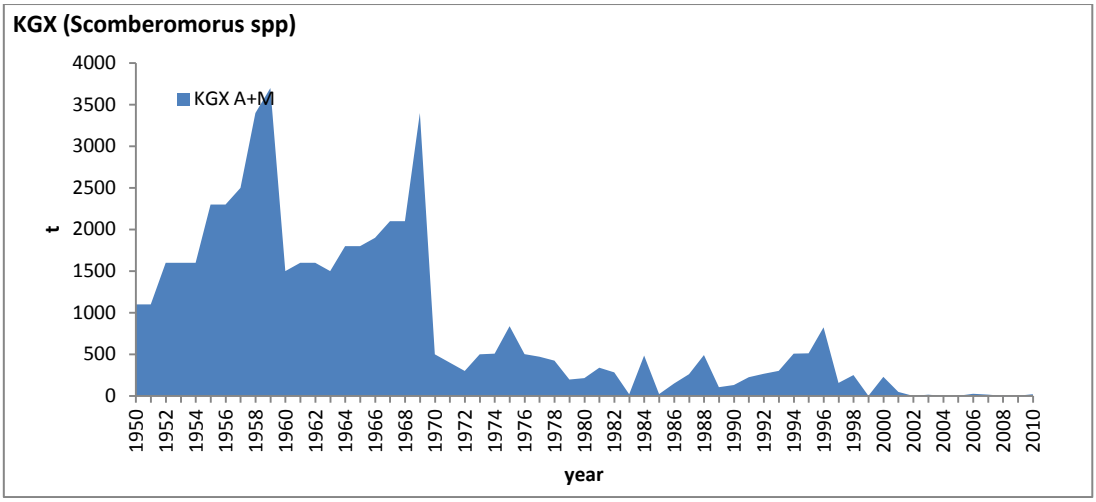


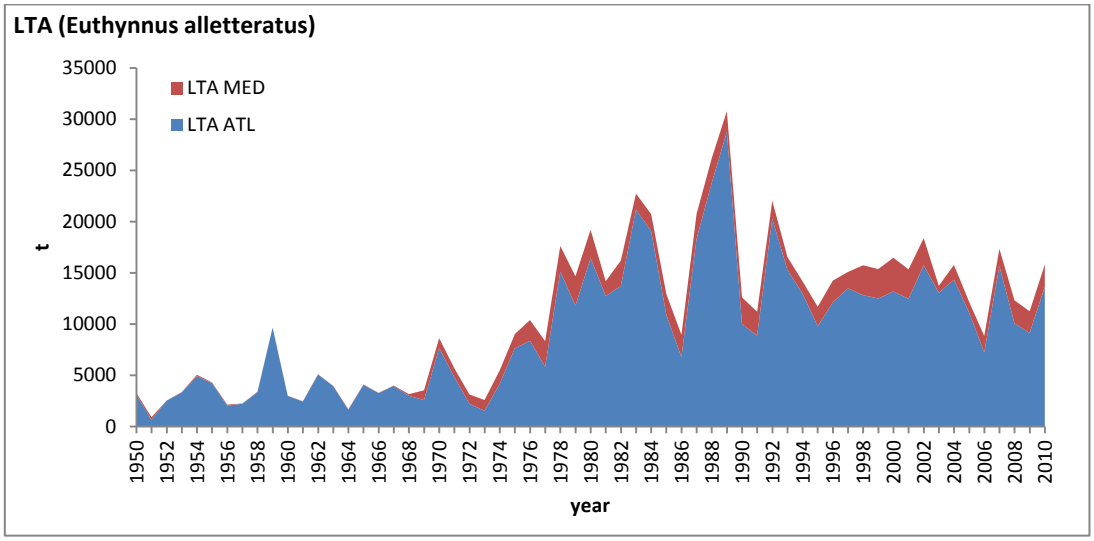




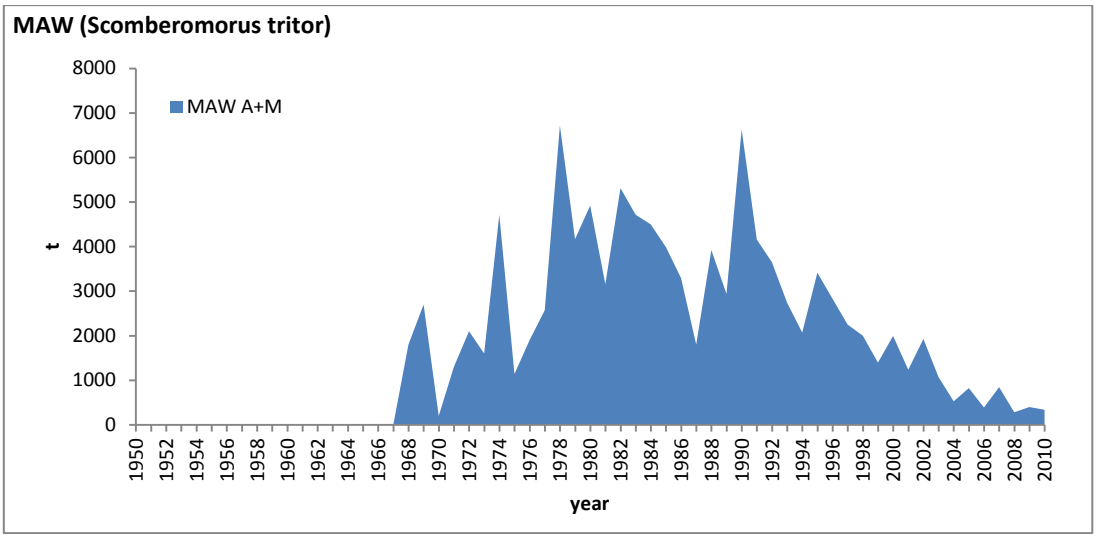
SMT-Figure 2. Cont. Estimated landings (t) of the major species of small tunas in the Atlantic and Mediterranean, 1950-2010. The data for the last years are incomplete.

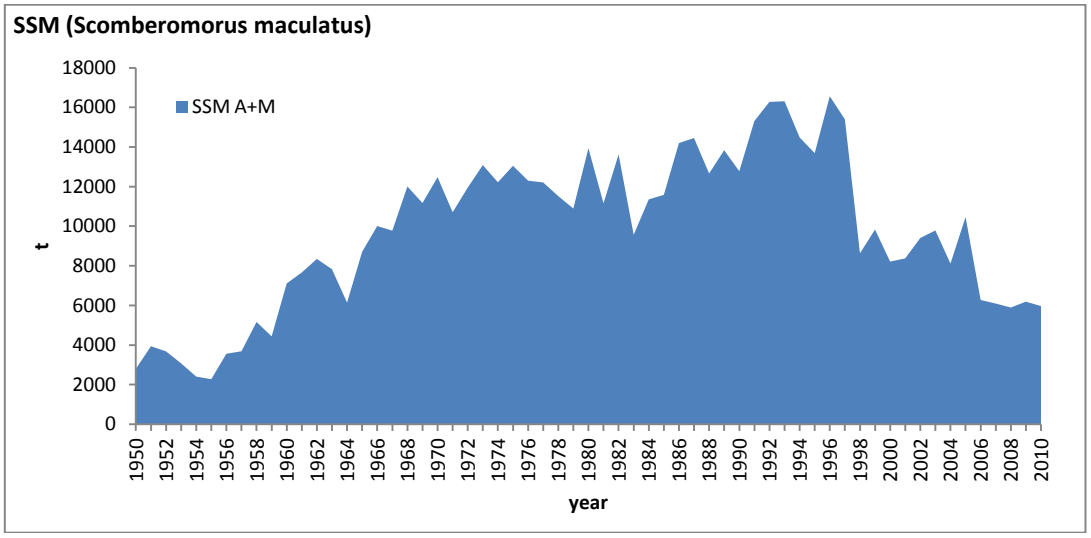


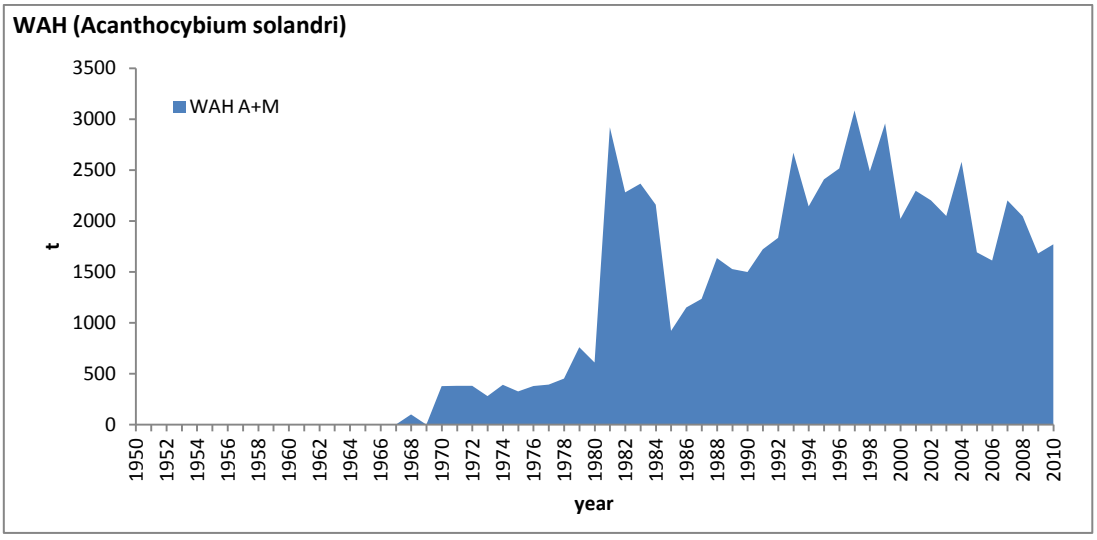




SMT-Figure 2. Cont. Estimated landings (t) of the major species of small tunas in the Atlantic and Mediterranean, 1950-2010. The data for the last years are incomplete.







SMT-Figure 2. Cont. Estimated landings (t) of the major species of small tunas in the Atlantic and Mediterranean, 1950-2010. The data for the last years are incomplete.

8.12 SHK - SHARKS

The status of the stocks of blue shark (*Prionace glauca*) and shortfin mako (*Isurus oxyrinchus*), resulting from the 2008 ICCAT assessment (Anon. 2009b), and the stock of porbeagle (*Lamna nasus*), which was assessed jointly with ICES in 2009, are given in the 2010 SCRS Report. The information from the Ecological Risk Assessment (ERA) for nine species of pelagic elasmobranches carried out in 2008 (Cortés *et al*. 2010) is also included in the 2010 SCRS Report.

In 2011, a data preparatory meeting was held in response to the *Recommendation by ICCAT on Atlantic Shortfin Mako Sharks Caught in Association with ICCAT Fisheries* [Rec. 10-06] and to define the steps to follow in carrying out the ERA envisaged for 2012. The full report of the data preparatory meeting is included in SCRS/2011/017.

SHK-1. Biology

A great variety of shark species are found within the ICCAT Convention area, from coastal to oceanic species. Biological strategies of these sharks are very diverse and are adapted to the needs within their respective ecosystems where they occupy a very high position in the trophic chain as active predators. Therefore, generalization as regards to the biology of these very diverse species results in inevitable inaccuracies, as would occur for teleosts. To date, ICCAT has prioritized the biological study and assessment of the major sharks of the epipelagic system as these species are more susceptible of being caught as by-catch by oceanic fleets targeting tuna and tuna-like species. Among these shark species there are some of special prevalence and with an extensive geographical distribution within the oceanic-epipelagic ecosystem, such as the blue shark and shortfin mako shark, and others with less or even limited prevalence, such as porbeagle, hammerhead sharks, thresher sharks, white sharks, etc.

Blue shark and shortfin mako sharks show a wide geographic distribution, most often between 50ºN and 50ºS latitude. On the contrary, porbeagle show a distribution that is restricted to cold-temperate waters, preferably close to the continental shelf of both hemispheres where this species rarely overlaps with the fishing activity directed at tunas and tuna-like species. These three species have an ovoviviparous reproductive strategy, which increases the probability of survival of their young, with litters from only a few individuals in the case of shortfin mako and porbeagle, to abundant litters of about 40 pups in the case of blue shark. Their growth rates differ between sexes and among these three species. Females often reach first maturity at a large size. A characteristic of these species is usually their tendency to segregate temporally and spatially by size-sex, according to their respective processes of feeding, mating-reproduction, gestation and birth. Numerous aspects of the biology of these species are still poorly understood or completely unknown, particularly for some regions, which contributes to increased uncertainty in quantitative and qualitative assessments.

SHK-2. Fishery indicators

Earlier reviews of the shark database resulted in recommendations to improve data reporting on shark catches. Though global statistics on shark catches included in the database have improved, they are still insufficient to permit the Committee to provide quantitative advice on stock status with sufficient precision to guide fishery management toward optimal harvest levels. Reported and estimated catches for blue shark, shortfin mako and porbeagle are provided in **SHK-Table 1** and **Figures 1 to 4**.

A number of standardized CPUE data series for blue shark and shortfin mako were presented in 2008 as relative indices of abundance. The Committee placed emphasis on using the series that pertained to fisheries that operate in oceanic waters over wide areas. **SHK-Figure 5** presents the central tendency of the available series for the four stocks of these species.

Considering the quantitative and qualitative limitations of the information available to the Committee, the results presented in 2008, as those of the 2004 assessment (Anon. 2005), are not conclusive. During the porbeagle assessment in 2009 (Anon. 2010a), standardized CPUE data were presented for three of the four stocks (NE, NW and SW; **SHK-Figure 6)**. These series when referring to fisheries targeting porbeagle could fail to reflect the global abundance of the stock and where they refer to sharks caught as by-catch they could be highly variable. In 2010, only new information from Japan on the CPUE of shortfin mako and Porbeagle was presented. However, it was suggested that the recently developed method used for the stratification of the areas for the analysis of CPUE should be sent to the ICCAT Secretariat.

With regard to the species for which ERAs were conducted, the Committee understands that, in spite of existing uncertainties, results make it possible to identify those species that are more vulnerable to prioritize research and management measures **(SHK-Table 2)**. These ERAs are conditional on the biological variables used to estimate productivity as well as the susceptibility values for the different fleets.

SHK-3. State of the Stocks

Ecological risk assessments for 11 priority species of sharks (including *blue shark and shortfin mako*) caught in ICCAT fisheries demonstrated that most Atlantic pelagic sharks have exceptionally limited biological productivity and, as such, can be overfished even at very low levels of fishing mortality. Specifically, the analyses indicated that bigeye threshers, longfin makos, and shortfin makos have the highest vulnerability (and lowest biological productivity) of the shark species examined (with bigeye thresher being substantially less productive than the other species). All species considered in the ERA, particularly smooth hammerhead, longfin mako, bigeye thresher and crocodile sharks, are in need of improved biological data to evaluate their biological productivity more accurately and thus specific research projects should be supported to that end. **SHK-Table 2** provides a productivity ranking of the species considered. ERAs should be updated with improved information on the productivity and susceptibility of these species.

SHK-3.1 Blue shark

For both North and South Atlantic blue shark stocks, although the results are highly uncertain, biomass is believed to be above the biomass that would support MSY and current harvest levels below F_{MSY}. Results from all models used in the 2008 assessment (Anon. 2009c) were conditional on the assumptions made (*e.g.*, estimates of historical catches and effort, the relationship between catch rates and abundance, the initial state of the stock in the 1950s, and various life-history parameters), and a full evaluation of the sensitivity of results to these assumptions was not possible during the assessment. Nonetheless, as for the 2004 stock assessment (Anon. 2005c), the weight of available evidence does not support hypotheses that fishing has yet resulted in depletion to levels below the Convention objective (**SHK-Figure 7**).

SHK-3.2 Shortfin mako shark

Estimates of stock status for the North Atlantic shortfin mako obtained with the different modeling approaches applied in 2008 were much more variable than for blue shark. For the North Atlantic, most model outcomes indicated stock depletion to about 50% of biomass estimated for the 1950s. Some model outcomes indicated that the stock biomass was near or below the biomass that would support MSY with current harvest levels above F_{MSY}, whereas others estimated considerably lower levels of depletion and no overfishing (**SHK-Figure 7**). In light of the biological information that indicates the point at which B_{MSY} is reached with respect to the carrying capacity which occurs at levels higher than for blue sharks and many teleost stocks. There is a non-negligible probability that the North Atlantic shortfin mako stock could be below the biomass that could support MSY. A similar conclusion was reached by the Committee in 2004, and recent biological data show decreased productivity for this species. Only one modeling approach could be applied to the South Atlantic shortfin mako stock, which resulted in an estimate of unfished biomass which was biologically implausible, and thus the Committee can draw no conclusions about the status of the South stock.

SHK-3.3 Porbeagle shark

In 2009, the Committee attempted an assessment of the four porbeagle stocks in the Atlantic Ocean: Northwest, Northeast, Southwest and Southeast (Anon. 2010e). In general, data for southern hemisphere porbeagle are too limited to provide a robust indication on the status of the stocks. For the Southwest, limited data indicate a decline in CPUE in the Uruguayan fleet, with models suggesting a potential decline in porbeagle abundance to levels below MSY and fishing mortality rates above those producing MSY (**SHK-Figure 8**). But catch and other data are generally too limited to allow definition of sustainable harvest levels. Catch reconstruction indicates that reported landings grossly underestimate actual landings. For the Southeast, information and data are too limited to assess their status. Available catch rate patterns suggest stability since the early 1990s, but this trend cannot be viewed in a longer term context and thus are not informative on current levels relative to B_{MSY}.

The northeast Atlantic stock has the longest history of commercial exploitation. A lack of CPUE data for the peak of the fishery adds considerable uncertainty in identifying the current status relative to virgin biomass. Exploratory assessments indicate that current biomass is below B_{MSY} and that recent fishing mortality is near or above F_{MSY} (**SHK-Figure 9**). Recovery of this stock to B_{MSY} under no fishing mortality is estimated to take ca.

15-34 years. The current EU TAC of 436 t in effect for the northeast Atlantic may allow the stock to remain stable, at its current depleted biomass level, under most credible model scenarios. Catches close to the current TAC (e.g. 400 t) could allow rebuilding to B_{MSY} under some model scenarios, but with a high degree of uncertainty and on a time scale of 60 (40-124) years.

An update of the Canadian assessment of the northwest Atlantic porbeagle stock indicated that biomass is depleted to well below B_{MSY}, but recent fishing mortality is below F_{MSY} and recent biomass appears to be increasing. Additional modelling using a surplus production approach indicated a similar view of stock status, i.e., depletion to levels below B_{MSY} and current fishing mortality rates also below F_{MSY} (**SHK-Figure 10**). The Canadian assessment projected that with no fishing mortality, the stock could rebuild to B_{MSY} level in approximately 20-60 years, whereas surplus-production based projections indicated 20 years would suffice. Under the Canadian strategy of a 4% exploitation rate, the stock is expected to recover in 30 to 100+ years according to the Canadian projections.

SHK-4. Management Recommendations

Precautionary management measures should be considered for stocks where there is the greatest biological vulnerability and conservation concern, and for which there are very few data. Management measures should ideally be species-specific whenever possible.

For species of high concern (in terms of overfishing), and for which a high survivorship is expected in fishing gears after release, the Committee recommends that the Commission prohibit retention and landing of the species to minimize fishing mortality. The Committee recognizes that the difficulty in identifying look-alike species may complicate compliance with management measures adopted for those species

For all the species, but particularly for those which can be easily misidentified, it is essential that the Committee advances data collection and research on life history, together with the interactions with tuna fisheries, with the final objective of assessing the status of the stocks. Until such information is made available, the Commission should consider taking effective measures to reduce the fishing mortality of these stocks. These measures may include minimum or maximum size limits for landing (for protection of juveniles or the breeding stock, respectively); and any other technical mitigation measures such as gear modifications, time-area restrictions, or others, as appropriate. Such management actions should be combined with research activities, in order to provide information on their effectiveness.

The SCRS welcomed the conservation and management measures adopted by the Commission in the past two years regarding the species ranked as the most vulnerable in the last Ecological Risk Assessment and for which almost no data have been submitted (bigeye thresher, oceanic whitetip shark and hammerhead shark). At the same time, the SCRS expressed concern with the fact that no conservation and management measures have been adopted so far for the top ranked species in the ERA, the silky shark, *Carcharhinus falciformis*. Accordingly, the SCRS recommended that proper conservation and management measures, similar to those adopted for those species, be also adopted for the silky shark.

Both porbeagle stocks in the northwest and northeast Atlantic were estimated to be overfished, with the northeastern stock being more highly depleted. The main source of fishing mortality on these stocks is from directed porbeagle fisheries which are not under the Commission's direct mandate. Those fisheries are managed mostly by ICCAT Contracting Parties through national legislation which includes quotas and other management measures.

The Committee also recommends that countries initiate research projects to investigate means to minimize by-catch and discard mortality of sharks, with a particular view to recommending to the Commission complementary measures to minimize porbeagle by-catch in fisheries for tuna and tuna-like species. For porbeagle sharks, the Committee recommends that the Commission work with countries catching porbeagle, particularly those with targeted fisheries, and relevant RFMOs to ensure recovery of North Atlantic porbeagle stocks and prevent overexploitation of South Atlantic stocks. In particular, porbeagle fishing mortality should be kept to levels in line with scientific advice and with catches not exceeding current level. New targeted porbeagle fisheries should be prevented, porbeagles retrieved alive should be released alive, and all catches should be reported. Management measures and data collection should be harmonized as much as possible among all relevant RFMOs dealing with these stocks, ICCAT should facilitate appropriate communication.

The Committee recommends that joint work with the ICES Working Group on Elasmobranch Fishes should be continued. In addition, stocks of mutual interest and areas of overlap, particularly species occurring in the Mediterranean Sea, should be discussed.

The Committee recommends that scientific observers be allowed to collect biological samples (vertebrae, tissues, reproductive tracts, stomachs) from species whose retention is prohibited by current regulations.

The Committee recommends that the CPCs explore methods to estimate catches of sharks in purse seine and artisanal fisheries.

NORTH ATLANTIC BLUE SHARK SUMMARY

2007 Yield		61,845 t[1]
Provisional Yield (2010)		37,238 t[2]
Relative Biomass:	B_{2007}/B_{MSY}	1.87-2.74[3]
	B_{2007}/B_0	0.67-0.93[4]
Relative Fishing Mortality:	F_{MSY}	0.15[5]
	F_{2007}/F_{MSY}	0.13-0.17[6]

[1] Estimated catch used in the 2008 assessments (Anon. 2009b).
[2] Task I catch.
[3] Range obtained from the Bayesian Surplus Production (BSP) (low) and the Catch-Free Age Structured Production (CFASP) (high) models. Value from CFASP is SSB/SSB_{MSY}.
[4] Range obtained from BSP (high), CFASP and Age-Structured Production Model (ASPM) (low) models.
[5] From BSP and CFASP models (same value). CV is from CFASP model.
[6] Range obtained from BSP (high) and CFASP (low) models.

SOUTH ATLANTIC BLUE SHARK SUMMARY

2007 Yield		37,075 t[1]
Provisional Yield (2010)		27,729 t[2]
Relative Biomass:	B_{2007}/B_{MSY}	1.95-2.80[3]
	B_{2007}/B_0	0.86-0.98[4]
Relative Fishing Mortality:	F_{MSY}	0.15-0.20[5]
	F_{2007}/F_{MSY}	0.04-0.09[5]

[1] Estimated catch used in the 2008 assessments (Anon. 2009b).
[2] Task I catch.
[3] Range obtained from BSP (low) and CFASP (high) models. Value from CFASP is $SSB/SSB_{MSY.}$
[4] Range obtained from BSP (high) and CFASP (low) models. Value from CFASP is SSB/SS_{B0}.
[5] Range obtained from BSP (low) and CFASP (high) models.

NORTH ATLANTIC SHORTFIN MAKO SUMMARY

2007 Yield		5,996 t[1]
Provisional Yield (2010)		4,016 t[2]
Relative Biomass:	B_{2007}/B_{MSY}	0.95-1.65[3]
	B_{2007}/B_0	0.47-0.73[4]
Relative Fishing Mortality:	F_{MSY}	0.007-0.05[5]
	F_{2007}/F_{MSY}	0.48-3.77[6]
Management measures in effect		[Rec. 04-10], [Rec. 07-06]

[1] Estimated catch used in the 2008 assessments (Anon. 2009b).
[2] Task I catch.
[3] Range obtained from BSP (low) and CFASP (high) models. Value from CFASP is $SSB/SSB_{MSY.}$
[4] Range obtained from BSP (low), ASPM, and CFASP (high) models. Value from CFASP is SSB/SS_{B0}.
[5] Range obtained from BSP (low) and CFASP (high) models.
[6] Range obtained from BSP (high) and CFASP (low) models.

NORTHWEST ATLANTIC PORBEAGLE SUMMARY

Current Yield (2008)		144.3 t[1]
Relative Biomass:	B_{2008}/B_{MSY}	0.43-0.65[2]
Relative Fishing Mortality:	F_{MSY}	0.025-0.075[3]
	F_{2008}/F_{MSY}	0.03-0.36[4]
Management measures in effect		TAC of 185, 11.3 t[5]

[1] Estimated catch allocated to the Northwest stock area.
[2] Range obtained from age-structured model (Canadian assessment; low) and BSP model (high). Value from Canadian assessment is in numbers; value from BSP in biomass. All values in parentheses are CVs.
[3] Range obtained from BSP model (low) and age-structured model (high).
[4] Range obtained from BSP model (low) and age-structured model (high).
[5] The TAC for the Canadian EEZ is 185 t (MSY catch is 250 t); the TAC for the USA is 11.3 t.

SOUTHWEST ATLANTIC PORBEAGLE SUMMARY

Current Yield (2008)		164.6 t[1]
Relative Biomass:	B_{2008}/B_{MSY}	0.36-0.78[2]
Relative Fishing Mortality:	F_{MSY}	0.025-0.033[3]
	F_{2008}/F_{MSY}	0.31-10.78[4]
Management measures in effect		None

[1] Estimated catch allocated to the southwest stock area.
[2] Range obtained from BSP (low and high) and CFASP models. Value from CFASP model (SSB/SSB_{MSY}) was 0.48 (0.20).
[3] Range obtained from BSP (low) and CFASP (high) models.
[4] Range obtained from BSP (low and high) and CFASP models. Value from CFASP model was 1.72 (0.51).

NORTHEAST ATLANTIC PORBEAGLE SUMMARY

Current Yield (2008)		287 t[1]
Relative Biomass:	B_{2008}/B_{MSY}	0.09-1.93[2]
Relative Fishing Mortality:	F_{MSY}	0.02-0.03[3]
	F_{2008}/F_{MSY}	0.04-3.45[4]
Management measures in effect		TAC of 436 t[5]
		Maximum landing length of 210 cm FL[5]

[1] Estimated catch allocated to the northeast stock area.
[2] Range obtained from BSP (high) and ASPM (low) models. Value from ASPM model is SSB/SSB_{MSY}. The value of 1.93 from the BSP corresponds to a biologically unrealistic scenario; all results from the other BSP scenarios ranged from 0.29 to 1.05.
[3] Range obtained from the BSP and ASPM models (low and high for both models).
[4] Range obtained from BSP (low) and ASPM (high) models. The value of 0.04 from the BSP corresponds to a biologically unrealistic scenario; all results from the BSP scenarios ranged from 0.70 to 1.26.
[5] In the European Union.

BSH-Table 1. Estimated catches (t) of blue shark (*Prionace glauca*) by area, gear and flag.

			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
TOTAL			1482	1614	1835	1810	3028	4307	3643	9577	9562	9634	9560	37610	33809	35093	39101	34447	32735	35572	36304	43071	40351	47044	53900	58830	65183
	ATN		1482	1614	1835	1810	3028	4299	3536	9566	8084	8285	7258	29053	26510	25741	27965	21022	20037	22911	21740	22357	23215	26925	30722	35201	37238
	ATS		0	0	0	0	0	8	107	10	1472	1341	2301	8409	7238	9332	11091	13378	12682	12650	14438	20642	16957	20068	23097	23444	27729
	MED		0	0	0	0	0	0	0	0	6	8	2	148	61	20	44	47	17	10	125	72	178	51	82	185	216
Landings	ATN	Longline	0	0	0	0	1387	2257	1583	5734	5880	5871	5467	27618	25288	24405	26473	20013	18426	21936	20304	21033	22090	25966	30443	34434	36347
		Other surf.	1482	1088	1414	1330	900	1270	1768	2696	1632	1793	1086	1255	1030	1228	1355	904	1543	975	1372	1258	1080	905	150	664	727
	ATS	Longline	0	0	0	0	0	8	107	10	1472	1341	2294	8398	7231	9305	11091	13376	12678	12645	14339	20638	16898	19998	22708	23438	27716
		Other surf.	0	0	0	0	0	0	0	0	0	0	0	6	4	27	0	1	4	6	99	3	59	10	375	6	14
	MED	Longline	0	0	0	0	0	0	0	0	6	8	2	148	61	20	44	47	17	10	44	72	83	49	81	18	50
		Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	81	0	95	2	1	167	165
Discards	ATN	Longline	0	526	421	480	741	772	184	1136	572	621	602	180	170	104	137	105	68	0	63	66	45	53	129	102	163
		Other surf.	0	0	0	0	0	0	0	0	0	0	103	0	22	4	0	0	0	0	1	0	0	0	1	1	1
	ATS	Longline	0	0	0	0	0	0	0	0	0	0	7	5	4	1	0	0	0	0	0	0	0	60	14	0	
		Other 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	
Landings	ATN	Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	114	461
		Brasil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	
		Canada	320	147	968	978	680	774	1277	1702	1260	1494	528	831	612	547	624	581	836	346	965	1134	977	843	0	0	0
		Cape Verde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		China P.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	185	104	148	0	0	0	367	109	88	53
		Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	171	206	240	588	292	110	78	133
		EU.Denmark	0	0	0	2	2	1	1	0	1	2	3	1	1	0	2	1	13	5	1	0	0	0	0	0	0
		EU.España	0	0	0	0	0	0	0	0	0	0	0	24497	22504	21811	24112	17362	15666	15975	17314	15006	15464	17038	20788	24465	26094
		EU.France	50	67	91	79	130	187	276	322	350	266	278	213	163	399	395	207	221	57	106	120	99	167	119	84	122
		EU.Ireland	0	0	0	0	0	0	0	0	0	0	0	0	0	66	31	66	11	2	0	0	0	0	0	0	0
		EU.Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
		EU.Portugal	0	0	0	0	1387	2257	1583	5726	4669	4722	4843	2630	2440	2227	2081	2110	2265	5643	2025	4027	4338	5283	6167	6252	8261
		EU.United Kingdom	0	0	0	0	1	0	0	0	0	12	0	0	1	0	12	9	6	4	6	5	3	6	6	96	8
		FR.St Pierre et Miquelon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
		Japan	0	0	0	0	0	0	0	0	1203	1145	618	489	340	357	273	350	386	558	1035	1729	1434	1921	2531	2007	1793
		Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	254	892	613	1575	
		Senegal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	456	0	0	0	0	43	134	255	56
		Trinidad and Tobago	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	3	2	1	1	0	2	8	9
		U.S.A.	1112	874	355	271	87	308	215	680	29	23	283	211	255	217	291	39	0	0	7	2	2	1	8	4	8
		UK.Bermuda	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0
		Venezuela	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	26	10	18	7	71	74
	ATS	Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37	259	0	236	109	0	273
		Benin	0	0	0	0	0	0	0	0	0	0	0	6	4	27	0	0	0	0	0	0	0	0	0	0	
		Brasil	0	0	0	0	0	0	0	0	0	0	743	1103	0	179	1683	2173	1971	2166	1667	2523	2591	2258	1986	1274	1500
		China P.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	565	316	452	0	0	0	585	40	109	41
		Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	521	800	866	1805	2177	1843	1341	1594
		EU.España	0	0	0	0	0	0	0	0	0	0	0	5272	5574	7173	6951	7743	5368	6626	7366	6410	8724	8942	9615	13099	13953
		EU.Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	
		EU.Portugal	0	0	0	0	0	0	0	0	0	847	867	1336	876	1110	2134	2562	2324	1841	1863	3184	2751	4493	4866	5358	6338
		EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	239	0	0	14	
		Japan	0	0	0	0	0	0	0	0	1388	437	425	506	510	536	221	182	343	331	209	236	525	896	1789	981	1123
		Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	222
		Namibia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2213	0	1906	6616	0	0	1829	207	2352
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	168	22	0	0	0	0	0	0	0	521	0	
		Russian Federation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	0	0	0	0	**0**
		South Africa	0	0	0	0	0	0	0	0	0	0	0	0	23	21	0	83	63	232	128	154	90	82	126	119	125
		U.S.A.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	0	0	0	0	0	0	
		Uruguay	0	0	0	0	0	8	107	10	84	57	259	180	248	118	81	66	85	480	462	376	232	337	359	942	208
	MED	EU.Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	3	6	5	0	0	0	0	
		EU.España	0	0	0	0	0	0	0	0	0	0	0	146	59	20	31	6	3	3	4	8	61	3	2	7	48
		EU.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	1
		EU.Italy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	113	1	95	46	75	175	165
		EU.Malta	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	1	0	2	2	2	1
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	2	0	5	41	14	3	0	56	22	0	0	0	2
		Japan	0	0	0	0	0	0	0	0	5	7	1	1	0	0	0	0	0	1	1	2	0	0	2	0	**0**
Discards	ATN	U.S.A.	0	526	421	480	741	772	184	1136	572	618	704	180	192	100	137	106	68	0	65	66	45	54	130	103	164
		UK.Bermuda	0	0	0	0	0	0	0	0	0	3	1	0	0	8	0	0	0	0	0	0	0	0	0	0	0
Discards	ATS	Brasil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	14	0	
		U.S.A.	0	0	0	0	0	0	0	0	0	0	7	5	4	1	0	0	0	0	0	0	0	0	0	0	

POR-Table 1. Estimated catches (t) of porbeagle (*Lamna nasus*) by area, gear and flag.

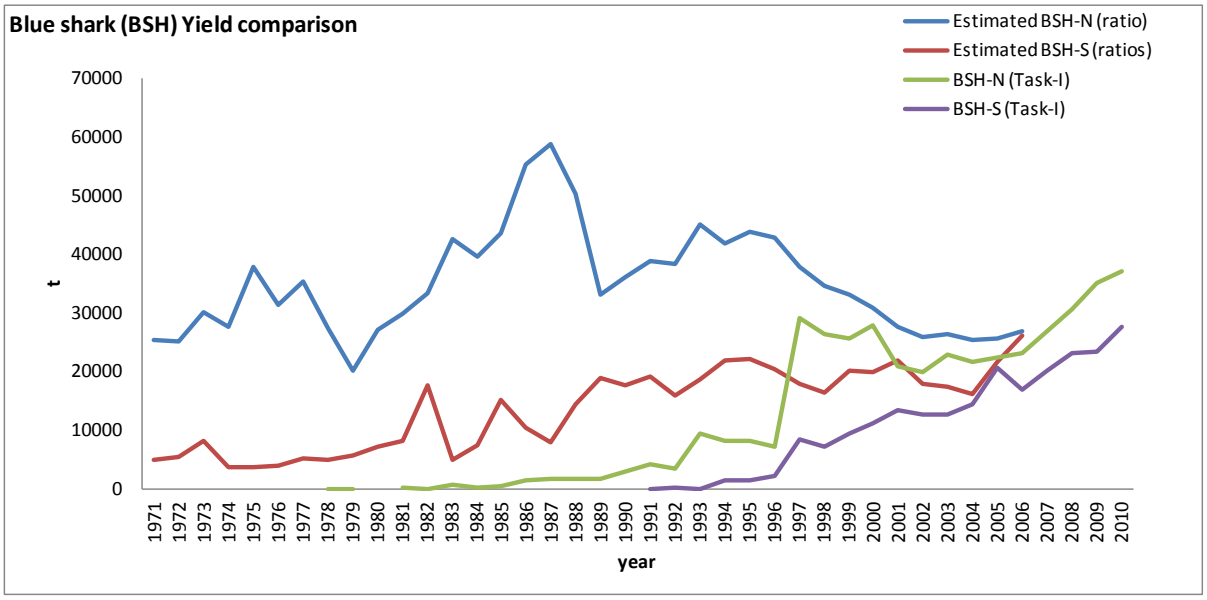
			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
TOTAL			732	844	1025	1013	1309	1990	2603	1910	2729	2140	1560	1859	1469	1403	1469	999	848	648	745	571	507	515	600	475	134
	ATN		732	844	1024	1013	1309	1990	2603	1909	2726	2136	1556	1833	1451	1393	1457	998	838	604	725	539	470	502	513	412	120
	ATS		0	0	1	0	0	0	0	1	2	3	3	26	17	10	11	1	11	43	17	31	37	13	85	62	14
	MED		0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	0	0	3	2	1	0	2	1	1
Landings	ATN	All gears	732	844	1024	1013	1309	1990	2601	1909	2725	2136	1556	1833	1451	1393	1457	998	838	604	725	539	470	502	512	412	117
	ATS		0	0	1	0	0	0	0	1	2	3	3	26	16	9	11	1	11	43	17	31	37	13	85	62	14
	MED		0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	0	0	3	2	1	0	2	1	1
Discards	ATN		0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
	ATS		0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	
Landings	ATN	Canada	24	59	83	73	78	329	813	919	1575	1353	1051	1334	1070	965	902	499	237	142	232	202	192	93	124	62	83
		EU.Denmark	114	56	33	33	46	85	80	91	93	86	72	69	85	107	73	76	42	0	0	0	0	0	0	0	0
		EU.España	26	30	69	42	26	47	15	21	52	19	41	25	25	18	13	24	54	27	11	14	34	8	41	77	
		EU.France	260	280	446	341	551	300	496	633	820	565	267	315	219	240	410	361	461	303	413	276	194	354	311	228	
		EU.Germany	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	1	3	0	0	0	0	0	0	0	
		EU.Ireland	0	0	0	0	0	0	0	0	0	0	0	0	0	8	2	6	3	11	18	0	4	8	7	3	0
		EU.Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Portugal	0	3	3	2	2	1	0	0	0	0	0	0	0	0	7	4	10	101	50	14	6	0	3	17	7
		EU.Sweden	8	5	3	3	2	2	4	3	2	2	1	1	1	1	1	1	0	0	0	0	0	0	0	0	
		EU.United Kingdom	6	3	3	15	9	0	0	0	0	0	0	0	1	6	8	12	10	0	0	24	11	26	15	11	0
		Faroe Islands	270	381	373	477	550	1189	1149	165	48	44	8	9	7	10	0	0	0	0	0	0	0	0	0	0	
		Iceland	0	0	0	0	0	0	1	3	4	6	5	3	4	2	2	3	2	1	1	0	1	0	1	0	1
		Japan	0	0	0	0	0	0	0	0	0	0	5	4	0	0	0	0	0	0	0	0	0	12	10	13	13
		Norway	24	25	11	25	43	32	41	24	24	26	28	17	27	32	22	11	14	19	0	8	27	0	0	0	12
		U.S.A.	0	1	0	2	2	5	1	50	106	35	78	56	13	3	1	1	1	0	1	0	0	0	1	1	1
	ATS	Benin	0	0	0	0	0	0	0	0	0	0	0	4	0	4	0	0	0	0	0	0	0	0	0	0	
		Chile	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Bulgaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.España	0	0	0	0	0	0	0	0	0	0	0	2	2	2	7	1	2	9	4	0	3	5	4	13	
		EU.Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Poland	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2	0	0	0	0	
		Falklands	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	
		Guinea Ecuatorial	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	0	1	0	0	0	0	1	0	0	3	14	0	1	0	0	0	0	0	0	0	5	41	34	8
		Seychelles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Uruguay	0	0	0	0	0	0	0	0	0	3	0	5	13	2	4	0	8	34	8	28	34	3	40	14	6
	MED	EU.Italy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0	2	0	0
		EU.Malta	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	0	0	0	1	0	0	0	1	0
Discards	ATN	U.S.A.	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
	ATS	Uruguay	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	

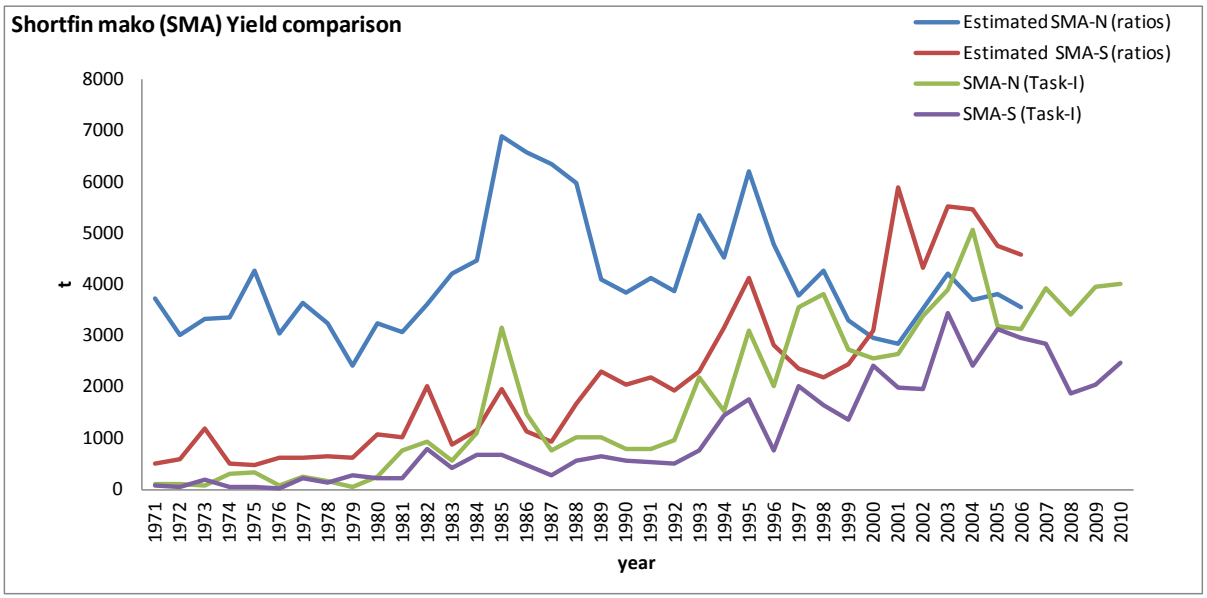
SMA-Table 1. Estimated catches (t) of Shortfin mako (*Isurus oxyrinchus*) by area, gear and flag.

			1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
TOTAL			1951	1028	1562	1648	1349	1326	1446	2966	2972	4870	2778	5570	5477	4097	4994	4654	5361	7324	7487	6336	6073	6753	5284	5987	6500
	ATN		1481	766	1014	1011	785	797	953	2193	1526	3109	2019	3545	3816	2738	2568	2651	3395	3895	5063	3190	3113	3917	3403	3947	4016
	ATS		471	262	548	637	564	529	493	773	1446	1761	759	2019	1652	1355	2422	1996	1964	3426	2423	3130	2951	2834	1880	2039	2482
	MED		0	0	0	0	0	0	0	0	0	0	0	6	8	5	4	7	2	2	2	17	10	2	1	1	2
Landings	ATN	Longline	184	295	214	321	497	573	660	1499	1173	1633	1770	3369	3648	2645	2254	2424	3129	3792	4755	3172	3105	3901	3367	3552	3548
		Other surf.	1297	462	795	681	278	213	254	670	331	1447	248	177	168	91	313	227	266	104	308	18	8	10	27	375	459
	ATS	Longline	471	262	548	637	564	519	480	763	1426	1748	744	1997	1642	1345	2413	1979	1949	3395	2347	3116	2907	2792	1798	2032	2482
		Other surf.	0	0	0	0	0	9	13	10	20	13	15	23	10	10	9	18	15	31	76	14	43	30	82	7	1
	MED	Longline	0	0	0	0	0	0	0	0	0	0	0	6	8	5	4	7	2	2	2	17	10	2	1	1	2
		Other 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	
Discards	ATN	Longline	0	9	5	9	10	11	38	24	21	29	1	0	0	0	0	0	0	0	0	0	0	7	9	20	9
		Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0
	ATS	Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	
Landings	ATN	Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	28
		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	
		Canada	0	0	0	0	0	0	0	0	0	111	67	110	69	70	78	69	78	73	80	91	71	72	43	53	41
		China P.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	81	16	19	29
		Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	84	57	19	30	25	23	12	15
		EU.España	0	0	0	0	0	0	0	0	0	0	0	2416	2199	2051	1566	1684	2047	2068	3404	1751	1918	1816	1895	2216	2091
		EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	2
		EU.Portugal	0	0	0	0	193	314	220	796	649	657	691	354	307	327	318	378	415	1249	473	1109	951	1540	1033	1169	1432
		EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	2	1	1	1	0	0	0	1	15	0
		FR.St Pierre et Miquelon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	4
		Japan	120	218	113	207	221	157	318	425	214	592	790	258	892	120	138	105	438	267	572	0	0	82	131	98	117
		Mexico	0	0	0	0	0	0	0	0	0	10	0	0	0	0	10	16	0	10	6	9	5	8	6	7	8
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	49	33	39	
		Philippines	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	
		Senegal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	17	21	
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	
		Sta. Lucia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Trinidad and Tobago	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	3	1	2	1	1	1	1	1
		U.S.A.	1361	540	896	795	360	315	376	948	642	1710	469	407	347	159	454	395	415	142	411	187	130	216	188	202	217
		UK.Bermuda	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0
		Venezuela	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	58	20	6	11	2	35	22
	ATS	Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	0	17	2	0	32
		Brasil	0	0	0	0	0	0	0	0	0	0	83	190	0	27	219	409	226	283	238	426	210	145	203	99	128
		China P.R.	0	0	0	0	0	0	0	34	45	23	27	19	74	126	305	22	208	260	0	0	0	77	6	24	32
		Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	626	121	128	138	211	124	123	146
		Côte D'Ivoire	0	0	0	0	0	9	13	10	20	13	15	23	10	10	9	15	15	30	15	14	16	25	0	5	7
		EU.España	0	0	0	0	0	0	0	0	0	0	0	1356	1141	861	1200	1235	811	1158	703	584	664	654	628	939	1192
		EU.Portugal	0	0	0	0	0	0	0	0	0	92	94	165	116	119	388	140	56	625	13	242	493	375	321	502	336
		EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	11	
		Japan	428	234	525	618	538	506	460	701	1369	1617	514	244	267	151	264	56	133	118	398	0	0	72	115	108	107
		Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29
		Namibia	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	459	0	509	1415	1243	1002	295	23	307
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	24	1	0	0	0	0	0	0	0	10	0	
		Philippines	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	
		Russian Federation	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 Africa	0	0	0	0	0	0	0	0	0	0	0	0	19	13	0	79	19	138	126	125	99	208	136	100	144
		U.S.A.	0	0	0	0	0	0	0	0	0	0	0	2	1	0	2	0	0	0	0	0	0	0	0	0	
		Uruguay	43	28	23	19	26	13	20	28	12	17	26	20	23	21	35	40	38	188	249	146	68	36	41	106	23
		Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	52	12	13	1	0	0	
	MED	EU.Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0
		EU.España	0	0	0	0	0	0	0	0	0	0	0	6	7	5	3	2	2	2	2	2	4	1	0	0	1
		EU.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	
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	5	0	0	0	15	5	0	0	0	0
		Japan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Discards	ATN	Mexico	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		U.S.A.	0	9	5	9	10	11	38	24	21	28	1	0	0	0	0	0	0	0	0	0	0	7	10	20	9
		UK.Bermuda	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	
	ATS	Brasil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	

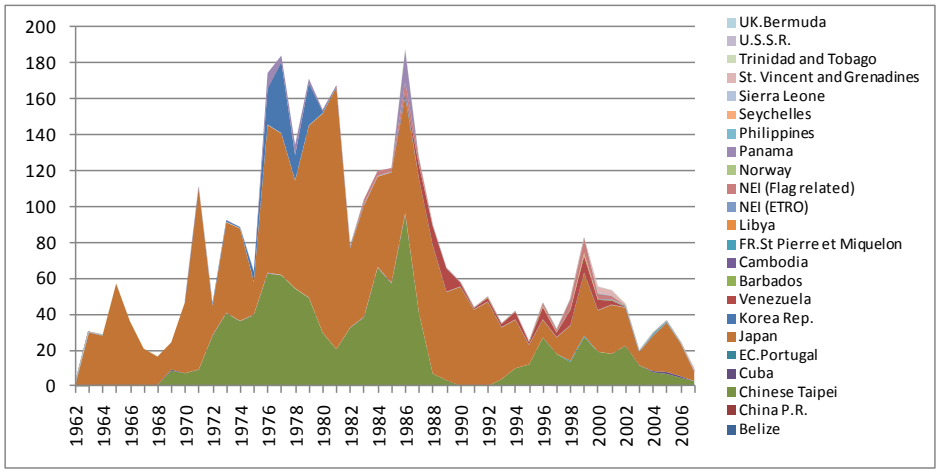
SHK-Table 2. Productivity values ranked from lowest to highest.

Species	*Productivity (r)*	*Productivity rank*
BTH (*Alopias superciliosus*)	0.010	1
SMA (*Isurus oxyrinchus*)	0.014	2
LMA (*Isurus paucus*)	0.014	3
POR (*Lamna nasus*)	0.053	4
FAL (*Carcharhinus falciformis*)	0.076	6
OCS (*Carcharhinus longimanus*)	0.087	7
SPL (*Sphyrna lewini*)	0.090	8
SPZ (*Sphyrna zygaena*)	0.124	9
ALV (*Alopias vulpinus*)	0.141	10
PST (*Pteroplatytrygon violacea*)	0.169	11
BSH (*Prionace glauca*)	0.301	12
CRO (*Pseudocarcharias kamoharai*)	-	-

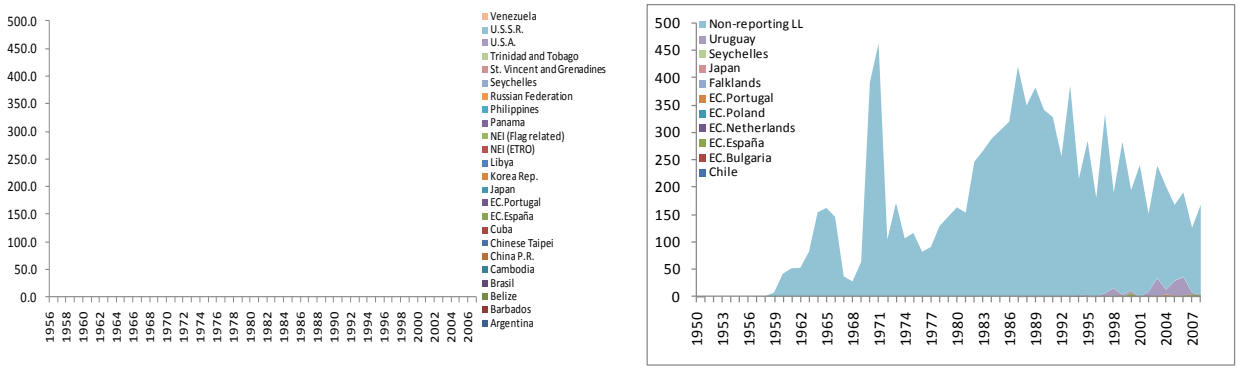




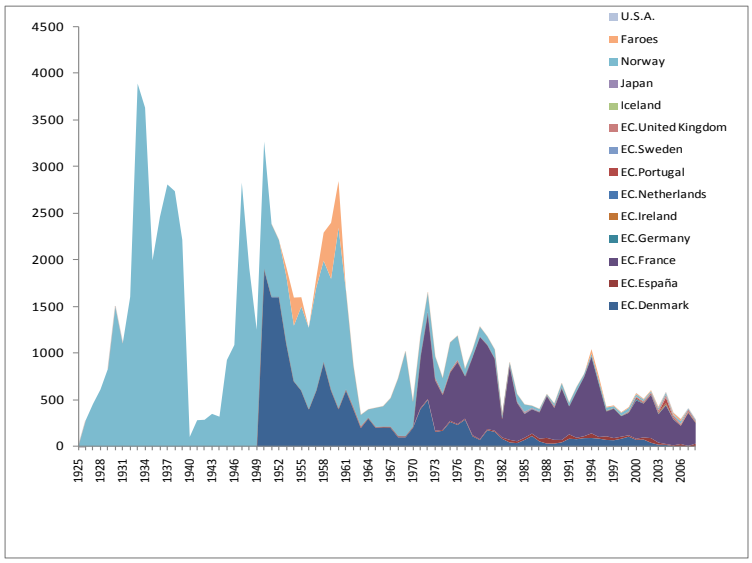
SHK-Figure 1. Blue shark (BSH) and shortfin mako (SMA) catches reported to ICCAT (Task-I) and estimated by the Committee.



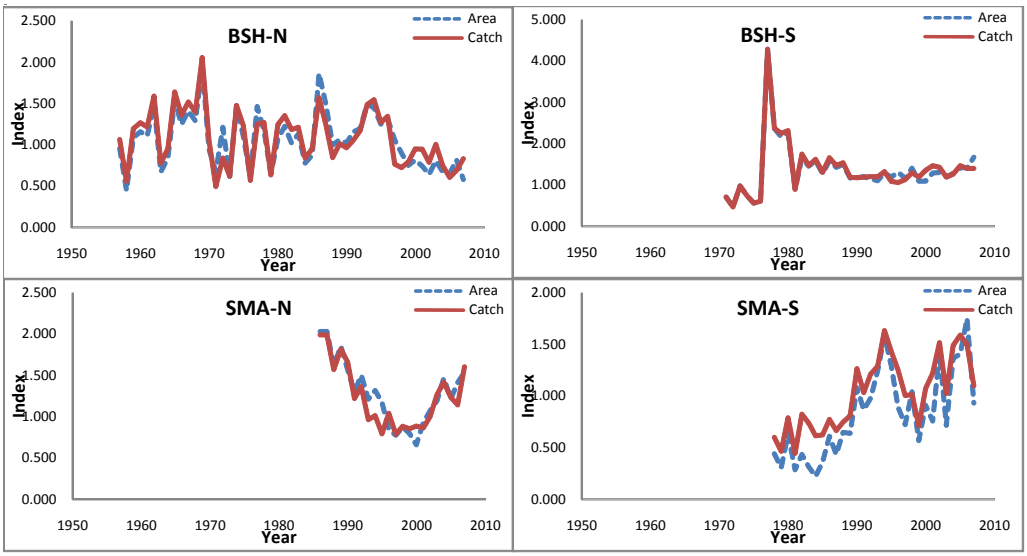
SHK-Figure 2. Potential catch of porbeagle by non-reporting longline fleets using catch ratios for the NW stock. Limited observations across the time-series result in an unquantified uncertainty in the estimates.



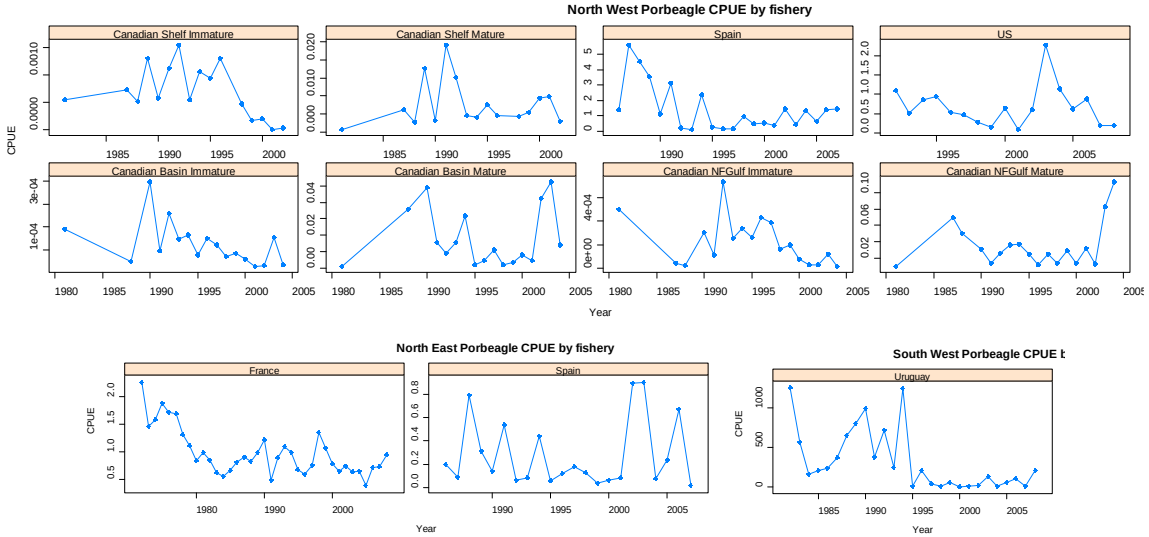
SHK Figure 3. Left plate: Estimated catch of porbeagle by non-reporting longline fleets using catch ratios for the SW stock. Very limited observations across the time-series result in a high but unquantified uncertainty in the estimates. Right plate: Comparison of estimates for non-reporting longline fleets with reported catch levels held in the Task I data set for the SW stock area.



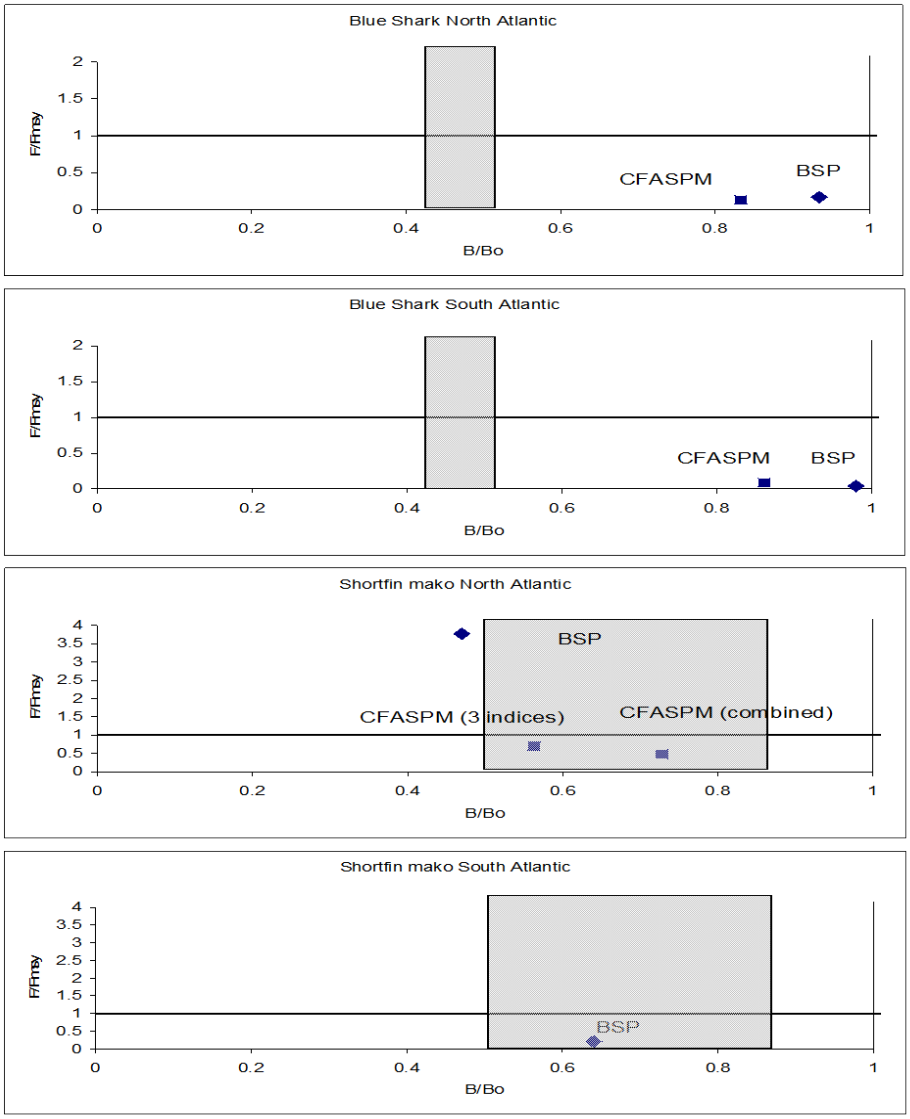
SHK Figure 4. Catch by flag of porbeagle sharks from the northeastern Atlantic used in the assessment. While these catches are considered the best available,, they are believed to underestimate the pelagic longline catches for this species.



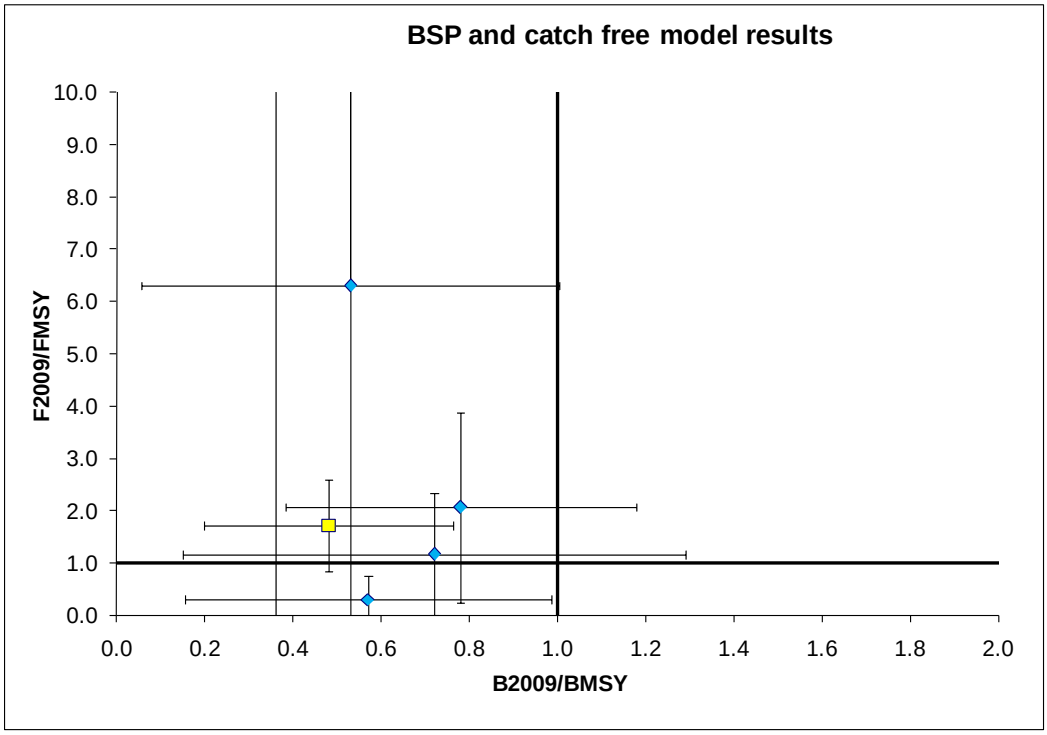
SHK-Figure 5. Average trends in the CPUE series used in the assessments of blue shark (BSH) and shortfin mako (SMA). The averages were calculated by weighting the available series either by their relative catch or by the relative spatial coverage of the respective fisheries.



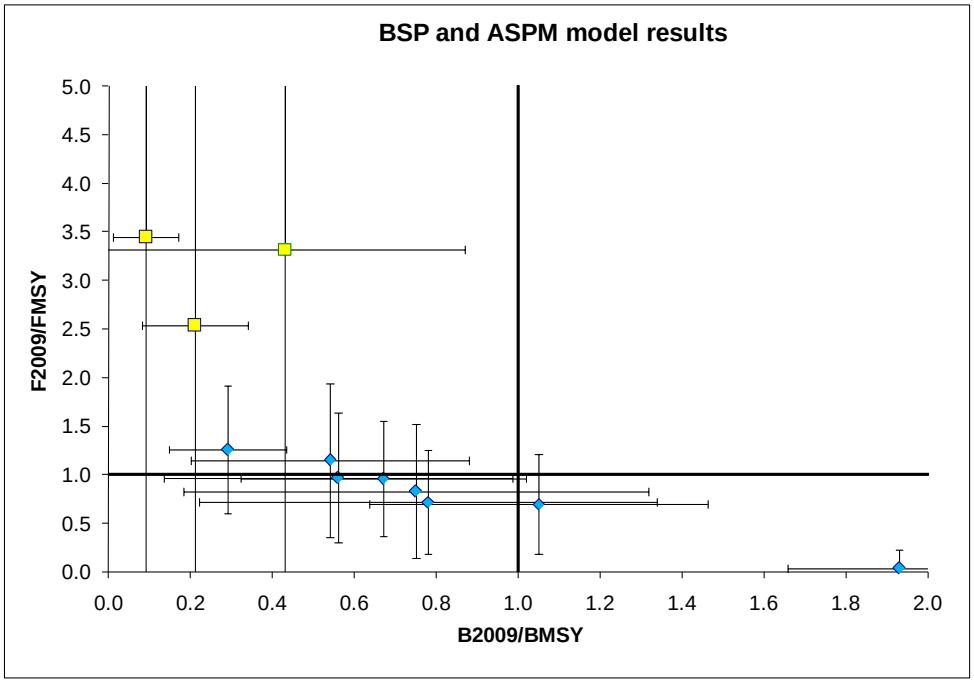
SHK-Figure 6. CPUE series for the porbeagle NW stock (upper figures), NE stock (lower left figures) and SW stock (lower right figure).



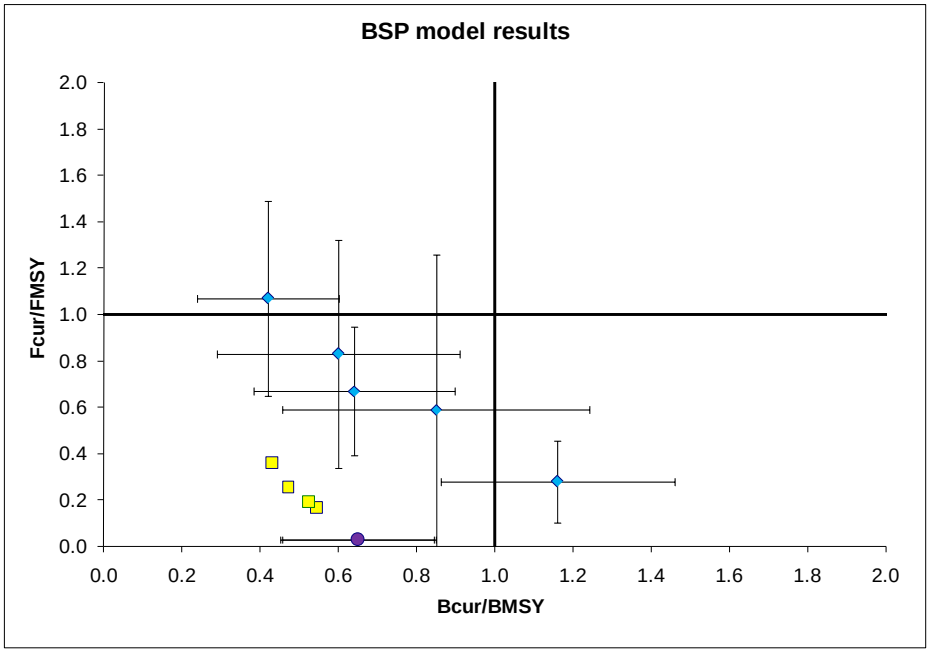
SHK-Figure 7. Phase plots summarizing base scenario outputs for the current stock status of blue shark (BSH) and shortfin mako (SMA). BSP=Bayesian surplus production model; CFASPM=catch-free, age-structured production model. The shaded box represents the area at which the biomass at MSY is estimated to be reached. Any points inside or to the left of the box indicate the stock is overfished (with respect to biomass). Any points above the horizontal line indicate overfishing (with respect to F) is occurring.



SHK-Figure 8. Phase plot for the southwest Atlantic porbeagle, showing status in 2009 from both the BSP model runs (diamonds) and the catch free age structured production model (square) results. Error bars are plus and minus one standard deviation.



SHK-Figure 9. Phase plot showing current status of northeast Atlantic porbeagle for the BSP model (diamonds) and the ASPM model (squares). Error bars are plus and minus one standard deviation.



SHK-Figure 10. Phase plot showing the northwest Atlantic porbeagle expected value of B/B_{MSY} and F/F_{MSY} in the current year, which is either 2005 (diamonds) or 2009 (circles), as well as approximate values from Campana *et al.* (2010) (squares). B/B_{MSY} was approximated from Campana *et al.* (2010) as N2009/N1961 times 2. Error bars are plus and minus one standard deviation.

9. Report of inter-sessional meetings

The reports of the inter-sessional meetings held in 2011 were presented, with special emphasis not directly related to the stock assessments because their results are not included and presented in the Executive Summaries. The following meetings were presented.

9.1 Workshop on the use of R tools in the data preparatory work ICCAT-SCRS

The workshop was held in Madrid, February 7-11, with the objective of developing the skills needed within Species Groups; both during data preparatory meetings and stock assessments. Participants came from a range of CPCs, both developed and developing states (with help from the various ICCAT funds). The topics covered were working with data, accessing ICCAT databases and conducting exploratory data analyses. The types of tasks performed in stock assessment were also covered, *i.e.* conversion of catch-at-size to catch-at-age, standardisation of CPUE as well as conducting stock assessments and presentation of advice in the form of "Kobe Strategy Matrices".

9.2 Working Group on the Organization of the SCRS

The meeting on the organisation of the SCRS, Madrid, March 2-4, reviewed various issues related to the increased demands on the SCRS and implications for Secretariat support. Topics included the Secretariat's role in providing scientific support to the SCRS and participation of CPC scientists at meetings of the SCRS. It was also recognised that the work load of the SCRS had increased due to the need to address a wide variety of recommendations from the Commission. In particular, in relation to the implementation of the Precautionary Approach and the incorporation of advice on the Ecosystem Based Approach to Fisheries Management. Other issues considered were the importance of agreeing a data confidentiality policy to ensure scientific access to data, and the implications for the Secretariat and SCRS discussed.

Other topics covered were how to agree a standard format for scientific reports and collaboration with other tRFMOs.

Recommendations included the need for increased scientific analytical support if more use was to be made of statistical stock assessment methods and Management Strategy Evaluation. Currently: data analyses and research supporting stock assessments are the joint responsibility of CPC scientists and Secretariat professional staff. The increased demands on the SCRS and the need for additions to Secretariat staff, e.g. for data management and by-catch coordination, were discussed. The importance of capacity building and methods for quality assurance and transparency were also discussed.

Document SCRS/2011/012 contains the detailed report of the meeting.

9.3 2011 Blue Marlin Stock Assessment Session and White Marlin Data Preparatory Meeting

The meeting for the blue marlin stock assessment and white marlin data preparatory was held in Madrid in April 25 to 29, 2011. The meeting had the dual purpose of producing an assessment of blue marlin to estimate reference points and update management recommendations, and preparing the general basic fishery data, such as estimates of total harvest and relative abundance estimates, and the specific data to support the models to be used in the next white marlin assessment in 2012. The blue marlin assessment meeting achieved its main goals by producing new benchmarks for the stock and suggesting new management recommendations to rebuild the stock. During the white marlin data preparatory meeting, in addition to obtaining estimates of total removals and partial information on abundance indices, it was recognized that the next white marlin assessment be considered as a mixed species stock assessment because of the mixture with other similar species.

The detail report of the meeting is presented as document SCRS/2011/013.

Discussion

The Committee acknowledges the analyses and presentation regarding the blue marlin assessment. It was noted that the implementation of complex models such as statistically integrated models (SS3) are sensitive to the assumptions of the parameters estimated. Considering the condition of blue marlin being a by-catch species in some important fisheries, the inherent uncertainty with regard to data and the productivity of the stock was recognized.

9.4 Inter-Sessional Meeting of the Sub-Committee on Ecosystems

The inter-sessional meeting of the Sub-Committee on Ecosystems was held in Miami, Florida, USA from May 9 to 13, 2011. During this meeting, the Sub-Committee discussed the following:

1. Spatial production models for multi-species and multi-area stock assessments.
2. The integration of environmental variables in the standardization of CPUE (e.g. effect of expansion in oxygen minimum zones).
3. Ecosystem based indicators.
4. By-catch estimation procedures and measures of precision.
5. Seabird and sea turtle by-catch mitigation measures.
6. Safe release and handling protocols for sea turtles.

The Group also considered a summary of the International Circle Hook Symposium, made recommendations to ICCAT regarding the job description of the proposed by-catch coordinator, and recommended a reorganization of the Sub-Committee, specifically the addition of an Ecosystems Rapporteur.

The Detail Report of the meeting is presented as document SCRS/2011/014.

9.5 Tropical Tuna Species Group Intersessional Meeting on the Ghanaian Statistics Analysis (Phase II)

An inter-sessional meeting of the Tropical Tuna Species Group on the Ghanaian Statistics Analysis (Phase II) met in Madrid, on May 30 to June 3, 2011. The objective of the meeting had been defined in the 2011 Work Plan for Tropical Species approved by the SCRS (ICCAT, 2011). This included the revision of the data for the eastern tropical purse seine fisheries, in particular the Ghanaian statistics, as well as the accounting of *faux poissons*.

This year thorough review of data has been conducted in order to better understand aspects of the data collection, processing and reporting systems.

The work during the meeting focused on obtaining the best scientific estimates of catch, effort and size data for the three main species of tropical tunas. These estimates are important in order to allow the SCRS to better estimate the stock status and to provide more accurate responses to the Commission.

The Report of the meeting is presented as document SCRS/2011/016.

9.6 Sharks Data Preparatory Meeting to apply Ecological Risk Assessment

The Shark Species Group met on Madrid in June 20 to 24, 2011, to increase the current database in order to update in 2012 the Ecological Risk Assessment (ERA) carried out in 2008 (Cortés *et al.* 2010). On this occasion, the Group increased the number of species to 18 to apply the ERA.

The Report of the meeting is presented as document SCRS/2011/017.

Discussion

Discussion focused on the use of the ERA as a first approach to the stock assessment of the resources and the importance of this approach against the traditional stock assessment methods.

The Committee considered that this type of analysis does not replace the traditional stock assessment methods, but that they were alternative and/or supplemental methods which were applied when the available data did not allow the use of conventional models. Likewise, it was considered that the report of the meeting (SCRS/2011/017) included detailed information on the scope of the ERA.

The Committee recognized that currently this approach was only applied to industrial longline and that it would be positive if, in the future, it could include more information on other fleets, in particular, the artisanal fleets. The Committee valued the information which these methods contributed in providing scientific advice to the Commission when the available data were insufficient.

9.7 Joint Meeting of the ICCAT Working Group on Stock Assessment Methods and the Bluefin Tuna Species Group to analyze assessment methods developed under the GBYP and electronic tagging

The meeting was held in Madrid, Spain, June 27-July 1, 2011 with the objective of reviewing of current development of stock assessment methods (GBYP), conducting Meta-analysis for investigation of key parameters such as steepness, virgin biomass or K, r and M and investigating limit, threshold and target reference points as part of HCRs to manage risk of exceeding key reference points.

The Detail Report of the meeting is presented as document SCRS/2011/018.

9.8 South Atlantic Albacore and Mediterranean Albacore Assessment Sessions

The meeting was held in Madrid, Spain, July 25-29, 2011. The Mediterranean stock was evaluated for the first time. An update of the 2007 assessment was carried out for the Southern stock. The Albacore executive report summarizes the main results for both stocks.

The Detailed Report of the meeting is presented as document SCRS/2011/019.

9.9 Yellowfin Stock Assessment Session

The SCRS conducted a comprehensive assessment of Atlantic yellowfin tuna on September 5-12, 2011, using the available data (catch, effort and size statistics).

The Detailed Report of the meeting is presented as document SCRS/2011/020.

10. Report of Special Research Programs

10.1 Atlantic-wide Bluefin Tuna Research Programme (GBYP)

Dr. Antonio Di Natale, Program Coordinator, presented the report on the Atlantic-wide Bluefin Tuna Research Programme (GBYP) activities carried out in 2011.

The Report was adopted and is attached as **Appendix 5**.

10.2 Enhanced Research Program for Billfish

The report of the Program for Enhanced Research on Billfish, together with the proposed budget for 2012, was presented by the Program Coordinator, Dr. David Die.

The report was adopted and is attached as **Appendix 6**.

11. Report of the Sub-Committee on Statistics

Dr. Gerald Scott presented the Report of the Sub-Committee on Statistics (**Appendix 7**) which held its session in Madrid, September 26 and 27, 2011. With regards to the official statistics submitted by CPC (Task I and II) the following was noted: (a) The importance and potential use of the Fleet Characteristic data, but given the variability of the information provided it was recommended to crosscheck it with other vessel lists submitted to the Secretariat for validation; (b) The decreasing trend of conventional and electronic tag reports, thus it was recommended that the Secretariat update the list of CPC Tagging Correspondents and remind them to submit this information to the Secretariat; (c) Under the recently adopted Data Confidentiality policy by the Commission, the SCRS may further utilize more detailed information for scientific purposes, such the VMS data. With respect to VMS data it recommends to increase the resolution of the information received by the VMS signal, and to extend the VMS requirements to all main tuna operations.

The Sub-Committee also noted the importance of the documentation of the ICCAT database, and reiterated it as a priority task for the Secretariat. As regards to data quality and the impact on stock evaluations, the Sub-Committee recommended to update the evaluation of data availability and focus more on methods or protocols to

perform data quality evaluations rather than compliance submission controls. To this respect it was also proposed as future work for this Sub-Committee to seek expertise to explore evaluation of auxiliary data compiled by the Secretariat such as the market related reports.

In response to the Commission Rec. 10-10, this Sub-Committee reviewed and summarized the responses provided by CPCs regarding the CPC Observer programs in tuna fisheries. The low response by CPCs, and the different level of information provided was noted. It was recommended to send a simple form by the Secretariat to CPCs and update the information received in preparation for the response to be provided to the Commission in 2012.

Clarification of the quality and usefulness of the cannery data provided by ISSF to the Secretariat was requested regarding comments raised in earlier discussions. The Sub-Committee Chair reported that this data was fully utilized in the revision of the Ghanaian and other tuna fisheries statistics. Scientists that participated in this evaluation commented on the importance and high value of the information provided by ISSF cooperating canneries in support of the work of the Committee. It was noted that use of these data are in fact critical in identifying possible problems in species classification and enabled the Group to develop hypotheses that can be tested through controlled experiments to explain differences and thus advise on methods to overcome possible inconsistencies. The Committee agreed that the value of data provided by ISSF cooperating canneries was high and encouraged the continued reporting of these data to ICCAT.

Finally, the record high participation of scientists at SCRS Species Working Group meetings was noted to have led to a very crowded meeting room. The Secretariat noted that larger facilities (larger meeting rooms) or improvement(s) at the Secretariat location is limited by the regulations of the hosting administration.

12. Report of the Sub-Committee on Ecosystems

Dr. Shannon Cass-Calay, the Convener of the Sub-Committee on Ecosystems, presented the report of the inter-sessional meeting held in Miami (USA), May 9 to 13, 2011, and the recommendations and conclusions of the Joint Technical By-catch Working Group (JTBWG), which met at the Kobe III tuna RFMOs meeting. The JTBWG agreed to meet electronically every three months and to meet in person whenever possible in conjunction with Kobe meetings or, in the absence of a Kobe meeting, every three years. Over the next several years the Working Group proposes the following work plan:

- Harmonization of data collection
- Development of harmonized identification guides and release protocols
- Identify and recommend research priorities
- Prioritization of collaborative work
- Progress BMIS information sharing website
- Funding sources
- Compliance with data reporting requirements

The Committee approved the recommendations adopted by the Sub-Committee on Ecosystems which are included in the general recommendations of the SCRS.

13. A Consideration of Implications of the Working Group on the Organization of the SCRS that met in Madrid in February

Dr. Josu Santiago, the Chair of the SCRS, presented the conclusions and recommendations from the meeting. The critical need for capacity building and support for attendance at SCRS meetings was emphasized, particularly given the need to provide advice on the Commission's increasingly important areas of concern, such as the Ecosystem Approach to Fisheries Management.

The need was noted to provide advice that more fully considers uncertainty (such as the Kobe II Strategy Matrix) requiring the application of more complex methods such as fully integrated statistical modelling frameworks and Management Strategy Evaluation. The problem is, therefore, to ensure that there is sufficient capacity within the SCRS to apply such approaches. It was thought that there were two main ways to do this, e.g., recruit skilled staff at the Secretariat or to contract experts as required.

The benefits of both responses were discussed. Recruitment of staff at the Secretariat would ensure continuity across and between working groups but would require an agreement from the Commission. However, it was thought that for reasons of transparency, full participation by CPCs in working groups, would still be essential.

14. Consideration of Implications of the Future of ICCAT meeting in Madrid in May

Dr. Josu Santiago, the Chair of the SCRS, presented the conclusions and recommendations made to the Commission from the Meeting of the Working Group on the Future of ICCAT.

Important areas discussed were the needs to provide advice on the Precautionary Approach and an Ecosystem Approach on Fisheries Management. It was recognized that to provide advice on both areas requires greater consideration on issues such as the management of by-catch species and advice that more fully considers uncertainty.

15. Consideration of Implications of the Third Meeting of Tuna RFMOs held in July in La Jolla, USA

Dr. Josu Santiago, the Chair of the SCRS, presented the conclusions and recommendations of the meeting relating to the SCRS.

The importance to develop common data confidentiality rules and a draft protocol for data sharing was recognized. Therefore, the development of a protocol to specify the types of data to be shared, how these data can be used, and who can have access to these data, was recommended.

The importance of the Kobe II Strategy Matrix (K2SM) to communicate between stakeholders and to assist in the decision-making process was recognized as was the fact that substantial uncertainties still remain in the assessments. Therefore, it was recommended that the Scientific Committees and Bodies of the tRFMOs develop research activities to better quantify the uncertainty and understand how this uncertainty is reflected in the risk assessment inherent in the K2SM.

As it was also recognized that a Management Strategy Evaluation (MSE) process needs to be widely implemented in the tRFMOs in line with implementing a precautionary approach for tuna fisheries management, it is recommended that a Joint MSE Technical Working Group be created and that this Joint Working Group work electronically, in the first instance, in order to minimize the cost of its work. It was agreed that ICCAT take a leading role in this work.

16. Consideration of plans for future activities

16.1 Annual Work Plans

The rapporteurs summarized the 2012 Work Plans for the various Species Groups. These Plans were adopted and are attached as **Appendix 4.**

Regarding the tropical tunas proposal of implementing a large-scale tagging program in 2012 and beyond, the Committee considered the possibility of getting funds from the Directorate General for Development and Cooperation of the European Commission. In order to activate the procedure it was decided to create a task force among the tropical group members. With respect to the small tunas proposal, it was requested that the Secretariat explore alternative sources of funding for data collection and research of important local small tunas fisheries, particularly in developing countries. Côte d'Ivoire and Senegal expressed their support and willingness to participate in this research initiative. There was a general recommendation to support scientific quota allocations to support financially different research programs, with priority for the bluefin year program (GBYP). Norway expressed their favorable experience in this area and offered to share their expertise. The United States, Canada and the EU endorsed this recommendation.

16.2 Inter-sessional meetings proposed for 2012

Taking into account the assessments mandated by the Commission and the Committee's recommendations for research coordination, the proposed inter-sessional meetings for 2012 are shown as in **Table 16.2**. The

Committee noted that the schedule needs to maintain some flexibility in order to account for any changes that may result from the deliberations held by the Commission in November 2012 and the meetings scheduled by other RFMOs.

Depending on the decision of the Commission, the inter-sessional meetings next year will include the Methods Working Group and the Tropical Tunas Species Group in April 2012, the white marlin assessment in May, the Sharks Species Group meeting in June, the Working Group on Ecosystems in July, and the bluefin tuna stock assessment in early September. Portugal expressed its wish of holding the Shark Species Group meeting. The meeting will be held in the Algarve region.

Table 16.2 Proposed calendar of ICCAT scientific meetings in 2012.

ICCAT MEETINGS 2012

	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sat
Jan		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31										
Feb					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29						
Mar						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Apr		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30						
																	METHODS							TROPICALS														
May				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31			
																															WHM ASSESS						
Jun							1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	30
																	SHARKS RISK ASSESS*																					
Jul		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31						
			SC-ECO																																		
Aug					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
Sep								1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
											BFT ASSESS																			Species Groups							
Oct			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31				
			SCRS																																		
Nov						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
Dec	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31						

* The tentative five days meeting could be extended two more days, before or after the current dates.

16.3 Date and place of the next meeting of the SCRS

The next meeting of the SCRS will be held in Madrid from the October 1 to 5, 2012; the Species Groups will meet from the September 24 to 29, 2012.

17. General recommendations to the Commission

The SCRS noted that attendance at inter-sessional meetings is becoming an increasing concern. During the last Atlantic swordfish and South Atlantic and Mediterranean albacore assessments the lack of scientists familiar with the analyses being present at the meeting and/or conducted in the previous assessment made it difficult to conduct and/or evaluate some of the analyses. This important issue was analyzed in detail by the Working Group on the Future Organization of the SCRS. Based on the result of these analyses, the Committee recommends that actions beyond encouraging participation in scientific meetings of CPC scientists and providing short-term training workshops should be further encouraged and supported with capacity building funds to involve developing economy scientists in the work of the SCRS. Actions such as supporting visiting scientist opportunities at national laboratories or the Secretariat could accelerate more participation and involvement in the work of SCRS. Broad participation in the SCRS by CPC national scientists is an important element in promoting scientific transparency in the methods, data, and assumptions used in development of scientific advice to the Commission. While capacity building funds have been used to encourage a broader attendance of scientists from developing economies, there is evidence that scientific contributions from all but a few developing economies are not improving to a measurable degree and additional actions are needed for improvement.

The Committee endorsed the recommendations of the working group on SCRS Organization. The Committee noted in particular, the following:

Increase analytical and data base management support at the Secretariat

The recommendations for increased data base, analytical, and by-catch coordination support were endorsed by the Sub-Committee on Statistics and were recommended to Plenary. These positions should be included in the 2012 Budget of the Secretariat, but because the proposed budget was already circulated in July and only included the by-catch coordinator position, it presents a difficulty. The timing between preparation of the Budget and the identified needs of the SCRS needs to be better coordinated. The Committee recommended the SCRS Chair and Executive Secretary consult on procedures to avoid such difficulties.

Quality assurance and transparency

The Committee endorsed the recommendations to use the data fund to contract help to develop stock assessment documentation during meetings and to invite experts from other tRFMOs to participate in our stock assessments.

17.1 General recommendations to the Commission that have financial implications

The acquisition of new biological information is necessary to reduce uncertainties in key biological parameters and processes that affect the outputs of the stock assessment models, such as growth, reproduction, stock delimitation and stock mixing. Fisheries-independent information, such as tagging operations or aerial/acoustic surveys, has been also shown, for many pelagic exploited fish species of various oceans, to be crucial to get better estimates of natural and fishing mortality and to track trends in population size; and thereby to provide more robust and more precise scientific advice to the commission. Finally, more sophisticated (but also more demanding) modeling approaches are increasingly used in RFMOs while the Kobe process further encourages original approaches, such as the Management Strategy Evaluation to better take into account for uncertainties in the scientific advice. The establishment of scientific quota in several fisheries worldwide, such as the small pelagic fisheries of the North Atlantic, contributed to generate higher revenue for the fisheries.

All these needs are fully justified from a scientific and management viewpoint. Because such needs apply for all the tuna and tuna-like species, the SCRS recently requested funding of large-scale research program for several species, such as bluefin tuna, albacore tuna, billfish and the three major tropical tuna species. However, research programmes have also a high cost and can hardly be supported by CPCs if they are planned at the same time. Furthermore, the development of fisheries-independent surveys and original modeling approaches imply continuous effort over several years to be fruitful, so that it is crucial to secure funding over the whole duration of the research program. Finally, it worth noting that large research programme will be attractive to academic scientists and could thus contribute to the strengthening and the renewal of the SCRS.

For all these reasons the SCRS recommends that the Commission consider the possibility of establishing a "scientific TAC" for each tuna and tuna-like species for which a TAC is already implemented and for which a large-scale research programme is needed. Such a scientific quota would be part of the TAC but would not exceed a small percentage of this TAC. It could further be managed by the ICCAT secretariat which could, according some terms of reference, sell it on the market at the best offering fisheries entity during an annual official auction or subcontract a fishing vessel to sell the catch on the market. The modalities of such scientific quota need, however, to be deeper investigated and could be studied by the SCRS in 2012, according to existing scientific TAC in other fisheries worldwide.

Albacore

The Committee reinforces the recommendation of initiating and focusing on an albacore research program for North Atlantic albacore, given the large uncertainties identified by the Committee and in the light of the observed changes in availability of the stock in the northeast Atlantic during the last few years. The research plan will be focused on three main research areas: biology and ecology, fisheries data, and management advice during a four-year period. Detailed research aims are presented in Ortíz de Zárate (2011). The requested funds to develop this research plan have been estimated at a cost of 4.3 million Euros. Details of the economic plan are provided in the Albacore Work Plan **(Appendix 4).**

Billfishes

Noting the misidentification problems between white marlin, roundscale and longbill spearfishes, the SCRS recommended conducting an Atlantic-wide survey of WHM-RSF-SPF distribution and abundance with the collaboration of CPCs with fleets covering the entire Atlantic, particularly in the eastern and southwestern Atlantic fishing areas.

The Committee strongly recommended that the Commission provide additional funding (15K Euros) to the Enhanced Billfish Research Program for a genetic study in order to accelerate the data acquisition and analysis for separating white marlin from spearfishes to be undertaken in the immediate future.

Bluefin tuna

The SCRS strongly supports the Atlantic-wide Research Programme for Bluefin Tuna (GBYP) and the continued acquisition of new biological information and fisheries-independent information as well as to investigate new and original modeling approaches. Without continued effort in these areas, it is very unlikely that the SCRS will be able to reduce the uncertainty in its scientific advice.

The SCRS recommends that the Commission and all CPCs concerned reaffirm their commitments to GBYP by:

- Developing a funding schedule by which CPCs may calculate their voluntary contributions;
- Ensuring assistance for the necessary permits concerning the GBYP activities in their territorial waters or airspace;
- Providing the necessary contacts at the national level for ensuring the regular development of the GBYP;
- Providing official derogations to allow the sampling of fish below the minimum size limit, the use of any type of fishing gear and the possibility of fishing even during the closed fishing season.
- Implementing a "research mortality allowance" up to 20 t for incidental mortality of bluefin tuna during GBYP conventional tagging and biological sampling programmes. Those dead fish could not be sold.

The development of fisheries-independent surveys and original modeling approaches imply continuous effort over several years to a decade to be fruitful and allow us to detect trend in population size. Therefore, it is crucial to secure funding over several consecutive years to avoid any potential waste of money and effort due to a premature stop in the funding of the scientific operations.

To do so, the SCRS strongly encourages the Commission to consider a research TAC set aside to help fund the GBYP for the coming year. A research allocation up to of 50 t could be quite beneficial in supporting the GBYP research enterprise while reducing the necessity for voluntary contributions for the program. For 2013 and thereafter, such a scientific TAC could fully fund the GBYP (so that no voluntary contributions will be needed) if the allocation may reach up to 320 t / year (about 2.5% of the current TAC). This scientific quota could be managed by ICCAT Secretariat which could, for instance, sell it on the market at the best offering fisheries

entity during an annual official auction or subcontract a fishing vessel to sell the catch on the market. The modalities of such scientific quota need, however, to be deeper investigated and could be studied by the GBYP steering committee or the SCRS, according to existing scientific TAC in other fisheries worldwide.

Tropical tunas

1. The Committee encourages the continuation of the cooperation with Ghanaian scientists. A proposal for collaboration between Ghanaian and IRD scientists is presented as an Addendum to the Tropical Tuna Species Group Work Plan for 2012 **(Appendix 4)**.

2. The Committee reiterates the importance of the implementation of a large-scale tagging program for tropical tuna species in 2012 and beyond (see Addendum 2 to Appendix 5 of the 2010 SCRS Report) (ICCAT, 2011).

Sharks

The Committee recommended incorporating the description of the six shark species that have been included in recent Recommendations (ALV, BTH, OCS, SPL, SPZ, SPM) in Chapter 2 of the *ICCAT Manual* in the by-catch species section **(Appendix 4)**.

Sub-Committee on Ecosystems

The Committee noted that the By-catch Coordinator position remains unfilled and strongly recommends that this position be recruited promptly.

Small tunas

The Committee recommends the establishment of an ICCAT Year Research Programme for small tuna species as detailed in the Addendum to the Small Tunas 2012 Work Plan (Appendix 4).

17.2 Other recommendations

Albacore

The SCRS recommended continuing the work towards integrating the various studies relating life history parameters and ecology for Mediterranean albacore.

Billfishes

The SCRS recommended that the study on age and growth of blue marlin continue, stressing the need to include in the study anal spine sections from large specimens in subtropical and temperate areas.

The SCRS recognized the complexity of white marlin reported catches where historical catches may comprise a mixture of species, like roundscale spearfish (RSP) and longbill spearfish (SPF) in addition to white marlin. Therefore, the Committee recommended that the white marlin stock assessment to be conducted in 2012 be considered as mixed species stock assessment.

In noting that estimation of relative abundance indices is always best done at the highest spatiotemporal resolution warranted by the available data, the SCRS recommended that all CPCs, and especially those that have important catches of white marlin, provide updated relative abundance indices obtained from such high resolution CPUE data and also to take into consideration the effect of current regulations in the standardization process. For instance, when only information on retained fish is available, the effect of implementing regulations requiring the release of live fish from longlines should be accounted for, such as by developing separate indices before-after implementation.

The SCRS recommended that the surplus production models conducted in the 2000 white marlin stock assessment be updated in the 2012 stock assessment meeting.

Bluefin tuna

The Committee reiterated that it is essential to obtain representative samples of otoliths and other tissues from all major fisheries in all areas. Such collections will provide direct estimates of the age composition of the catch

(avoiding the biases associated with determining age from size), direct estimates of the stock of origin (a key factor to improve our ability to conduct mixing analyses) and will help in verifying current assumptions concerning age-at-maturity and fecundity-at-age. This activity should be coordinated with the GBYP.

The SCRS recommends that the Secretariat conduct cross-validation of the ICCAT bluefin tuna size database.

Pilot studies using dual camera systems to retrieve the size of fish at the location of the catch (or close to) were presented at the SCRS in 2011. The results being encouraging, the SCRS strongly recommends that the CPCs carry on these studies, so that stereoscopic camera systems become operational as soon as possible.

In order to improve the utility of BCD for scientific use, the Commission should implement electronic reporting forms and formats for transmission of the data to the Secretariat in order to improve the availability of complete data to the SCRS for cross-validation.

Tropical tunas

Several recommendations concerning improvement of research and the statistics of tropical tunas can be found in the Detailed Report of the 2011 Tropical Tuna Species Group Inter-sessional Meeting on the Ghanaian Statistics Analysis (Phase II) (SCRS/2011/016) and in the Detailed Report of the 2011 ICCAT Yellowfin Tuna Stock Assessment Session (SCRS/2011/020).

Sharks

The SCRS is pleased with the conservation and management measures adopted by the Commission in the last two years regarding the species classified as the most vulnerable in the last ecological risk assessment and for which no data were presented (bigeye thresher, oceanic whitetip and hammerhead). At the same time, the SCRS expressed its concern that no conservation and management measures have been adopted up to now on silky shark (*Carcharhinus falciformis*), classified in the ERA among the most vulnerable species. Consequently, the SCRS recommended that adequate conservation and management measures, similar to those adopted for the aforementioned species also be adopted for silky shark.

The Committee recommended that observers be allowed to collect biological samples (vertebrae, tissues, reproductive tracts, stomachs) from those species whose retention is prohibited by current regulations. The Committee recommended that CPCs explore methods to estimate the catches of sharks in the purse seine and artisanal fisheries.

Sub-Committee on Ecosystems

1. The Committee recommends that the Secretariat attempt to collate user manuals or protocols describing data collection from CPC observer programs. Also, an attempt should be made to identify historical changes to the data collection protocols that might complicate data analyses and interpretation.

2. The Committee recommends that guidelines for the presentation and analysis of by-catch statistics be developed in conjunction with the Working Group of Stock Assessment Methods (WGSAM) and that these guidelines be made available as part of the *ICCAT Manual*. Furthermore, the Sub-Committee on Eco-Systems should work with WGSAM to evaluate how these data can be used as part of a risk management advice framework.

Assessments and methods

1. Meta-analysis and methods for informing key parameters: It was recommended to pursue Robin Hood approaches in order to evaluate their use for providing management advice and continue pursuing meta-analyses but identifying biases due to model assumptions. The Robin Hood approach is where stock assessments are conducted for multiple stocks at the same time. This allows information from data-rich stock assessments, e.g. trends in fishing mortality, values for parameters of selectivity functions and biological parameters to be provided to data-poor assessments. This leads to stock assessments for the most data-poor stocks being informed by those for the most data-rich stocks, i.e. taking from the rich and giving to the poor (Punt *et al.*, 2011).

2. Harvest Control Rules: Simulated HCRs should be based on the advice provided by the 2010 Working Group Stock on Assessment Methods and Appendix 6 of the 2011 Future of ICCAT meeting report unless shown otherwise. Alternative harvest control rules, including empirical rules (Anon. 2011g) should be developed and evaluated, although it thought that these will supplement rather than replace more comprehensive analytical harvest control rules. Management Strategy Evaluation should be a participative approach involving all stakeholders, from scientists to managers, the industry and the fishing communities. It should be developed for ICCAT tuna fisheries and it is recommended that MSE be actively pursued to develop robust management practices which can achieve the Convention objectives within time frames and tolerable risks that the Commission decides appropriate. As part of this process, it is necessary to work toward a full characterization of scientific uncertainty in stock status to improve estimates of risk.

Sub-Committee on Statistics

The Committee recommended that VMS signals should be reported at no more than two hour interval. Furthermore, the Committee recommended requesting VMS data from other ICCAT fisheries and from VMS associated to FADs.

During the Yellowfin Stock Assessment Session, Japan submitted revised CAS of YFT-LL for the period 1995-2010. Documentation supporting the review of the data was also provided during the yellowfin assessment in an SCRS document. The Committee inquired if the newly applied methodology could be extended to other species caught by the Japanese LL fleet and recommended that Japanese scientists consider if the methodology used for yellowfin tuna is also appropriate for other species.

The Committee agreed with the recommendation from the Billfish Species Group to develop ID cards for Istiophorids.

The Committee supported the Secretariat's proposal to contract out the development of the LL gear chapter of the *ICCAT Manual*. The Committee agreed with the recommendations to update the description of white marlin and spearfishes (RSP, *Tetrapturus georgei*, SPF, *Tetrapturus pfluegeri*) and to expand the description of several shark species to the corresponding chapter.

The Committee endorsed the recommendations of the Ghanaian statistics Working Group.

The Committee discussed and endorsed the recommendation to use market-based information to validate logbook catch reports and recommended expanding such approaches to other species, when such information is available.

The Committee reiterated that there is a need to quantify the quality of the information reported and the quality/representativeness of size samples from different fisheries is a question that fits within this issue. A 10% sampling fraction could be adopted as a general rule that could be revised on a fisheries basis. It was also indicated that for the future analysis to better characterize the level of sampling that will provide information to improve management recommendations should be conducted.

The Sub-Committee on Statistics discussed the need of forms to submit seabird, sea turtle, other by-catch, and observer data. It is expected that this task will be taken by the by-catch coordinator. The Secretariat indicated that it only received observer data from one CPC. The Committee recommended that CPCs report observer data to help the Secretariat to develop electronic forms for the submission of this type of data. The Committee approved the Secretariat's recommendation of adding spearfish to the list of main ICCAT species.

18. Responses to Commission's requests

18.1 Develop a Limit Reference Point (LRP) for the North Atlantic swordfish stock Rec. [10-02]

Rec. [10-02] paragraph 6 requests the SCRS to develop a Limit Reference Point (LRP) for the North Atlantic swordfish stock in advance of the next assessment of North Atlantic swordfish. On the basis of the LRP established by the Committee, future decisions on management shall include a measure that would trigger a rebuilding plan, should the biomass decrease to a level approaching the defined LRP.

An updated framework model for evaluation of biomass based limit reference points for the north Atlantic swordfish stock was reviewed by the Committee (Pons and Domingo, 2011). The objective was to determine the variability on biomass due to the particular biological characteristics of the stock.

In the case of North Atlantic, only the variability associated with the stock-recruitment (SRR) assumption as was considered as the source of "normal" variations of the total biomass. Preliminary results indicated that, at this level of variation under equilibrium age structure conditions 80% of the northern swordfish biomass is expected to be between -0.20 and +0.25 fraction of the reference biomass. Using as an example, a biomass limit point (B_{lim}) defined as $B_{lim} = B_{MSY}*(1-M)$, there is a low probability of $B < B_{lim}$ (< 5%), if the stock is fished at the F_{ref} reference harvest rate. This probability would represent the changes of false negatives (trigger a response, when actually the B is just responding to natural variations). The results also indicated that the response of the recovery once an overexploitation is realized can take several years, even at relatively moderate overfishing levels when its duration continues over several years.

It is recommended to conduct further evaluations of biomass based reference limit points, to include alternative stock-recruitment hypothesis, and different selectivity patterns. Consideration of alternative biomass limits, based on percentiles of other targets levels (B_{MSY} %) is also advised.

Once candidate limit reference points are identified, SCRS/2011/195 describes a simulation framework that will allow the evaluation of their performance (*i.e.*, how well management objectives are met), and their robustness to uncertainty.

The SCRS plans to continue with this work towards identifying and testing of a limit reference point prior to the next assessment (proposed for 2013), and this task is identified in the Species Group Work Plan. Finally, the SCRS noted that development of a limit reference point which increased the probability of remaining within the rebuilt condition for North Atlantic swordfish would be fully consistent with the principles of decision-making considered by the 2011 Working Group of the Future of ICCAT (**Figure 18.1**).

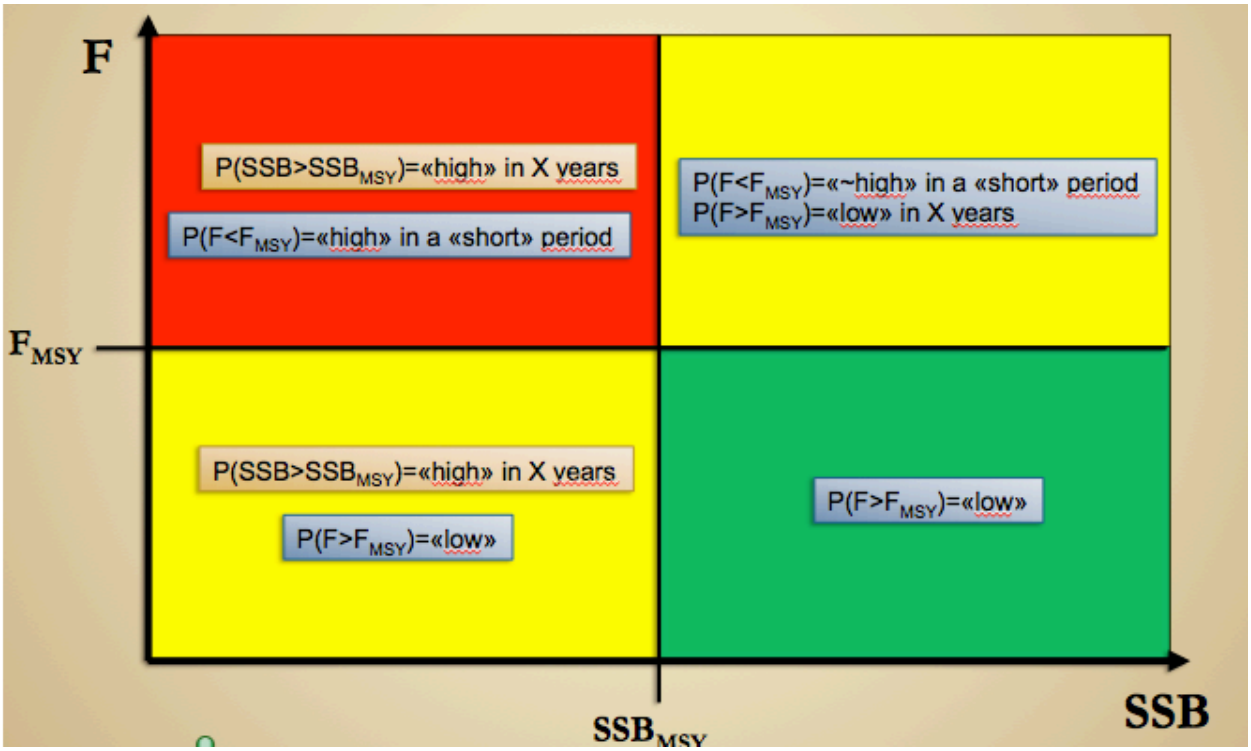


Figure 18.1. Principles of decision-making for ICCAT conservation and management measures (Working Group on the Future of ICCAT Meeting, 2011).

18.2 Review of North Atlantic swordfish data requested under [Rec. 10-02]

[Rec. 10-02] paragraph 12 calls for the SCRS to provide an evaluation of the best available data submitted by all CPCs. Those data should include catch, catch at size, location and month of capture on the smallest scale

possible, as determined by the SCRS. The data submitted shall be for broadest range of age classes possible, consistent with minimum size restrictions, and by sex when possible. The data shall also include discards and effort statistics, even when no analytical stock assessment is scheduled.

While no specific responses to this request were submitted by CPCs, the SCRS tabulated the information currently available to the SCRS for stock assessment purposes (see **Table 2,** Report of the Sub-Committee on Statistics). The information is ranked for the main CPC/gear combinations by percent catch (averaged over 1990-2009), and to make the information manageable, only the combinations comprising the top 95% of landings is shown. The summary indicates an improving trend in the availability of catch and effort information, but provides no indication of the quality or completeness of the available data (see also the Report of the Sub-Committee on Statistics). Over the recent past (2000-2010), CPCs providing information on dead discards include USA, Canada and Japan for the North Atlantic stock.

18.3 Exploration of operationally viable technologies and methodologies for determining the size and biomass at the points of capture and caging [Rec. 10-04]

The 2010 *Recommendation amending previous Recommendations by ICCAT to Establish a Multi-annual Recovery Plan for Bluefin Tuna in the eastern Atlantic and Mediterranean* [Rec. 10-04] requests the CPCs to initiate pilot studies on how to better estimate both the number and weight of bluefin tuna at the point of capture and caging including through the use of stereoscopic systems and report the results to the SCRS.

During the BFT Species Group held in September 2010, four SCRS documents regarding the use of stereoscopic camera systems were presented to the SCRS (SCRS/2011/173, SCRS/2011/189, SCRS/2011/190 and SCRS/2011/191). These documents describe some work in progress on board of Mediterranean cages in 2011. The estimates of fork length remain incomplete because of a few technical issues that remain to be solved. However, the first results are encouraging and confirm the potential of stereoscopic camera to recover the length composition of the fish that are transferred alive into cages. The SCRS strongly encourages the CPCs to carry on and complete these studies in 2012, so that stereoscopic camera systems become operational as soon as possible.

While the cages do not correspond to the exact points of captures, the information from cages may be, however, adequate to reconstruct the size composition of the catch if the measurements are performed at the arrival of the towing vessel. Trials with stereoscopic camera on board of fishing vessel have been also investigated in 2011, but the results of these operations were not provided to the SCRS.

18.4 Reporting on the scientific aspects of the national observer programmes on the basis of the information provided by CPC [Rec. 10-04] [Rec. 10-10]

18.4.1 Reporting on the bluefin scientific data coverage level achieved by each Contracting Party observer program [Rec. 10-04]

Rec. 10-04 establishes obligations to CPCs to conduct national observer programs to ensure specific observation coverage on vessels active in the bluefin tuna fishery. This provision affects purse seines equal or less than 24 m in 2011 (20 m in 2012), pelagic trawlers (over 15 m), longliners (over 15 m) and baitboats (over 15 m), tuna traps and towing vessels.

The main work of the observers on board is related to compliance activities but, in addition, when required by the Commission and based on the instructions of the SCRS, the observers could carry out scientific work, such collecting Task II data.

The SCRS has been requested to report on the coverage level achieved by each CPC and to provide a summary of the data collected and any relevant findings associated with the data. The SCRS has been also requested to provide any recommendations to improve the effectiveness of CPC observer programmes.

The Secretariat informed that few CPCs had provided information on their national observer programs. The information received presented insufficient degree of detail, except for China and Japan. The SCRS was aware that more CPCs had observer programs in place but details hadn't been made available to the Secretariat. Therefore due to the limitation of the data provided, the SCRS didn't have enough elements to conduct a detailed analysis on the coverage level achieved or on any relevant findings associated with the national observers data.

The SCRS recommends that the CPCs transmit as soon as possible all scientific information of the 2011 national observer programmes to the national scientists. If provided in due time, the national scientists could analyze this information and transmit all relevant processed data to the ICCAT Secretariat, according to the deadline of the 2012 bluefin tuna Work Plan.

18.4.2 Reporting Information on national observer programs based on the information provided by CPCs [Rec.10-10]

In response to the Commission's request 18.4, the Secretariat has received the responses from 12 CPCs so far (as of September 15, 2011). To date, only a low proportion of responses that could have been submitted have yet been received by the Secretariat. The level of detail and information provided was quite variable among CPCs. The Committee reviewed the information provided and recommended the Secretariat elaborate a questionnaire form to distribute to all CPCs to facilitate gathering the information requested under Rec 10-10.

18.5 Completing the sharks identification guide [Rec. 10-06]

The second part of the identification sheets for Atlantic shark species was presented to the Committee. The new guide is pending final revision and will soon be available in the three official ICCAT languages.

18.6 Evaluating the information provided by CPCs on alternative scientific monitoring approach to observer program to apply in vessels less than 15 m. [Rec. 10-10]

As of the start of the meeting of the Committee only partial information from one Contracting Party had been received on alternative methods for the collection of detailed information on vessels less than 15 m, which did not allow the Committee to carry out an assessment and prepare a response to the Commission regarding this matter.

18.7 Continuation of the evaluation of data elements pursuant to [Rec. 05-09]

In response to the Commission Rec. [05-09], the SCRS through the Sub-Committee on Statistics and the Secretariat, prepare each year a summary of the impact on stock assessment and evaluations from the lack of, deficiencies and limitations of data available for the Working Groups. Since 2007, a questionnaire has been distributed to the Rapporteurs of each Species Group that had an assessment or data preparatory meeting during the year. The questionnaire attempts to collect the working group data availability and impact on their analysis, as well specific recommendations to improve their assessment work. During 2011, several ICCAT species were assessed: blue marlin, southern and Mediterranean albacore, and yellowfin tuna. Document SCRS/2011/207 includes the response to the questionnaires by the Chairs of the respective Working Groups in 2011.

18.8 Response to the Commission Regarding Rec. 10-09

During the 2011 Species Groups meetings the Sub-Committee on Ecosystems met and reviewed progress toward meeting the data submission requirements outlined in Rec.10-09.

In 2011, the Sub-Committee on Ecosystems reviewed five working papers and two presentations addressing turtle by-catch in the Convention area. As with seabirds, factors were identified contributing to the number of encounters along with effective mitigation measures. The Group also viewed documentation geared towards educating fishers on proper gear removal and handling techniques. A description of a capacity building program, the Trans Atlantic Leatherback Conservation Initiative Program, was provided.

To expedite the evaluation of the impact of ICCAT fisheries on sea turtle populations [Rec. 10-09], the ICCAT Secretariat, the SCRS Chair and the Convener of the Sub-Committee on Ecosystems developed a call for tenders to hire a Sea Turtle Expert. The contract has been awarded and work is scheduled to begin in the first quarter of 2012. The contract is for a 6 months term and one of the final deliverables will be the database containing the information needed to conduct the impact assessment. The Sea Turtle Expert, through the Secretariat, will also coordinate efforts to identify and contact national scientists with expertise in sea turtles, by-catch estimation procedures or analytical techniques used to conduct impact assessments on by-catch species. The Sub-Committee on Ecosystems will coordinate with the Sea Turtle Expert to facilitate this process.

The Sub-Committee on Ecosystems also established a work plan for activities in 2012 relating to Rec. 10-09. During 2012, the Sea Turtle Expert, in cooperation with the Sub-Committee on Ecosystems and the Secretariat, will identify and compile the following:

1. Sea turtle by-catch data sources
2. Gaps in knowledge
3. Methodologies used to extrapolate total by-catch using data from the reporting fleets
4. Methods to estimate post-release mortality.
5. Impact assessment methodologies that may appropriate to implement given the available data.

The Sub-Committee will meet in 2012 to review this information and make recommendations with regard to the utility of the methodologies described in items 3-5. National scientists identified by the CPCs and selected by the Sea Turtle Expert as possessing expertise in these methodologies will be encouraged to attend.

19. Other matters

The issue of having two rapporteurs for the Sub-Committee on Ecosystems was discussed and it was agreed to have a rapporteur devoted on ecosystem issues and a second rapporteur focused on by-catch would help in addressing the increasing workload of this Sub-Committee.

At the Kobe III meeting it was agreed to create a joint Management Strategy Evaluation (MSE) working group and it was agreed that ICCAT would take the lead on this increasingly important approach for providing management advice. This would be handled within the Working Group on Stock Assessment Methods.

Although southern bluefin tuna is managed by CCSBT, it is found within the ICCAT Convention area. In the past, the SCRS was informed of the results of the assessment conducted by the CCSBT. However, in the most recent years, the SCRS decided it would no longer deal with issues related to southern bluefin leaving this to CCSBT, although it was felt that understanding the dynamics of southern bluefin was therefore important for the SCRS.

20. Adoption of the report and closure

The United States thanked the Chair of the SCRS for his guidance throughout the meeting and hoped he would be here to guide the SCRS through many more with the same skill.

The Chair responded by saying that chairing the SCRS was a great honour but also a great responsibility. He thanked the members of the Committee for their hard work not only during this week but also throughout the whole year. Dr. Santiago thanked everyone for their support and singled out Dr. Gerry Scott, the previous Chair of the SCRS. The SCRS Chair also expressed his appreciation for the support of the Secretariat as well as his thanks to the Interpreters who have a key task in allowing us all to understand each other. Finally, he emphasized that we now have the responsibility of giving our advice to the Commission.

The Executive Secretary then closed the meeting and thanked the chair for his guidance and leadership through this his first meeting. He then thanked all the members of the Committee and noted that there is always something new that crops up that stimulates the occasion. Mr. Meski thanked the Committee, the Secretariat and the Interpreters for their hard work this week on behalf of the Commission and wished everybody a safe journey home.

The Report of the 2011 SCRS meeting was adopted.

The 2011 Meeting of the SCRS was adjourned.

Appendix 1

AGENDA

1. Opening of the meeting
2. Adoption of Agenda and arrangements for the meeting
3. Introduction of Contracting Party delegations
4. Introduction and admission of observers
5. Admission of scientific documents
6. Report of Secretariat activities in research and statistics
7. Review of national fisheries and research programs
8. Executive Summaries on species:

   YFT-Yellowfin, BET-Bigeye, SKJ-Skipjack, ALB-Albacore, BFT-Bluefin, BIL-Billfishes, SAI-Sailfish, SWO-Atl. Swordfish, SWO-Med. Swordfish, SMT-Small Tunas, SHK-Sharks
9. Report of inter-sessional meetings
   - 9.1 Workshop on the use of R tools in the data preparatory work ICCAT-SCRS
   - 9.2 Working Group on the Organization of the SCRS
   - 9.3 2011 Blue marlin stock assessment session and white marlin data preparatory meeting
   - 9.4 Inter-Sessional Meeting of the Sub-Committee on Ecosystems
   - 9.5 Tropical tuna species group inter-sessional meeting on the Ghanaian statistics analysis (Phase II)
   - 9.6 Sharks data preparatory meeting to apply Ecological Risk Analysis
   - 9.7 Joint Meeting of the ICCAT Working Group on Stock Assessment Methods and the bluefin tuna species group to analyze assessment methods developed under the GBYP and electronic tagging
   - 9.8 South Atlantic albacore and Mediterranean albacore assessment sessions
   - 9.9 Yellowfin stock assessment session
10. Report of Special Research Programs
    - 10.1 Atlantic Wide Research Programme for Bluefin tuna (GBYP)
      - 10.1.1 GBYP working group on the aerial surveys analysis, conventional tagging and biological sampling
      - 10.1.2 Symposium on Trap Fishery for Bluefin Tuna
      - 10.1.3 Working Group to analyze assessment methods developed under the GBYP
    - 10.2 Enhanced Research Program for Billfish
11. Report of the Sub-Committee on Statistics
12. Report of the Sub-Committee on Ecosystems
13. A Consideration of Implications of the "Working Group on the Organization of the SCRS" met in Madrid in February.
14. A Consideration of Implications of the "Future of ICCAT" meeting in Madrid this May
15. A Consideration of Implications of the third meeting of Tuna RFMOs held in July in La Jolla, USA.
16. Consideration of plans for future activities
    - 16.1 Inter-sessional meetings proposed for 2012
    - 16.2 Date and place of the next meeting of the SCRS
17. General recommendations to the Commission
    - 17.1 General recommendations to the Commission that have financial implications
    - 17.2 Other recommendations

18. Responses to Commission's requests

    18.1 Develop a Limit Reference Point (LRP) for the North Atlantic swordfish stock Rec. [10-02]
    18.2 Review of North Atlantic swordfish data requested under [Rec. 10-02]
    18.3 Exploring operationally viable technologies and methodologies for determining the size and biomass at the points of capture and caging [Rec. 10-04]
    18.4 Reporting on the scientific aspects of the national observer programmes on the basis of the information provided by CPC [Rec. 10-04]
    18.5 Completing the sharks identification guide [Rec. 10-06]
    18.6 Evaluating the information provided by CPCs on alternative scientific monitoring approach to observer program to apply in vessels less than 15 m. [Rec. 10-10]
    18.7 Continuation of the evaluation of data elements pursuant to [Rec. 05-09]
    18.8 Response to the Commission Regarding Rec. 10-09

19. Other matters

20. Adoption of report and closure

Appendix 2

LIST OF PARTICIPANTS

CONTRACTING PARTIES

SCRS Chairman
Santiago Burrutxaga, Josu
SCRS Chairman - Head of Tuna Research Area, AZTI-Tecnalia, Txatxarramendi z/g, 48395 Sukarrieta (Bizkaia), Spain
Tel: +34 94 6574000 (Ext. 497); 664303631, Fax: +34 94 6572555, E-Mail: jsantiago@azti.es

BRAZIL
Frédou, Thierry
Professor Adjunto, Universidade Federal Rural de Pernambuco, Depto. de Oceanografía Centro de Geociências, Avenida Dom Manuel Medeiros s/n - Dois Irmaos, Recife PE
Tel: +55 81 3320 6508, Fax: +55 81 3320 6501, E-Mail: tfredou@depaq.ufrpe.br

Hazin, Fabio H. V.
Commission Chairman, Universidade Federal Rural de Pernambuco - UFRPE / Departamento de Pesca e Aqüicultura-DEPAq, Rua Desembargador Célio de Castro Montenegro, 32 - Apto 1702, Monteiro Recife Pernambuco
Tel: +55 81 3320 6500, Fax: +55 81 3320 6512, E-Mail: fabio.hazin@depaq.ufrpe.br;

Leite Mourato, Bruno
Rua Dom Manoel de Medeiros s/n - Dois Irmaos, Recife Pernambuco
Tel: +55 81 33206512, E-Mail: bruno.pesca@gmail.com

Travassos, Paulo*
Universidade Federal Rural de Pernambuco - UFRPE, Laboratorio de Ecologia Marinha - LEMAR, Departamento de Pesca e Aquicultura-DEPAq, Avenida Dom Manoel Medeiros s/n - Dois Irmaos, CEP 52.171-900 Recife Pernambuco
Tel: +55 81 3320 6511, Fax: +55 81 3320 6515, E-Mail: p.travassos@depaq.ufrpe.br

CANADA
Hanke, Alex*
Scientific, St. Andrews Biological Station/ Biological Station, Fisheries and Oceans Canada, 531 Brandy Cove Road, St. Andrews, New Brunswick E5B 2L9
Tel: +1 506 529 4665, Fax: +1 506 529 5862, E-Mail: alex.hanke@dfo-mpo.gc.ca

Neilson, John D.
Head, Large Pelagic and Pollock Projects, Population Ecology Section, Fisheries and Oceans Canada, St. Andrews Biological Station, 531 Brandy Cove Road, St. Andrews, New Brunswick E5B 2L9
Tel: +1 506 529 5913, Fax: +1 506 529 5862, E-Mail: john.neilson@dfo-mpo.gc.ca

CAPE VERDE
Marques da Silva Monteiro, Vanda
Instituto Nacional de Desenvolvimento das Pescas, Cova de Inglesa, C.P. 132, Mindelo, Sao Vicente
Tel: +238 232 13 73, Fax: +238 232 16 16, E-Mail: vamarmont@hotmail.com;

CHINA, (P. R.)
Li, Yunkai
College of Marine Sciences, Shanghai Ocean University, 999 Huchenghuan Rd. Pudong Area, 201306 Shanghai
Tel: +86 2161900311, Fax: +86 2161900304, E-Mail: YkLi@shou.edu.cn

Song, Liming
Professor, College of Marine Sciences, Shanghai Ocean University, 999 Huchenghuan Rd. Pudong Area, 201306 Shanghai
Tel: +86 021 619 00311, Fax: +86 021 619 00304, E-Mail: lmsong@shou.edu.cn

Zhang, Xinfeng
College of Marine Sciences, Shanghai Ocean University, Room 423, 999 Huchenghuan Rd. Pudong Area, 201306 Shanghai
Tel: +86 21 6190 0344, Fax: +86 21 6190 0304, E-Mail: xfzhang@shou.edu.cn; lmsong@shou.edu.cn

* Delegates who only participated in the Species Groups.

CÔTE D'IVOIRE
Sylla, Soumaila
Chercheur Hydrobiologiste, Centre de Recherches Océanologiques, Département des Ressources Aquatiques Vivantes, 29 Rue des Pêcheurs, B.P. V 18, Abidjan
Tel: +225 21 35 50 14 ou +225 21 35 58 80, Fax: +225 21 35 11 55, E-Mail: syllasoumahila@yahoo.fr

CROATIA
Franicevic, Vlasta
Head of Unit Aquaculture, Ministry of Agriculture Fisheries and Rural Development, Directorate of Fisheries, Ivana Mazuranica 30, 23000 Zadar
Tel: +385 23 309 820, Fax: +385 23 309 830, E-Mail: mps-uprava-ribarstva@zd.t-com.hr

Katavic, Ivan
Ministry of Agriculture, Fisheries and Rural Development, Ivana Mazuranica 30, 23000 Zadar
Tel: +385 61 06531, Fax: +385 6106 558, E-Mail: Katavic@izor.hr

EUROPEAN UNION
Fonteneau, Alain
9, Bd Porée, 35400 Saint Malo, France
Tel: +33 4 99 57 3200, Fax: +33 4 99 57 32 95, E-Mail: alain.fonteneau@ird.fr

Addis, Pierantonio*
Senior Researcher in Ecology, University of Cagliari, Department of Life Science and Environment, Via Fiorelli 1, 09126 Cagliari, Italy
Tel: +39 070 675 8082, Fax: +39 070 675 8022, E-Mail: addisp@unica.it

Ariz Tellería, Javier
Ministerio de Ciencia e Innovación, Instituto Español de Oceanografía, C.O. de Canarias, Apartado 1373, 38080 Santa Cruz de Tenerife Islas Canarias, Spain
Tel: +34 922 549 400, Fax: +34 922 549 554, E-Mail: javier.ariz@ca.ieo.es

Arrizabalaga, Haritz
AZTI - Tecnalia/Itsas Ikerketa Saila, Herrera Kaia Portualde z/g, 20110 Pasaia Gipuzkoa, Spain
Tel: +34 94 657 40 00, Fax: +34 94 300 48 01, E-Mail: harri@azti.es

Belmonte Ríos, Antonio
Biólogo ANATUN Poligono Industrial Oeste, Alcantarilla c/ Uruguay, s/n, 30820 Murcia, Spain
Tel: +34 968 845265, Fax: +34 968 844525, E-Mail: antonio.belmonte@taxon.es

Carroceda Carballal, Arancha*
Ministerio de Ciencia e Innovación, Instituto Español de Oceanografía - C.O. de A Coruña, Paseo Marítimo Alcalde Francisco Vázquez, 10 - P.O. Box 130, 15001 A Coruña, Spain
Tel: +34 981 205 362//981 21 8151, Fax: +34 981 229 077, E-Mail: arancha.carroceda@co.ieo.es

Chavance, Pierre*
Tropical Tuna Observator; Director - Fisheries Biologist, Centre de Recherche Halieutique Méditerranéenne et Tropical, Avenue Jean Monnet - BP 171, 34203 Sète cedex, France
Tel: +33 4 9957 3254, Fax: +33 4 9957 3295, E-Mail: pierre.chavance@ird.fr

Cosgrove, Ronan*
An Bord Iascaigh Mhara (BIM), New Docks, Co. Galway, Ireland
Tel: +353 91 564 318, Fax: +353 91 568 569, E-Mail: cosgrove@bim.ie

Cort, José Luis
Ministerio de Ciencia e Innovación, Instituto Español de Oceanografía, C.O. de Santander, Apartado 240 39080 Santander, Cantabria, Spain
Tel: +34 942 291 716, Fax: +34 942 27 5072, E-Mail: jose.cort@st.ieo.es

De Bruyn, Paul
AZTI - Tecnalia, Herrera Kaia Portualdea z/g, 20110 Pasaia Gipuzkoa, Spain
Tel: +34 94 657 40 00, Fax: +34 946 572 555, E-Mail: pdebruyn@pas.azti.es

De la Serna Ernst, José Miguel
Ministerio de Ciencia e Innovación, Instituto Español de Oceanografía, C.O. de Málaga, Puerto Pesquero s/n, 29640 Fuengirola Málaga, Spain
Tel: +34 952 197 124, Fax: +34 952 463 808, E-Mail: delaserna@ma.ieo.es

Delgado de Molina Acevedo, Alicia*
Ministerio de Ciencia e Innovación, Instituto Español de Oceanografía, C.O. de Canarias, Apartado 1373, 38080 Santa Cruz de Tenerife Islas Canarias, Spain
Tel: +34 922 549 400, Fax: +34 922 549 554, E-Mail: alicia.delgado@ca.ieo.es

Duarte, Rafael
European Commission - DGMARE, Rue Joseph II, 79, 02/21, 1000 Brussels, Belgium
Tel: +322 299 0955, E-Mail: rafael.duarte@ec.europa.eu

Elices López, Juan Manuel
Ministerio de Medioambiente, Medio Rural y Marino, C/ Velázquez, 147 - 3ª planta, 28002 Madrid, Spain
Tel: +34 91 347 1882, Fax: +34 91 347 6042, E-Mail: jmelices@marm.es

Farrugio, Henri*
IFREMER,1, Rue Jean Vilar, B.P. 171, 34200 Sète Cedex, France
Tel: + 33 4 67 46 7800, Fax: + 33 4 67 74 7090, E-Mail: henri.farrugio@ifremer.fr

Fernández Costa, Jose Ramón*
Ministerio de Ciencia e Innovación, Instituto Español de Oceanografía - C. Costero de A Coruña, Paseo Marítimo, Alcalde Francisco Vázquez, 10 - P.O. Box 130, 15001 A Coruña, Spain
Tel: +34 981 218 151, Fax: +34 981 229 077, E-Mail: jose.costa@co.ieo.es

Fraile, Igratza*
AZTI-TECNALIA, Herrera Kaia Portualdea z/g, 20110 Pasaia, Spain
Tel: +34 946 574000, E-Mail: ifraile@azti.es

Fromentin, Jean Marc
IFREMER - Dpt. Recherche Halieutique, BP 171 - Bd. Jean Monnet, 34203 Sète Cedex, France
Tel: +33 4 99 57 32 32, Fax: +33 4 99 57 32 95, E-Mail: jean.marc.fromentin@ifremer.fr

Gaertner, Daniel
I.R.D. UR nº 109 Centre de Recherche Halieutique Méditerranéenne et Tropicale, Avenue Jean Monnet - B.P. 171, 34203 Sète Cedex, France
Tel: +33 4 99 57 32 31, Fax: +33 4 99 57 32 95, E-Mail: gaertner@ird.fr

Garibaldi, Fulvio*
Laboratorio di Biologia Marina e Ecologia Animale Univ. Degli Studi di Genova,C Europa, 26, 16132 Genova, Italy
Tel: +39 010 353 30 18, Fax: +39 010 357 888, E-Mail: largepel@unige.it

Gatt, Mark
Malta Centre for Fisheries Sciences,Fort San Lucjan, Birzebbugia Malta
Tel: +356 222 93303, Fax: +356 21 659380, E-Mail: mark.gatt@gov.mt

Goñi, Nicolas*
AZTI-TECNALIA, Herrera Kaia Portualdea z/g, 20110 Pasaia, Spain
Tel: +34 946 574000, Fax: E-Mail: mgoni@azti.es

Goujon, Michel
ORTHONGEL, 11 bis Rue des Sardiniers, 29900 Concarneau, France
Tel: +33 2 9897 1957, Fax: +33 2 9850 8032, E-Mail: orthongel@orthongel.fr

Johnston, Graham
Pelagic & Deepwater STO, Marine Institute, Renville Oranmore, Galway, Ireland
Tel: +353 91387405, Fax: +353 87 2075963, E-Mail: graham.johnston@marine.ie

Katselis, Georgios*
Technological Educational Institution, Greece
Tel: +30 26310 38232, Fax: E-Mail: gkatsel@teimes.gr

Keatinge, Michael
BIM (The Irish Seafisheries Board), Crofton Road, Dun Laoghaire, Dublin, Ireland
Tel: +353 1 214 4230, Fax: +353 1 230 0564, E-Mail: keatinge@bim.ie

Lastra, Patricia*
Ministerio de Ciencia e Innovación, Instituto Español de Oceanografía, Centro Oceanográfico de Santander, Apdo. 240, 39080 Santander, Spain
Tel: +34 942 291 717, Fax: +34 942 275072, E-Mail: patricia.lastra@st.ieo.es

Macías, Ángel David*
Ministerio de Ciencia e Innovación, Instituto Español de Oceanografía, C.O.de Málaga, Puerto pesquero s/n, 29640 Fuengirola, Málaga, Spain
Tel: +34 952 197 124, Fax: +34 952 463 808, E-Mail: david.macias@ma.ieo.es

Mangalo, Caroline*
Comité National des Pêches Maritimes et des Élevages Marins, 134, Avenue Malakoff, 75116 Paris, France
Tel: +33 1 7271 1814, Fax: +33 1 7271 1850, E-Mail: cmangalo@comite-peches.fr

Martínez Cañabate, David Ángel
ANATUN, Urbanización La Fuensanta 2, 30157 Algeciras, Spain
Tel: +34 968 554141, Fax: +34 91 791 2662, E-Mail: es.anatun@gmail.com

Mèlich Bonancia, Begonya
Grupo Balfegó, Polígono Industrial - Edificio Balfegó, 43860 L'Ametlla de Mar, Tarragona, Spain
Tel: +34 977 047707, Fax: +34 977 457812, E-Mail: begonya@grupbalfego.com

Monteagudo, Juan Pedro
Asesor Científico, Organización de Productores Asociados de Grandes Atuneros Congeladores - OPAGAC, C/Ayala, 54-2A, 28001 Madrid, Spain
Tel:Fax:E-Mail: monteagudo.jp@gmail.com;opagac@arrakis.es

Muniategi, Anertz
ANABAC-OPTUC, Txibitxiaga, 24 - Entreplanta, 48370 Bermeo - Bizkaia, Spain
Tel: +34 94 688 2806, Fax: +34 94 688 5017, E-Mail: anabac@anabac.org

Murua, Hilario
AZTI - Tecnalia /Itsas Ikerketa Saila, Herrera Kaia Portualde z/g, 20110 Pasaia, Gipuzkoa, Spain
Tel: +34 94 657 40 00, Fax: +34 943 004801, E-Mail: hmurua@azti.es

Navarro Cid, Juan José*
Grupo Balfegó, Polígono Industrial - Edificio Balfegó, 43860 L'Ametlla de Mar, Tarragona, Spain
Tel: +34 977 047700, Fax: +34 977 457 812, E-Mail: juanjo@grupbalfego.com

Neves dos Santos, Miguel*
Instituto Nacional dos Recursos Biológicos I.P. / IPIMAR, Avenida 5 Outubro s/n, 8700-305 Olhão Portugal
Tel: +351 289 700 504, Fax: +351 289 700 535, E-Mail: mnsantos@ipimar.pt

Ortiz de Urbina, Jose María
Ministerio de Ciencia e Innovación, Instituto Español de Oceanografía, C.O de Málaga, Puerto Pesquero s/n, 29640 Fuengirola, Málaga, Spain
Tel: +34 952 197 124, Fax: +34 952 463 808, E-Mail: urbina@ma.ieo.es

Ortiz de Zárate Vidal, Victoria
Ministerio de Ciencia e Innovación, Instituto Español de Oceanografía, C.O. de Santander, Promontorio de San Martín s/n, 39012 Santander, Cantabria, Spain
Tel: +34 942 291 716, Fax: +34 942 27 50 72, E-Mail: victoria.zarate@st.ieo.es

Pereira, Joao Gil
Universidade dos Açores, Departamento de Oceanografia e Pescas, 9900 Horta, Portugal
Tel: +351 292 207 806, Fax: +351 292 207811, E-Mail: pereira@uac.pt

Peristeraki, Panagiota (Nota)
Hellenic Center for Marine Research, Institute of Marine Biological Resources, P.O. Box 2214, 71003 Iraklion, Greece
Tel: +30 2810 337 830, Fax: +30 2810 337 822, E-Mail: notap@her.hcmr.gr

Pianet, Renaud*
I.R.D. US No. 007 (OSIRIS), BP 570, Victoria Mahé, Republic of Seychelles
Tel: +248 22 47 42, Fax: +33 4 99 57 32 95, E-Mail: renaud.pianet@ird.fr; rpianet@sfa.sc

Ramfos, Alexis*
Technological Educational Institution of Mesolonghi, Department of Aquaculture & Fisheries Management, New Buildings, 30200 Mesolonghi, Greece
Tel: +30 26310 58202, Fax: +30 26310 58202, E-Mail: ramfos@teimes.gr

Rodríguez-Marín, Enrique
Ministerio de Ciencia e Innovación, Instituto Español de Oceanografía, C.O. de Santander, Promontorio de San Martín s/n, 39004 Santander, Cantabria, Spain
Tel: +34 942 291 716, Fax: +34 942 27 50 72, E-Mail: rodriguez.marin@st.ieo.es

Rodríguez-Sahagún González, Juan Pablo
Gerente Adjunto, ANABAC, c/Txibitxiaga, 24, entreplanta apartado 49, 48370 Bermeo, Bizkaia, Spain
Tel: +34 94 688 2806, Fax: +34 94 688 5017, E-Mail: anabac@anabac.org

Saber Rodríguez, Samar*
Ministerio de Ciencia e Innovación, Instituto Español de Oceanografía - C.O. Málaga, Puerto pesquero s/n, 29640 Fuengirola, Málaga, Spain
Tel: +34 952 197124, Fax: +34 952 463 808, E-Mail: samar.saber@ma.ieo.es

Serra, Simone
Via Torino, 146, 00184 Roma, Italy
Tel: +39 06 4782 4042, Fax: +39 06 4821 097, E-Mail: serra.s@unimar.it

Tinti, Fausto*
University of Bologna, Dept. Experimental Evolutionary Biology; Lab. Marine Biology and Fisheries, 61032 Viale Adriático 1/n, Fano (PU), Italy
Tel: +39 0721 802689, Fax: +39 0721 801 654, E-Mail: fausto.tinti@unibo.it

Tserpes, George
Hellenic Center for Marine Research (HCMR), Institute of Marine Biological Resources, P.O. Box 2214, 71003 Heraklion, Crete, Greece
Tel: +30 2810 337851, Fax: +30 2810 337820, E-Mail: gtserpes@her.hcmr.gr

Vladimirou, Savvas
Embassy of the Republic of Cyprus in Madrid, Paseo de la Castellana, 45 - 4º y 5º Izq., 28045 Madrid, Spain
Tel: +34 91 5783114, Fax: +3491 578 2189, E-Mail: enbajadachipre@telefonica.net

GHANA
Bannerman, Paul
Ministry of Fisheries, Marine Fisheries Research Division, P.O. Box BT 62, Tema
Tel: +233 244 794859, Fax: +233 302 208048, E-Mail: paulbann@hotmail.com

JAPAN
Inoue, Yukiko*
Assistant Researcher, Ecologically Related Species Group, Tuna and Skipjack Resources Division, National Research Institute of Far Seas Fisheries, 5-7-1 Orido, Shimuzu-Ku Shizuoka 424-8633
Tel: +81 543 36 6046, Fax: +81 543 35 9642, E-Mail: ykkino@gmail.com

Itoh, Tomoyuki
Section Leader, Bluefin tuna Section, BFT Resources Division, National Research Institute of Far Seas Fisheries, 5-7-1 Orido Shimizu, Shizuoka 424-8633
Tel: +81 543 36 6036, Fax: +81 543 35 9642, E-Mail: itou@fra.affrc.go.jp

Kimoto, Ai
Researcher, Tuna Fisheries Resources Group, Tuna and Skipjack Resources Division, National Research Institute of Far Seas Fisheries, 5-7-1 Orido Shimizu-ku, Shizuoka-City, Shizuoka 424-8633
Tel: +81 543 36 6036, Fax: +81 543 35 9642, E-Mail: aikimoto@affrc.go.jp

Minami, Hiroshi
Chef, Ecologically Related species group, National Research Institute of Far Seas Fisheries, Tuna and Skipjack Resources Division, 5-7-1-Orido, Shimizu, Shizuoka 424-8633
Tel: +81 54 336 6000, Fax: +81 54 335 9642, E-Mail: hminami@affrc.go.jp

Miyake, Makoto P.
Associate Scientific, National Research Institute of Far Seas Fisheries, 3-3-4 Shimorenjaku, Tokyo Mitaka-Shi
Tel: +81 422 46 3917, E-Mail: p.m.miyake@gamma.ocn.ne.jp

Nakano, Hideki
Director, BFT Resources Division, National Research Institute of Far Seas Fisheries,5-7-1 Orido, Shimizu-Ku, Shizuoka-City, Shizuoka 424-8633
Tel: +81 54 336 6000, Fax: +81 54 335 9642, E-Mail: hnakano@affrc.go.jp

Okamoto, Hiroaki
Tropical Tuna Section Chief, National Research Institute of Far Seas Fisheries, Fisheries Research Agency of Japan, 7-1, 5 Chome Orido, Shizuoka-shi Shimizu-ku
Tel: +81 543 36 6043, Fax: +81 543 35 9642, E-Mail: okamoto@fra.affrc.go.jp

Satoh, Keisuke*
Tuna Fisheries Resources Group; Tuna and Skipjack Resources Division, National Research Institute of Far Seas Fisheries, Fisheries Research Agency of Japan, 5-7-1, Chome Orido, Shizuoka-Shi Shimizu-Ku 424-8633
Tel: +81 543 36 6044, Fax: +81 543 35 9642, E-Mail: kstu21@fra.affrc.go.jp

Yokawa, Kotaro*
Chief, Tuna Fisheries Resources Group, Tuna and Skipjack Resources Division, National Research Institute of Far Seas Fisheries, 5-7-1 Orido, Shimizu-ku, Shizuoka-City Shizuoka 424 8633
Tel: + 81 543 36 6046, Fax: + 81 543 35 9642, E-Mail: yokawa@fra.affrc.go.jp

KOREA REP.
Moon, Dae-Yeon
Senior Scientific, National Fisheries Research and Development Institute, Distant Water Fisheries Resources Division, 408-1 Shirang-Ri Kijang-Up, Busan Kijang-gun
Tel: +82 51 720 2320, Fax: +82 51 720 2337, E-Mail: dymoon@nfrdi.go.kr

MEXICO
Beléndez Moreno, Luis Francisco J.
Director General de Investigación Pesquera en el Atlántico, Instituto Nacional de Pesca - SAGARPA, Av. Ejército Mexicano #106, Col. Ex-Hacienda Ylang-Ylang, C.P. 94298 Boca de Rio, Veracruz
Tel: +52 1 229 130 4520, Fax: E-Mail: luis.belendez@inapesca.sagarpa.gob.mx

Ramírez López, Karina
Jefe de Departamento DGIPA-INAPESCA, Instituto Nacional de Pesca - SAGARPA, Av. Ejército Mexicano No.106, Colonia Exhacienda, Ylang Ylang, C.P. 94298 Boca de Río, Veracruz
Tel: +52 22 9130 4518, Fax: +52 22 9130 4519, E-Mail: kramirez_inp@yahoo.com; kramirez_lopez@yahoo.com.mx

MOROCCO
Abid, Noureddine
Center Regional de L'INRH á Tanger/M'dig, B.P. 5268, 90000 Drabed, Tangier
Tel: +212 53932 5134, Fax: +212 53932 5139, E-Mail: abid.n@menara.ma; noureddine.abid65@gmail.com

El Ktiri, Taoufik
Chef de service de l'Application de la Réglementation et de la Police Administrative - DPRH, Direction des Pêches Maritimes et de l'Aquaculture, Ministère de l'Agriculture et de la Pêche Maritime, Département de la Pêche Maritime, Nouveau Quartier Administratif; BP 476, Haut Agdal, Rabat
Tel: +212 5 37 68 81 15, Fax: +212 5 37 68 8089, E-Mail: elktiri@mpm.gov.ma

Faraj, Abdelmalek
Chef du Département des Ressources Halieutiques, Institut National de Recherche Halieutique
Tel: +212 6 61079909, Fax: +212 6 61649185, E-Mail: faraj@ihrh.org.ma;abdelmalekfaraj@yahoo.fr

NORWAY
Nottestad, Leif
Principal Scientist, Institute of Marine Research, P.O. Box 1870 Nordnesgaten, 33, NO-5817 Bergen
Tel: +47 55 23 68 09, Fax: +47 55 23 86 87, E-Mail: leif.nottestad@imr.no

Tangen, Oyvind
Engineer, Institute of Marine Research, P.O. Box 1870, Nordnesgt, 33, 5817 Bergen
Tel: +47 55 23 8414, Fax: +47 55 23 8687, E-Mail: oyvind.tangen@imr.no

RUSSIAN FEDERATION
Nesterov, Alexander
Head Scientist, Atlantic Research Institute of Marine, Fisheries and Oceanography (AtlantNIRO), 5, Dmitry Donskoy Str., 236022 Kaliningrad
Tel: +7 (4012) 925322/925457, Fax: + 7 (4012) 219997, E-Mail: nesterov@atlant.baltnet.ru; oms@atlant.baltnet.ru

SENEGAL
Ndaw, Sidi
Chef du Bureau des Statistiques à la Direction des Pêches, Ministère de l'Economie Maritime, Direction des Pêches Maritimes, 1, rue Joris, Place du Tirailleur, B.P. 289, Dakar
Tel: +221 33 823 0137, Fax: +221 33 821 4758, E-Mail: sidindaw@hotmail.com;dopm@orange.sn

Ngom Sow, Fambaye
Chargé de Recherches, Centre de Recherches Océanographiques de Dakar Thiaroye, CRODT/ISRA, LNERV - Route du Front de Terre - BP 2241, Dakar
Tel: +221 33 832 8265, Fax: +221 33 832 8262, E-Mail: famngom@yahoo.com

TURKEY
Ceyhan, Tevfik
Assistant Profesor, Ege University, Faculty of Fisheries, 35100 Bornova Izmir
Tel: +90 232 311 5212 Fax: +90 232 3747450, E-Mail: tevfik.ceyhan@ege.edu.tr

UNITED KINGDOM (OVERSEAS TERRITORIES)
Wolfaardt, Anton
UK Joint Nature Conservation Committee, Inverdee House, Baxter Street, Aberdeen, P.O. Box 794, FIQ11 ZZ Stanley, Falklands Islands
Tel: +500 54068, Fax: E-Mail: anton.wolfaardt@jncc.gov.uk

UNITED STATES
Brown, Craig A.
NOAA Fisheries Southeast Fisheries Center, Sustainable Fisheries Division, 75 Virginia Beach Drive, Miami, Florida 33149
Tel: +1 305 361 4590, Fax: +1 305 361 4562, E-Mail: Craig.brown@noaa.gov

Cass-Calay, Shannon
NOAA Fisheries, Southeast Fisheries Center, Sustainable Fisheries Division, 75 Virginia Beach Drive, Miami, Florida 33149
Tel: +1 305 361 4231, Fax: +1 305 361 4562, E-Mail: shannon.calay@noaa.gov

Cortés, Enric
Research Fishery Biologist, NOAA-Fisheries, Southeast Fisheries Science Center, Panama City Laboratory, 3500 Delwood Beach Road, Panama City, Florida
Tel: +1 850 234 6541, Fax: +1 850 235 3559, E-Mail: enric.cortes@noaa.gov

Díaz, Guillermo
NOAA-Fisheries, Southeast Fisheries Science Center,1315 East-West Highway # 13562, Silver Spring, Maryland 20910
Tel: +1 301 713 2363, Fax: +1 301 713 1875, E-Mail: guillermo.diaz@noaa.gov

Die, David
Cooperative Unit for Fisheries Education and Research University of Miami, 4600 Rickenbacker Causeway, Miami, Florida 33149
Tel: +1 305 421 4607, Fax: +1 305 421 4221, E-Mail: ddie@rsmas.miami.edu

Hoolihan, John
NOAA Fisheries, Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, Florida 33149
Tel: +1 305 365 4116, Fax: +1 305 361 4562, E-Mail: john.hoolihan@noaa.gov

Porch, Clarence E.
Chief, Sustainable Fisheries Division, Southeast Fisheries Science Center, National Marine Fisheries Service, 75 Virginia Beach Drive, Miami, Florida 33149
Tel: +1 305 361 4232, Fax: +1 305 361 4219, E-Mail: clay.porch@noaa.gov

Prince, Eric D.
NOAA Fisheries, Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, Florida 33149
Tel: +1 305 361 4248, Fax: +1 305 361 4219, E-Mail: eric.prince@noaa.gov

Schirripa, Michael
NOAA Fisheries, Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, Florida 33149
Tel: +1 305 361 4568, Fax: +1 305 361 4562, E-Mail: michael.schirripa@noaa.gov

Scott, Gerald P.
NOAA Fisheries, Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, Florida 33149
Tel: +1 305 361 4596, Fax: +1 305 361 4219, E-Mail: gerry.scott@noaa.gov

Secor, David
University of Maryland Center for Environmental Science, P.O. Box 38, MD Solomons 20688
Tel: +1410 326 7229, Fax: +1 410 326 7210, E-Mail: secor@cbl.umces.edu

URUGUAY
Domingo, Andrés
Dirección Nacional de Recursos Acuáticos - DINARA, Sección y Recursos Pelágicos de Altura, Constituyente 1497, 11200 Montevideo
Tel: +5982 400 46 89, Fax: +5982 41 32 16, E-Mail: adomingo@dinara.gub.uy

Jiménez, Sebastian
Dirección Nacional de Recursos Acuáticos - DINARA, Sección Recursos Pelágicos de Altura, Constituyente 1497, 11200 Montevideo
Tel: +598 99 781644, E-Mail: jimenezpsebastian@gmail.com

OBSERVERS FROM INTERGOVERNMENTAL ORGANIZATIONS

GENERAL FISHERIES COMMISSION FOR THE MEDITERRANEAN (GFCM)
Srour, Abdellah
Secrétaire Exécutif, Commission Générale des Pêches pour la Méditerranée - GFCM, Via delle Terme di Caracalla, 0153 Rome, Italy
Tel: +39 06 5705 5730, Fax: +39 06 5705 6500, E-Mail: abdellah.srour@fao.org

COOPERATING NON-CONTRACTING PARTIES, ENTITIES, FISHING ENTITIES

CHINESE TAIPEI
Chang, Feng-Chen
Overseas Fisheries Development Council,19 Lane 113, Roosevelt Road Sect. 4, 106 Taipei
Tel: +886 2 2738 1522, Fax: +886 2 2738 4329, E-Mail: fengchen@ofdc.org.tw; d93241008@ntu.edu.tw

Hsu, Chien-Chung
Professor, Institute of Oceanography National Taiwan University, P.O. Box 23-13, Taipei
Tel: +886 2 3362 2987, Fax: +886 2 2366 1198, E-Mail: hsucc@ntu.edu.tw

Huang, Julia Hsiang-Wen
Assistant Professor, Institute of Marine Affairs and resources Management, National Taiwan Ocean University, 2 Pei-Ning Road, 20224 Keelung
Tel: +886 2 24622192, Fax: +886 2 2463 3986, E-Mail: julia@ntou.edu.tw

Lee, Shu-Min
Specialist, Deep Sea Fisheries Division, Fisheries Agency, Council of Agriculture, Executive Yuan, 70-1, Sec. 1, Jinshan S. Rd., Taipei
Tel: +886 2 3343 6101, Fax: +886 2 3343 6096, E-Mail: shumin@ms1.fa.gov.tw

Wu, Ren-Fen
Overseas Fisheries Development Council, Nº 19, Lane 113, Roosevelt Rd; Sec 4, 106 Taipei
Tel: +886 2 2738 1522, Fax: +886 2 2738 4329, E-Mail: fan@ofdc.org.tw

OBSERVERS FROM NON-GOVERNEMENTAL ORGANIZATIONS

BIRDLIFE INT.
Anderson, Orea
Policy Officer, Birdlife Intl Global Seabird Programme, RSPB, The Lodge, Sandy, Bedfordshire SG19 2DL, United Kingdom
Tel: +44 1767 693587, Fax: +44 1767 692365, E-Mail: orea.anderson@rspb.org.uk

Small, Cleo*
Senior Policy Officer, BIRDLIFE International Global Seabird Programme, RSPB, The Lodge, Sandy, Bedfordshire SG19 2DL, United Kingdom
Tel: +44 1767 601931, Fax: +44 1767 692 365, E-Mail: cleo.small@rspb.org.uk

FEDERATION OF EUROPEAN AQUACULTURE PRODUCERS - FEAP
Recabarren, Pablo*
Federation of European Aquaculture Producers - FEAP, Rue de Paris 9, B- 4020 Liège, Belgium
Tel: +336 1005 3176, Fax: +331 74180086, E-Mail: par@atlantis-ltd.com

Tzoumas, Apostolos*
Chairman of the FEAP Tuna Aquaculture Commission, Bluefin Tuna Hellas, S.A., 409 Vouliagmenis Avenue, 163, 46 Athens, Greece
Tel: +30 210 976 1120, Fax: +30 210 976 1097, E-Mail: bluefin@bluefin.gr

FEDERATION OF MALTESE AQUACULTURE PRODUCERS - FMAP
Deguara, Simeon
Research and Development Coordinator, Federation of Maltese Aquaculture Producers - FMAP, 54, St. Christopher Str., VLT 1462 Valletta, Malta
Tel: +356 21223515, Fax: +356 2124 1170, E-Mail: sdeguara@ebcon.com.mt

FUNDATUN
Giménez, Carlos
Director Ejecutivo, Fundación para la Pesca Responsable y Sostenible de Túnidos (FUNDATUN), Multicentro Empresarial del Este, Avenida Francisco Miranda - Piso 10 - Oficina 103, Chacao Caracas, Venezuela
Tel: +582 12 267 6666, Fax: +58212 267 0086, E-Mail: cegimenez@fundatun.com

GREENPEACE
Losada Figueiras, Sebastián
Oceans Policy Adviser, Greenpeace International, c/San Bernardo, 107, 28015 Madrid, Spain
Tel: +34 91 444 1400, Fax: +34 91 447 1598, E-Mail: slosada@greenpeace.org

INSTITUTE FOR PUBLIC KNOWLEDGE - IPK
Telesca, Jennifer Elisabeth
Institute for Public Knowledge - IPK, New York University (NYU), 20 Cooper Square, 5th floor, New York, New York 10003, United States
Tel: +1 914 318 9550, E-Mail: jet302@nyu.edu

INTERNATIONAL SEAFOOD SUSTAINABILITY FOUNDATION - ISSF
Restrepo, Victor
Chair of the ISSF Scientific Advisory Committee, ISS-Foundation, P.O. Box 11110, McLean, Virginia 22102, United States
Tel: +1 703 226 8101, E-Mail: vrestrepo@iss-foundation.org

PEW ENVIRONMENT GROUP
Miller, Shana
Pew Charitable Trusts, 901 E Street, NW, Washington, DC 20004, United States
Tel: +1 631 671 1530, E-Mail: skmiller76@optonline.net

Morgan, Alexia
Pew Environment Group, 901 E Street NW, 10th floor, Washington, DC 20004, United States
Tel: +1 352 262 3368, Fax: +1 202 552 2299, E-Mail: alexia.morgan2@gmail.com

Parmentier, Rémi
Pew Environment Group, 901 E Street, NW, 20004 Washington, DC, United States
Tel: +34 637 557 357, Fax: +1 202 552 2299, E-Mail: remi@vardagroup.org

WORLD WIDE FUND FOR NATURE - WWF
Galaz Ugalde, Txema*
WWF Mediterranean Programme Office, C/Río Bidasoa, 6, 30370 Playa de Honda, Cartagena, Murcia, Spain
Tel: +34 646033824, E-Mail: medaquafarmser@hotmail.com

Tudela Casanovas, Sergi*
WWF Mediterranean Programme Office Barcelona,c/ Carrer Canuda, 37 3er, 08002 Barcelona, Spain
Tel: +34 93 305 6252, Fax: +34 93 278 8030, E-Mail: studela@atw-wwf.org

****

Billfish Rapporteur
Arocha, Freddy
Instituto Oceanográfico de Venezuela Universidad de Oriente, A.P. 204, 6101 Cumaná Estado Sucre, Venezuela
Tel: +58293 400 2111- móvil: 58 416 693 0389, Fax: E-mail: farocha@sucre.udo.edu.ve;farochap@gmail.com

****

ICCAT SECRETARIAT
C/ Corazón de María, 8 - 6th Floor, 28002 Madrid - Spain
Tel: +34 91 416 5600; Fax: +34 91 415 2612; E-mail: info@iccat.int

Meski, Driss
Pallarés, Pilar
Kell, Laurence
Ortiz, Mauricio
Moreno, Juan Antonio
Palma, Carlos
Seidita, Philomena
Campoy, Rebecca
García-Orad, María José
De Andrés, Marisa
Peyre, Christine
Pinet, Dorothee
Fiz, Jesús
García Rodríguez, Felicidad
Gallego Sanz, Juan Luis
Moreno, Juan Ángel
García Piña, Cristóbal
Peña, Esther

JDIP/ICCAT
Ara, Takahiro

GBYP/ICCAT
Di Natale, Antonio
Idrissi, M'Hamed

ICCAT EXPERT
Cooke, Justin G.*
Centre for Ecosystem Management Studies,
Höllenbergstr 7, 79312 Emmendingen-Windenreute,
Germany
Tel: +49 7641 935 1631, Fax: +49 7641 935 1632, E-Mail: jgc@cems.de

ICCAT INTERPRETERS
Baena Jiménez, Eva
Faillace, Linda
Herrero, Patricia
Jeelof-Wuhrmann, Jolyn
Linaae, Cristina
Meunier, Isabelle

Appendix 3

LIST OF 2011 SCRS DOCUMENTS

Number	*Title*	*Author(s)*
SCRS/2011/011	Report of the GBYP Working Group on the Aerial Surveys Analysis, Conventional Tagging and Biological Sampling (Madrid, Spain - February 14 to 18, 2011).	Anonymous
SCRS/2011/012	Report of the Working Group on the Organization of the SCRS (Madrid, Spain - March 2 to 4, 2011).	Anonymous
SCRS/2011/013	Report of the 2011 Blue Marlin Stock Assessment Session and White Marlin Data Preparatory Meeting (Madrid, Spain - April 25 to 29, 2011).	Anonymous
SCRS/2011/014	Report of the 2011 Inter-sessional Meeting of the Sub-Committee on Ecosystems (Miami, USA - May 9 to 13, 2011).	Anonymous
SCRS/2011/015	Report of the Symposium on G-BFT Trap Fishing and Related Data Sets (Tangiers, Morocco - May 23 to 25, 2011).	Anonymous
SCRS/2011/016	Report of the Tropical Tuna Species Group Inter-sessional Meeting on the Ghanaian Statistics Analysis (Phase I) (Madrid, Spain - May 30 to June 3, 2011).	Anonymous
SCRS/2011/017	Report of the 2010 Sharks data preparatory meeting to apply Ecological Risk Analysis (Madrid, Spain - June 20 to 24, 2011).	Anonymous
SCRS/2011/018	Report of the 2010 Joint Meeting of the ICCAT Working Group on Stock Assessment Methods and the Bluefin Tuna Species Group to Analyze Assessment Methods Developed under the GBYP and Electronic Tagging (Madrid, Spain - June 27 to July 1, 2011).	Anonymous
SCRS/2011/019	Report of the 2011 South Atlantic Albacore and Mediterranean Albacore Assessment Sessions (Madrid, Spain - July 25 to 29, 2011).	Anonymous
SCRS/2011/020	Report of the 2011 Yellowfin Stock Assessment Session (Madrid, Spain - September 5 to12, 2011).	Anonymous
SCRS/2011/021	Sex ratio at size of blue marlin (*Makaira nigricans*) from the Venezuelan fishery off the Caribbean Sea and adjacent waters.	Arocha, F., Marcano, L., and Silva, J.
SCRS/2011/022	Spatial and temporal characteristics of recent landings of western Atlantic bluefin tuna in the Canadian zone, in relation to a program of biological sampling proposed as part of the grande bluefin tuna year program.	Neilson, J.D., Hanke, A. and Paul S.D.
SCRS/2011/023	Thirty Five Years of Collective Endeavour, A Review of SCRS Papers.	Kell, L. and Pallarés P.
SCRS/2011/024	Revision of the Detailed Report's Structure.	Pallarés, P., Ortíz, M., Kell, L. and Palma, C.
SCRS/2011/025	Tagging Manual for the Atlantic-wide Research Program on Bluefin Tuna (GBYP)	Cort, J.L., Abascal, F, Belda, E. Bello, G., Deflorio, M., de la Serna, J.M., Estruch, V. Godoy, D. and Velasco, M.

SCRS/2011/026	Captura, distribución y composición de tallas del aguja blanca, *Tetrapturus albidus*, observada en la flota de palangre uruguaya (1998-2010),	Domingo A., Forselledo, R. and Pons, M.
SCRS/2011/027	Índice de abundancia estandarizado de las capturas de atún rojo (*Thunnus thynnus*) obtenidas por las almadrabas españolas y marroquíes.	Abid, N., Ortiz de Urbina, J.M. and de la Serna, J.M.
SCRS/2011/028	Annual mean weight of bluefin tuna (*Thunnus thunnus*) caught by the traps in the south of Spain between 1914-2010.	Cort, J.L., de la Serna, J.M. and Velasco, M.
SCRS/2011/029	Encomienda de la SGM al IEO para el estudio del atún rojo (*Thunnus thynnus*) del Atlántico este y Mediterráneo empleando las almadrabas españolas como observatorios científicos.	De la Serna, J.M., Macías, D., Ortiz de Urbina, J.M., Abascal, F. and Rodríguez Marín, E.
SCRS/2011/030	La migración del atún rojo (*Thunnus thynnus*) a través del Estrecho de Gibraltar mediante el seguimiento de las pesquerías de almadrabas españolas y marroquíes.	de la Serna, J.M., Abid, N., Godoy, D. and Rioja, P.
SCRS/2011/031	Series históricas de capturas del atún rojo (*Thunnus thynnus*) en las almadrabas del Golfo de Cádiz.	López, J.A. and Ruiz, J.M.
SCRS/2011/032	Prospecciones aéreas en el Mediterráneo Occidental durante la concentración de juveniles de atún rojo (*Thunnus thynnus*) en el Golfo de León.	Sorell, J.M.
SCRS/2011/033	Standardized catch rates for white marlin (*Tetrapturus albidus*) from the Venezuelan pelagic longline fishery off the Caribbean Sea and the western central Atlantic: Period 1991-2010.	Arocha, F. and Ortiz, M.
SCRS/2011/034	Catch rates for white marlin (*Tetrapturus albidus*) from the small scale fishery off La Guaira, Venezuela: period 1991-2010.	Arocha, F., Barrios, A. and Marcano, L.A.
SCRS/2011/035	Observaciones sobre la aguja blanca (*Tetrapturus albidus*) a bordo de la flota española de palangre de superficie dirigida al pez espada, durante el periodo 1993-2010.	Mejuto, J., García-Cortés, B. and Ramos-Cartelle, A.
SCRS/2011/036	The iconography of tuna traps: An essential information for the understanding of the technological evolution of this ancient fishery.	Di Natale, A.
SCRS/2011/037	The literature on eastern Atlantic and Mediterranean tuna trap fishery.	Di Natale, A.
SCRS/2011/038	Tuna trap data in the ICCAT database and GBYP contributions.	Di Natale, A. and Idrissi, M.
SCRS/2011/039	Factors to be taken into account for a correct lecture of tuna traps catch series.	Ortiz, M., Palma, C., Pallarés, P., Kell, L., Idrissi, M. and Di Natale, A.
SCRS/2011/040	Brief information on Japanese trap fisheries capturing Pacific bluefin tuna (*Thunnus orientalis*) -fishery and socio-economic roles.	Suzuki, Z. and Kai, M.
SCRS/2011/041	Abundance index of young Pacific bluefin tuna (*Thunnus orientalis*) estimated from the Japanese set-net fishery's data.	Kai, M.
SCRS/2011/042	Movement of Atlantic bluefin tuna toward the Strait of Gibraltar inferred from Japanese longline data.	Suzuki, Z. and Kai, M.
SCRS/2011/043	Standardized CPUE of blue marlin caught by Japanese longliners in the Atlantic Ocean using GLM model.	Kimooto, Ai and Yokawa, K.
SCRS/2011/044	Standardized CPUE of white marlin caught by Japanese longliners in the Atlantic Ocean using GLM model.	Kimooto, Ai and Yokawa, K.

SCRS/2011/045	Standardization of blue marlin (*Makaira nigricans*) CPUE for the Taiwanese longline fishery in the Atlantic Ocean.	Sun, C-L., Su. N-J. and Yeh, S-Z.
SCRS/2011/046	Possible stock production models for blue marlin in the Atlantic Ocean up to 2009.	Schirripa, M. and Babcock, E.
SCRS/2011/047	An evaluation of methods for standardizing catch rates of highly migratory by-catch species.	Lynch, P.D., Shertzer, K.W., and Latour, R.J.
SCRS/2011/048	Preliminary analyses of simulated longline Atlantic blue marlin CPUE with HBS and generalized linear models.	Goodyear, C.P. and Bigelow, K.A.
SCRS/2011/049	Length composition and spatiotemporal distribution of blue marlin (*Makaira nigricans*) in the South Atlantic Ocean.	Frédou, T., Frédou, F.L., Hazin, F.H.V. and Travassos, P.
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SCRS/2011/053	Cory's shearwater by-catch in the Mediterranean Spanish commercial longline fisheries: Implications for conservation.	Báez, J.C., García-Barcelona, S., Mendoza, M., Ortiz de Urbina, J.M., Real, R. and Macías, D.
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SCRS/2011/162	Updated white marlin (*Tetrapturus albidus*) catch rates from the U.S. recreational tournament fishery in the northwest Atlantic, U.S. Gulf of Mexico, Bahamas and U.S. Caribbean 1973-2010.	Lauretta, M.V., Hoolihan, J.P., Prince, E.D. and Walter, J.F.
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SCRS/2011/165	Biological observations of silky shark (*Carcharhinus falciformis*) on Spanish surface longliners targeting swordfish in the Pacific Ocean over the period 1990-2011 and applicability to the Atlantic case.	García-Cortés, B., Ramos-Cartelle, A. and Mejuto, J.
SCRS/2011/166	ICCAT-GBYP Atlantic-wide Bluefin Tuna Research Programme 2011 GBYP coordination detailed activity report for Phase 2.	Di Natale, A. and Idrissi, M.

SCRS/2011/167	Preliminary length-weight relationship for bluefin tuna (*Thunnus thynnus*) caught by Moroccan Atlantic traps.	Abid, N., Benchoucha, S., Lamtai, A. and El Fanichim C.
SCRS/2011/168	A detailed description of the 2010 stock assessment model for blue marlin in the Atlantic Ocean.	Schirripam M.J.
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SCRS/2011/170	Changes in length-weight relationships of Atlantic bluefin tuna, *Thunnus thynnus*, caught by Maltese longliners during the years 2008-2011.	Deguaram S., Gattm M., Caruanam S. and Agiusm C.
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SCRS/2011/190	Experimental setup for monitoring the growth of tuna in cages by the combined use of acoustic and optical cages.	Puig, V., Espinosa, V., Soliveres, E., Gandara, F, Ortega, A. and Belmonte, A.
SCRS/2011/191	Malta's report on a Pilot study carried out in 2011 to estimate the number and weight of bluefin tuna at the point of capture and caging by stereoscopic camera.	Anon.
SCRS/2011/192	Estimates of seabird incidental catch by tuna longline fisheries in the South Atlantic Ocean.	Hsiang-wen Huang, Julia
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SCRS/2011/199	Outline of a candidate management procedure for Atlantic bluefin tuna.	Cook, J.
SCRS/2011/200	Report of Japan's scientific observer program for the tuna longline fishery in the Atlantic Ocean in the fishing years of 2008 to 2010.	Japan
SCRS/2011/201	Estimates of seabird incidental catch by pelagic longline fisheries in the South Atlantic Ocean.	Yeh, Y., Huang, H., Dietrich, K.S. and and Melvin, E.

SCRS/2011/202	Reproduction of the albacore, *Thunnus alalunga* (Bonaterre, 1778), caught by the Brazilian longline fleet in the southwestern Atlantic Ocean.	Pedrosa V., Travassos P., Oliveira P., Hazin F., Fernandes C and Hazin H..
SCRS/2011/203	Scientific documents presented in the 2011 BFT Species Group Meeting.	Anonymous
SCRS/2011/204	Scientific documents presented in the SC-ECO 2011 Species Group Meeting.	Anonymous
SCRS/2011/205	Alternative Virtual Population Analyses of yellowfin tuna (*Thunnus albacares*), 1970-2010.	Tropical Tunas Species Group
SCRS/2011/206	A proposal for the smooth introduction of effective mitigation measures for seabirds into longline fishery in the Atlantic Ocean.	Minami, H., Yokawa, K., Ochi, D. and Inoue, Y.
SCRS/2011/207	Responses to the data deficiencies and its impact on assessments.	Ortiz, M. and Scott, G.

Appendix 4

WORK PLANS OF THE SPECIES GROUPS FOR 2012

Tropical Tunas Work Plan

No stock assessment(s) are planned for yellowfin tuna, bigeye tuna or skipjack tuna in 2012. Nonetheless, scientists are encouraged to update the fishery indicators for all three stocks in 2012. The Working Group on Tropical Tunas considered that an inter-sessional meeting is necessary to:

1. To revise biological parameters for the three species. National scientist should continue to carry out studies on biological parameters for tropical tunas. Some estimates on reproduction, maturity, length-weight relationships, growth and other biological parameters are based on studies carried out many years ago. Changes might have occurred in the population during this period that should be considered. Furthermore, new information from other oceans should also be taken in consideration.
2. Evaluation of alternative methods for estimation of catch at age inferred from catch at size need to be conducted.
3. Problems were identified concerning standardized CPUE series for some fleets, which results in uncertainties in the assessment. Stock assessments rely heavily upon CPUE data, and, their representativeness as indices of abundance is of concern. Therefore, it is recommended to:
   a) Explore methods to combine the data from different fisheries in a single longline index.
   b) Explore methods to improve and combine the indices provided from different fisheries in a single combined index.
4. Stock assessments lack information on abundance of recruits and juveniles. Therefore, it is important to find alternative indices of abundance. Obtaining a better understanding of the factors that affect CPUE in purse seine (FADs, echo-sounders, satellites, etc.) and baitboat fisheries (FADs, schools associated with BB) and subsequent development of standardized abundance indices could result in improvements of the use of these data in stock assessments.
5. It was noted that ISSF will hold a workshop on this very topic in March 2012. The Committee expressed support for the workshop and encourages ICCAT scientists to participate since it will contribute to the goals of the inter-sessional meeting.
6. It is noted that the Methods Working Group is looking at methods to develop procedures for select indices that are suitable for each assessment method. It is of interest of the Tropical Working Group to participate in their work.
7. The Working Group encourages the continuation of the cooperation with Ghana scientists. A proposal of collaboration between Ghanaian and IRD scientists is presented in the *Addendum to the Tropical Tunas Work Plan*.

In addition, the Tropical Tunas Working Group strongly endorses the implementation of a large-scale tagging program in 2012 and beyond (see Addendum 2 to Appendix 5 to the 2010 SCRS Report). In preparation for this program, the Working Group will develop contacts with the industry to test the feasibility of different tagging protocols for tropical tunas.

Addendum to Tropical Tunas Work Plan

Collaboration IRD/Ghana

ICCAT Working Group on Ghanaian tuna statistics held in Madrid (Phase II, May 30 to June 3, 2011), revised historic Ghanaian Tasks I and II, proposed some corrections and elaborated some technical recommendations to improve future data collection such as greater collaboration between Ghanaian, Ivoirian and EU sampling teams due to the frequent Ghanaian landings in Abidjan. The persons in charge of tuna statistics in these CPC had a brief meeting with the ICCAT Secretary on September 28, 2011 and identified the following actions to be held in the near future:

Port and observer sampling

Objective: Insure that all vessels from any flag landing in each country being sampled according to established and common procedures agreed by ICCAT.

- Insure training of Ghanaian sampling teams in the field and vessels and verify correct collection and management of data
- Adopt measures allowing any vessels landing in either country to be sampled by national sampling team
- Identify and adopt data exchange protocols for logbook, sampling data and carrying capacity data collection
- Analyze the species composition from scientific sampling and from canneries

Data management

Objective: Insure that the Ghanaian team has at their disposal and handles the same tools for data entry, management and processing used by the European and associated tropical surface fleets.

- Update AVDTH English version used by Ghana and train the local team using it
- Translate and improve data validation software (Akado)
- Translate and adapt processing software (T3 +) for Ghanaian statistics case taking into account mix fisheries (*i.e.*, purse seiners cooperating with baitboats and large purse seiners operating alone)
- Transfer and eventually adapt software ObServe for introduction and management of observer data

Coordination and data processing

Objective: Insure a good coordination between technical and scientific teams. Insure adequacy and evolution of procedures and tools. Enhance common analysis and scientific contributions to ICCAT Working Group.

- Participation of Ghana to the annual coordination meeting of EU and associated scientific teams monitoring tuna surface fisheries. During these annual meeting organized alternatively in France and Spain, sampling collection activities, database and tools are regularly discussed and revised and common scientific contributions to the ICCAT Working Group are identified and planned.

The project should consider:

- Equipment (Computers, ichtyometers, etc.)
- Software development (Akado; T3 and ObServe)
- Travel funds:

a) IRD team in Ghana (1 week/yr)
b) Participation of Ghanaian team in Europe for annual coordination meetings (1 week/yr)
c) Participation of Ghanaian team to the Observer Program inter RFMOs meeting which will take place in France in April 2012 (probably associated with (b)).

Work Plan for North and South Atlantic and Mediterranean Albacore

The Albacore Species Group does not envisage a stock assessment in 2012. Moreover, it reiterates the fact that several key uncertainties remain and significantly affect our understanding of albacore dynamics and stock status. Thus, the working group plans to focus on improving statistics as well as conducting biological research and modeling during 2012.

North Atlantic Stock Proposed Work Plan for 2012

Given the uncertainties identified by the group, and considering the abnormal situation in the north east Atlantic fisheries during the last three years, the Group reiterates the need to carry out a comprehensive research program (Ortíz de Zárate, 2011) that had been presented for support by the Contracting Parties and allocation of funds. The main research objectives identified by the Albacore Species Group are:

1. Improved knowledge of the population dynamics of albacore in the North Atlantic.
2. Improved understanding of the interactions between the biological and ecological processes of the albacore stock and the fisheries.
3. Reduced uncertainty in stock assessment, e.g. modeling of biological processes and indices of abundance, considering spatial, environmental, behavioural and targeting issues.

4. The provision of robust management strategies for the sustainable exploitation of the stock at MSY that take into account social and economic objectives.

The Committee endorses the proposed research plan in SCRS/2010/155 and the *Addendum to the Albacore Work Plan* and recommends funding be initiated in 2012 or as soon as possible.

South Atlantic Stock Proposed Work Plan for 2012

During 2012, the group will focus effort on:

- Updating time series of standardized CPUE for the main surface and longline fleets
- Exploring the influence of spatial and environmental variables on CPUE standardization
- Research on biological parameters (e.g. reproduction)

Mediterranean Albacore Stock Proposed Work Plan for 2012

During 2012, the group will try to improve the "data poor" situation of this stock by focussing on the following tasks:

- Revision and completion Task 1 and Task II series
- Update and, where ever possible, extend back in time the existing CPUE series, so that long enough, consistent CPUE series become available for the group.
- Considering that biological data have likely been collected in different data collection programs (e.g. EU/DCR), it is recommended that a concerted effort be made to consolidate these data in an appropriate form for analyses.
- Pursue biological studies (e.g. integrated growth analysis)

Addendum to Albacore Work Plan

North Atlantic Albacore ICCAT Research Program

The Albacore species Group reiterates the last year proposal to initiate a coordinated, comprehensive research program on North Atlantic albacore to advance knowledge of this stock and provide more accurate scientific advice to the Commission.

The research plan will be focussed on three main research areas: biology and ecology, fisheries data and management advice during four-year period. Each of these main topics includes more detailed research aims as is presented in Ortíz de Zárate, 2011. The requested funds to develop this research plan have been estimated in a cost of 4.3 million Euros. The research program will be an opportunity to join efforts from European scientists from research institutes involved in the albacore fisheries as well as CPC's scientists involved in the research of longline fisheries of North Atlantic albacore.

Research aim	*Feasibility*	*Priority*
1. Biology and Ecology	1 to 4	1 to 3
- Reproductive biology (maturity, spawning area and season, and sex-ratio)	2	1
- Growth (validation, growth modelling by sex)	1	1
- Stock structure, genetics	1	1
- Natural mortality, conventional tagging (*)	4	3
- Habitat and migration (wintering and feeding areas; horizontal and vertical distribution),electronic tags (*)	2	1
- Feeding ecology (isotopes)	1	3
2. Fishery data		
- Recovery of catch, effort and size from logbooks and increase the number of size samples for longline and surface fleets	1	1
- Efficiency of fleets	1	1

3. Modelling		
- Environmental influence on the population dynamics	2	1
- Improve relative abundance indices by means of CPUE's analyses	2	1
- Improve conversion of catch-at-size into catch-at-age	2	1
- evaluate uncertainties under alternative hypothesis and models used	1	1
- Evaluate robustness of alternative management strategies, uncertainties	1	1

Cost estimates in Euros (*) all tagging activities: conventional and electronic

Biology and ecology: estimated budget	€3,790,000
Fishery data: estimated budget	€250,000
Modelling: estimated budget	€300,000
Total estimated cost for a 4 year program	€4,340,000

Bluefin Tuna Work Plan

1. Overview

The last bluefin tuna stock assessment (East and West) was conducted in 2010 and the next has been scheduled by the Commission for 2012. This short intermission has not allowed time for key research projects to be completed; therefore the Group plans to focus on updating the analyses used to provide management advice in 2010. Seven days in early September are deemed to be sufficient to conduct this work and write the report.

The Bluefin Species Group reiterates that a three to four year period between assessments would be more appropriate because bluefin tuna is a long-lived species and it takes several years to detect changes in bluefin biomass in response to changes in exploitation or management. A longer period would also allow scientists more time for inter-sessional work focusing on the research activities outlined within the Bluefin Research Plan, such as large-scale tagging, aerial surveys, otolith micro-constituent analyses, genetics and reproductive biology. Moreover, such an interim would provide an opportunity for the Bluefin Tuna Species Group to improve models for evaluating bluefin dynamics and status (which can hardly be done during a stock assessment year), including forecasting and operating models that incorporate spatial variability and mixing.

The group recommends an inter-sessional meeting in 2013 to incorporate new data and biological information that have been collected during the recent national research programs and GBYP and to review progress in modeling approaches, including mixing.

2. Data submission

Task I and II data for the eastern and western stock through 2011 should be submitted to the Secretariat by the June 30rd (before the July 31 deadline) so that the Secretariat can incorporate the statistics into the database. *Action National Scientists and Contracting Parties.*

The standardized CPUE series used in the 2010 assessment (East and West) should be updated including 2011 and made available as working papers by the first day of the meeting. The length database of ICCAT should be also checked and validated. *Action National Scientists and Secretariat.*

3. Catch and VMS summaries

The Secretariat should prepare summaries of the available catch data, catch-at-size, catch-at-age and VMS data (i.e. effort by gear/year/month/area) by the start of the meeting. *Action Secretariat.*

4. Assessment

The stock assessment work should focus on updating the analyses conducted in 2010 that were used to provide management advice. Mainline advice should be based on results from validated and documented software retained in the ICCAT catalog. These catalog entries need to be completed by April 2012. *Action National Scientists.*

Billfish Work Plan

Background

The Working Group initially proposed to conduct a Data Preparatory Meeting in 2009 and the next assessment of blue marlin and white marlin in 2010. These meetings were later postponed to 2010 and 2011 to better accommodate the 2009 Atlantic sailfish stock assessment. Due to genetic analyses and model projections results reported by Beerkircher *et al.* (2009), historical catches of white marlin may also inadvertently reflect significant numbers of roundscale spearfish and even longbill spearfish. For this reason, the working group felt that a white marlin assessment would not be possible in 2011, until this problem is resolved.

In 2009 the Working Group proposed to conduct the assessment through a three stage process:

1. Hold a data preparatory meeting for blue marlin in the first half of 2010 to produce catch estimates, update biological parameters, and estimate relative abundance indices for blue marlin which was successfully completed.
2. Conduct an assessment of blue marlin in 2011 and develop white marlin catch estimates, including a major effort to separate catches of roundscale spearfish (and other spearfish) from white marlin catches to the extent possible. We anticipate this effort will require an investment of funds by ICCAT through the Enhanced Research Program for Billfish (ERPBF) to accelerate the genetic analyses currently being conducted on this topic. Update biological parameters and estimate relative indices of abundance for white marlin if possible. Data in support of the blue marlin assessment and white marlin data preparatory meeting evaluation must be available at least two weeks in advance (Task I and Task II, including any revisions to historical time series, through 2009, submission of more recent data is also encouraged, but not required) of the assessment meeting.
3. Conduct an assessment of white marlin in 2012.

The last stock assessment for blue marlin was conducted in 2011 and for white marlin in 2006. No assessments have ever been conducted on spearfishes (*Tetrapturus spp.*). During 2009 the Working Group conducted the first successful assessments for western and eastern Atlantic sailfish stocks.

Proposed work for 2012

Blue marlin

All countries catching blue marlin (directed and by-catch) should contrast their information with the blue marlin catalog for Task I and II detailed in the 2010 Report of the Blue Marlin Data Preparatory Meeting (Anon. 2011d), and provide the updated information by next SCRS meeting.

The new catch estimates of blue marlin from FAD fisheries of Martinique and Guadalupe (EU France) used in the recent blue marlin assessment need to be documented and presented as an SCRS document in the next species group meeting, in order to incorporate them into the Task I database.

The group will explore the development of the historical Japanese longline fine-scale catch rate index.

Continue the Atlantic-wide study on age and growth of blue marlin.

White marlin

Data in support of the white marlin assessment meeting must be available at least two weeks in advance (Task I and Task II, including any revisions to historical time series, through 2010, submission of more recent data is also encouraged, but not required) of the assessment meeting.

During the white marlin data preparatory meeting, it was concluded that the amount of variability in the observed ratios between white marlin and round scale spearfish (annual and inter-annual) and the insufficient spatial sampling coverage would preclude the ability to reliably estimate proportions of roundscale spearfish from white marlin catches at present. It was decided to base the white marlin assessment (2012) on the information being reporting as white marlin.

All countries catching white marlin (directed and by-catch) should contrast their information with the white marlin catalog for Task I and II given in the Detailed Report of the Blue Marlin Stock Assessment Session and White Marlin Data Preparatory Meeting, and provide the updated information at least two months prior to the white marlin assessment.

Prior to the stock assessment, CPCs should provide historical series of numbers of white marlin discarded dead and released alive so that the effect of discarding and releasing can be fully integrated in the stock assessment. Efforts should be made to obtain reliable estimates of discards with regard to quantity and length composition.

In addition to the surplus production model to be used in the assessment, the application of statistically integrated assessment models should be explored to take into consideration, seasonal catch, effort, size information for all gears, and alternative geographic stratification. Review of input parameters required for the statistically integrated model will be conducted via web-based.

During the 2012 white marlin assessment the group will explore the use of informative priors of the stock recruitment steepness parameters.

Update biological parameters for white marlin (sex ratio at size, age and growth).

All Istiophorid species

Continue to support the improvement of biological sampling of all billfish species.

Continue to support on the age and growth of sailfish and longbill spearfish.

Continue to support on sailfish reproduction off the West Africa and Atlantic coast of South America.

Swordfish Work Plan

Background

The last assessments for North and South Atlantic swordfish were conducted in 2009. The next assessment is proposed for 2013.

For the Mediterranean stock, the last assessment was conducted in 2010 (Anon. 2011f). The next assessment should take place not before 2013 except if negative indicators arise from the fisheries.

Proposed work

North Atlantic and South Atlantic

The Species Group, with the assistance of the Secretariat, should complete its work evaluating possible limit reference points for North Atlantic swordfish, as requested by the Commission in Rec. 10-02.

A list of recommended work has been provided in the Report of the 2009 ICCAT Atlantic Swordfish Stock Assessment Session (Anon. 2010c). Among those recommendations, the following were identified as high priority areas where continued efforts are required:

- Data Preparatory and Methods Meetings. Due to time constraints, recent sessions of the Swordfish Working Group have provided assessments that have updated past results using methods and approaches available at the time. The Group recognizes that newer stock assessment approaches are now available which more fully incorporate biological data and provide more complete representations of uncertainties in stock status. To allow the Group time to explore the new approaches and to assemble the data in advance of the stock assessment session, it is recommended that a working session of five days duration be convened prior to the next assessment. Based on experience with other stocks, it is recommended that the data preparatory and methods meeting take place in the same year that the assessment meeting is scheduled (2013).

- Catch. All countries catching swordfish (directed or by-catch) should report catch, catch-at-size (by sex) and effort statistics by a small an area as possible, and by month. These data must be reported by the ICCAT deadlines, even when no analytical stock assessment is scheduled. Historical data should also be provided.
- CPUE series. It is recommended that given the similarity between part of the Brazilian and Uruguayan swordfish fishing fleets and taking into account that the CPUE standardization studies of both fleets submitted at the meeting differ in their methods and results it would be desirable that scientists from Brazil and Uruguay hold inter-sessional meetings to deal with the standardization of CPUE series and processing of data from their respective fleets.
- Assignment of ages. The computer codes used for ageing swordfish in the Atlantic should be updated. The new sex-specific growth curves (Arocha *et al.* 2003) should be incorporated, and its impact in terms of the catch-at-age estimation, as well as its consistency with the tagging data should be evaluated before a new set of growth curves is formally adopted by the Group.
- Discards. Information on the number of undersized fish caught, and the numbers discarded dead and released alive should be reported so that the effect of discarding and releasing can be fully included in the stock assessment. Observer sampling should be sufficient to quantify discarding in all months and areas in both the swordfish directed fisheries and the tuna fisheries that take swordfish as by-catch. Studies should be conducted to improve estimation of discards and to identify methods that would reduce discard mortality of swordfish. Studies should also be conducted to estimate the subsequent mortality of swordfish discarded alive; these are particularly important given the level of discarding due to the minimum size regulatory recommendation.
- Target species. All fleets should record detailed information on log records to quantify which species or species group is being targeted. Compilation of detailed gear characteristics and fishing strategy information (including time of set) are very strongly recommended in order to improve CPUE standardization. The recommendations made by the 2002 meeting of the Working Group on Methods for looking at diagnostics in this context should be followed. The Group recommended the investigation of alternative forms of analyses in the south that deal with both the by-catch and target patterns, such as age- and spatially-structured models.
- Recruitment indices. The Group's ability to forecast stock status within the VPA is contingent on the availability of reliable indices of abundance at the youngest ages. For example, age-1 indices of abundance are only available up to 2001. Countries that have traditionally provided such indices should update their time series, as a matter of high priority. This research should be supported at the Contracting Party level.

Mediterranean

- Catch and effort. All countries catching swordfish (directed or by-catch) should report catch, catch-at-size (by sex) and effort statistics by as small an area as possible (5-degree rectangles for longline, and 1-degree rectangles for other gears), and by month. It is recommended that at least the order of magnitude of unreported catches and discards be estimated. The Group noted that it is important to collect size data together with the catch and effort data to provide meaningful CPUEs by age.
- Gear selectivity studies. Although some work has been already done, further research on gear design and use is encouraged in order to minimize catch of age-0 swordfish and increase yield and spawning biomass per recruit from this fishery.
- Stock mixing and management boundaries. Considering differences in the catch and CPUE patterns between different Mediterranean fisheries, further research, including tagging investigations, in defining temporal variations in the spatial distribution pattern of the stock will help to improve stock assessment and management.

Small Tunas Work Plan for 2012-2013

The following recommendations should be taken into account for improving Task I and Task II data and conducting future assessment in order to provide ICCAT with appropriate management advice for fisheries targeting small tuna:

1. All countries should report Task I and Task II data and make effort to improve knowledge on the biology and the stock structure and other relevant aspects of these species;
2. National scientists should review their catches and try to classify them by species;
3. Support national scientists working on small tuna species to participate in the ICCAT meetings;
4. CPCs should ensure a large distribution of the ICCAT small tunas species identification sheets to improve their Task I statistics data;
5. Set up an ICCAT Year Research Programme for small tuna species, the details of this program are attached as the *Addendum to the Small Tunas Work Plan*;
6. Continue studies on stock structure and species distribution;
7. Develop simple indicators of stock sustainability such as proportion of juveniles within the catch and statistical trends in historical catches;
8. Collaborate, as much as possible through joint Working Groups, with RFOs (GFCM, CRFM, COPACE, and CECAF) to improve and exchange basic fisheries data on SMT; Include blackfin tuna (*Thunnus atlanticus*) in the small tunas chapter of the *ICCAT Manual;*
9. Follow progress of blackfin tuna aquaculture experiments being performed by the University of Miami (United States).

Addendum to Small Tunas Work Plan

A Proposal to Set Up an ICCAT Year Research Programme or Small Tunas (SMTYP)

Overview

The status of small tuna stocks in the ICCAT Convention area is generally unknown. Nevertheless these species have a high socio-economic relevance for a considerable number of local communities at the regional level, which depend on landings of these species for their livelihoods.

Fisheries statistics and biological data which can provide a basis for assessing these resources and thus providing the Commission with the appropriate scientific advice for their sustainable exploitation are generally unavailable for these species.

To deal with this issue and to achieve the objectives established by the 2008 joint ICCAT GFCM working group, it is now high time to establish an ICCAT Year Research Programme for Small Tunas (SMTYP), whose the main objective for the first two years will be the collection of statistics and biological data as well as the recovery of all the historical available data in the main fishing areas, with a focus on the priority species identified by the ICCAT/GFCM in 2008. This program has a wide geographical sampling coverage to include also the Caribbean Sea.

The work plan for this programme would be as follow:

January 2012- June 2013: Priority for the collection of all the available data (statistical and biological data) in the main fishing area:

- Mediterranean and Black Sea: Bullet tuna, Atlantic bonito, little tunny and plain bonito;
- West Africa: Atlantic bonito, little tunny, bullet tuna and West African Spanish mackerel; frigate tuna, wahoo
- Caribbean area: Blackfin tuna and serra Spanish mackerel, king mackerel

July 2013: A small tuna data preparatory meeting to gather and analyze the recovered data in the main area mentioned above. Exchange of information and data between national responsible scientists in each area by email, after an agreement between ICCAT and other RFOs concerned (GFCM, CECAF, CRFM, and WECAF).

***September -October** 2013:* Presentation of the preliminary results obtained to the SCRS Species Group.

Estimation of the preliminary budget:

Sampling area	*Participating countries*	*Species sampled*	*Total budget (Euros)*
East Mediterranean	Turkey Egypt	Bullet tuna, Atlantic bonito, little tunny and plain bonito;	15,000.00
Central Mediterranean	Tunisia Italy	Bullet tuna, Atlantic bonito, little tunny and plain bonito;	15,000.00
West Mediterranean	Morocco Spain	Bullet tuna, Atlantic bonito, little tunny and plain bonito	15,000.00
West Africa	Morocco Mauritania Senegal Cape Verde Côte d'Ivoire	Atlantic bonito, little tunny, bullet tuna and West African Spanish mackerel; frigate tuna, wahoo	35,000.00
Caribbean area (western Atlantic)	CARICOM countries Brazil Venezuela	Blackfin tuna and Serra Spanish mackerel	15,000.00
Total			95,000.00

Sharks Work Plan

General comments

As on other occasions, the Group noted the absence of scientists from the Parties that catch shark species, thereby limiting the possibilities of access to information. This situation is not unique to this Group and this poses a problem that should be resolved by a strong commitment of the Parties.

Work Plan

- Carry out the Ecological Risk Assessment (ERA)

Two coordinators were selected (E. Cortés and A. Domingo) to compile the necessary information provided by the national scientists to develop the ERA. The information required, which is given in detail in the report of the inter-sessional meeting (Item 3 and Appendix 4), should be available prior to the end of 2011.

- Assessment of *Isurus oxyrinchus*

Contact the national scientists who could assist in running the models. Request the CPCs to conduct a review of their historical catches and carry out the following tasks two months prior to the assessment:

- Catches (Secretariat)

  a) Comparison of shark catches available in the ICCAT databases compared to the Eurostat data.
  b) Estimation of catch series using the tuna:sharks ratios.
  c) Estimation of catch series using shark fin trade information.

- Effort (Secretariat)

  Updating of the time series of estimated longline effort (EFFDIS) prior to the assessment

- Specific gear/fleet selectivities (U.S. scientists)

  Estimation of the gear/fleet selectivities to use in those models that do not estimate them internally, revising the methodology and the biological data used.

- Biological data (Uruguayan scientists)

  Review of the biological data on shortfin mako used in the last assessment and update them if necessary.

- Catch rates (U.S. scientists)

  Compile the catch series sent by the national scientists and estimate the combined CPUE series.

Working Group on Methods Work Plan

The plan for 2012 includes:

1. The Blue Marlin and Shark Working Groups requested the Working Group on Stock Assessment Methods to investigate and test the GLMtree model for CPUE standardization and especially for use for by-catch species.

2. Generic methods for combining and standardizing multiple CPUE series for inclusion in stock assessment models will be investigated and generic methods for these procedures will be developed.

3. Methods for selecting appropriate CPUE series for inclusion in assessment models are crucial. For many species groups there has been concern as to which CPUE series have been included in the assessments in 2011. The Group aims to develop generic protocols for the inclusion or use of CPUE series in assessment models (rigorous assessment of CPUE series including hind casting).

4. As requested by the Sub-Committee on Statistics, methods for monitoring and evaluating recreational fisheries will be investigated.

5. The Group aims to generate simulated data sets for testing generic assessment techniques and methods (multiple sets for multiple species life histories).

Appendix 5

ICCAT ATLANTIC-WIDE RESEARCH PROGRAMME FOR BLUEFIN TUNA (GBYP)
ACTIVITY REPORT FOR 2011 (PHASE 2)

1. Introduction

The Atlantic-wide Research Programme for Bluefin Tuna was officially adopted by SCRS and the ICCAT Commission in 2008, and it started officially at the end of 2009, with the objective to:

a) Improve basic data collection, including fishery independent data;
b) Improve understanding of key biological and ecological processes;
c) Improve assessment models and provision of scientific advice on stock status.

The total budget of the programme was estimated at about 19 million Euros in six years, with the engagement of the European Community and some other Contracting Parties to contribute to this programme in 2009 and in the following years. The initial year had a budget of 750,000 Euros, while the second phase had a total budget of 2.502.000 Euros (against the original figure of 3,476,075 Euros).

Phase 1 and Phase 2 activities were jointly committed by the European Community (80%), Canada, Croatia, Japan, Libya, Morocco, Norway, Turkey, United States of America, Chinese Taipei and the ICCAT Secretariat. Some private entities provided funds or in kind support; the detailed list is available on http://www.iccat.int/GBYP/en/Budget.htm.

2. Coordination activities

The GBYP Phase 2 officially started on 22 December 2010, with the signature of the agreement between the European Community and the ICCAT Secretariat. A detailed weekly work-plan for 2011 was set up in the very first period of this second Phase. The GBYP Coordination staff was reinforced with a Coordinator Assistant. Dr. M'Hamed Idrissi, who started his duties on 1 March 2011. The ICCAT Secretariat nominated Dr. Laurence Kell as internal focal point for the GBYP activities.

A relevant activity at the early beginning of Phase 2 was the organisation of the three meetings planned in February, which required considerable effort. The participation of 44 scientists from 11 countries and the extremely positive comments received compensated all efforts and confirmed the positive reaction of the scientific community and stakeholders to the GBYP activities. Another meeting (the Symposium on Traps) was organised in Tangier in May 2011, with the participation of 58 scientists.

During this Phase 2 it was necessary to issue nine Calls for Tenders on various items and a total of 18 contracts were signed by the ICCAT Secretariat. The EC Grant Agreement includes 19 deliverables (periodic reports) and many have been already delivered. The administrative and desk work behind these duties was quite important. In Phase 2 of GBYP, the coordination staff participated officially in 14 meetings in various countries. Furthermore, the GBYP coordination is providing scientific support to all the national initiatives which are potentially able to increase the effectiveness of the GBYP and its objectives.

The detailed report is available in document SCRS/2011/166.

3. Steering Committee

The GBYP Steering Committee was renewed after the 2010 ICCAT Commission meeting. The members are the Chair of SCRS, Dr. Josu Santiago, the BFT-W Rapporteur, Dr. Clay Porch, the BFT-E Rapporteur, Dr. Jean-Marc Fromentin, the ICCAT Executive Secretary, Mr. Driss Meski, and an external expert, Dr. Tom Polacheck, who was duly contracted.

The activity of the Steering Committee included continuous and constant e-mail contacts with the GBYP coordination, which provided the necessary information. The Steering Committee held two meetings (February 17, 2010; June 27-July 1, 2011), discussing various aspects of the programme, providing guidance and opinions. A third meeting is planned during the SCRS Species Group meeting, to define the activities and the budget options for Phase 3.

4. Data mining and data recovery

The data mining and data recovery activity continued following the objectives recommended by the Steering Committee, with a particular focus on tuna trap data series. Two Calls for Tenders were issued and seven contracts were awarded. A very important amount of data, previously not included in the ICCAT database, was recovered, particularly for tuna trap series, which now start from 1525, including about 25 million new entries for tuna trap catches and about 33,000 new entries for other fisheries. With these data, GBYP is filling many of the existing gaps, but not all, extending the historical data series back in centuries. All data were provided on the forms provided by the ICCAT Secretariat, according to the needs of the ICCAT database.

GBYP also acquired SST data for the three months of the main spawning period (May-June-July) for the years 2000-2011. These data are used for the spatial analysis of the aerial survey data and they are also available for further analyses by SCRS. Following the same approach agreed in Phase 1, aerial survey data have been analised also within the data recovery budget and the final results will be available at the end of 2011. In Phase 2, the team elaborating on the data has been requested to provide extensive survey scenarios for setting up the GBYP working programme for 2012 and the following years.

5. Aerial surveys

The aerial surveys have the scope to provide fishery-independent indices on various fractions of the stock. The aerial surveys targeting spawning aggregations can potentially provide trends and indices for the spawning stock biomass, while aerial surveys targeting aggregations of juveniles can potentially provide indices for recruitment. Surveys shall be conducted with a statistically sound design and for several years in order to get reliable indices. Since the beginning of the GBYP, it was decided to concentrate all efforts on spawning aggregations, while the surveys on juveniles should be conducted by the various countries concerned.

In Phase 2, as planned, the activity was preceded by a Workshop on Aerial Survey (February 14-16, 2011). The Workshop discussed how improving the methodology and which technical requirements should be necessary. The Steering Committee endorsed most of the recommendations.

A training course for pilots, professional observers and scientific observers concerned with the GBYP Aerial Survey activity was organised at the ICCAT Secretariat on May 17-18, 2011.

5.1 Aerial survey design

The preliminary work was devoted to updating the identification of the most relevant areas and this was carried out at the ICCAT Secretariat using the 2008 to 2010 VMS data from tuna purse seine vessels. It was agreed to concentrate efforts only on areas where the PS fishing activity was more intense in these last three years and 4 or 5 sub-areas were identified, under two different scenarios.

The study for the aerial survey design was committed to the same team who provided the design for Phase 1, adopting the same methodological approach (DISTANCE software). The design was provided on March 30, 2010 and the ICCAT Secretariat provided the revised file to submit the survey data.

5.2Aerial survey on spawning aggregations

The aerial survey on spawning aggregations was carried out by three companies, selected over four tenders and the contracts were discussed and agreed on May 17, 2011. All tenders were able to get the flight permits from Spain, Italy, and Malta in due time, but it was not possible to get flight permits from Syria, while the permit from Turkey was released after the expiry date of the survey. All these problems imposed a revision of one contract and, at the same time, a revision of the aerial survey design, limiting the areas to three (Balearic area, South Tyrrhenian Sea and central Mediterranean), in agreement with the Steering Committee. The aerial survey started at the beginning of May and was completed on July 15, 2011.

The monitoring of the sea surface temperatures and sea state and winds was carried out by the coordination team and data were provided to the various teams in real time. The wind in the western Mediterranean and in the Tyrrhenian Sea, some international constrains in the central Mediterranean, and some technical problems of two aircraft created additional operational problems for the aerial survey in Phase 2. Three aircraft and teams conducted the surveys in the various sub-areas, while a fourth aircraft and its team was stopped in Turkey. The aerial survey data have been provided on schedule by all teams and the individual reports are already available.

A contract was provided to the same team that provided the data elaboration in Phase 1, to analyse the aerial survey data. The interim report was provided in due time (September 19, 2011) and the results are considered very useful for improving and developing the aerial survey activities in the following years, also providing the various scenarios for a comprehensive Mediterranean survey in Phase 3, as requested by the Steering Committee. This second year activity of aerial surveys confirmed the validity of the methodological approach in general, as one of the very few able to provide fishery independent data and trends. At the same time, the problems encountered showed the need to get very precise commitments from the CPCs concerned, in order to carry out the necessary flight permits on time.

The final report concerning the elaboration on aerial survey data, the spatial analyses and the complete range of scenarios and designs for the comprehensive surveys will be provided before the end of Phase 2, according to the contract.

6. Tagging

The GBYP tagging activity was planned from Phase 2. The tagging design, elaborated as a draft in Phase 2, was better defined in the first part of Phase 2. The operational meeting on biological sampling was held at the ICCAT Secretariat in Madrid on February 17, 2011, to discuss the many aspects of this complex activity and the GBYP Tagging Design, including the GBYP Tagging Manual, which were officially adopted. The meeting was attended by 42 scientists.

The Tagging Design was officially adopted by the Steering Committee and it is considered extremely relevant, because an appropriate tagging activity is a better estimate of natural mortality rates (M) by age or age-groups and/or total mortality (Z), of course if the tag reporting rate substantially improves, reaching a sufficient level by major fisheries and areas, and this should improve knowledge on the habitat utilisation and movement patters of bluefin tuna in the various areas. It is the base for carrying out the tagging activities in the following years, with important implications on the GBYP budget.

A sufficient number of conventional tags were acquired on time (10,000 single barb dart, 8.000 double barb small darts and 2,000 double barb big darts), along with a sufficient number of tag applicators and 50 PIT readers.

6.1 Tagging activity

The GBYP tagging activity was defined by the Steering Committee on February 17, 2011 and refined during the summer meeting (June 27-July 1, 2011). A Call for Tenders was issued on May 12, 2011 and only one bid was received. The bid was not awarded and another Call for Tenders was issued on June 11, 2011. Another bid was submitted and awarded on July 9, while the contract was released on July 29, 2011 to a Spanish consortium of six entities.

The tagging activity will be carried out on juvenile bluefin tunas (age 0 to age 3) in the Bay of Biscay by baitboats (about 1250 tunas), in the area of Gibraltar by baitboats (about 1250 tunas), in the western Mediterranean by a purse seiners (about 1250 tunas) and in the central Mediterranean by a purse seiners (about 1250 tunas). A complementary tagging activity will be carried out, on an opportunistic basis, by the sport fishermen (possibly 500-700 tunas).

The tagging activity started immediately, and several operational problems were encountered, mostly due to bad weather conditions, but the first mid-term report, submitted by September 23, 2011, shows that about 2,000 tunas have been tagged to date and that the tagging activity will continue until the end of the period.

Another tagging activity, not included in Phase 2 due to budgetary problems, was carried out with electronic tags in a Moroccan trap, thanks to the cooperation of several institutions, the tuna industry and WWF-MEDProgramme (the details are included in the detailed report). A total of 11 large tunas were tagged and several tags are providing surprising and extremely interesting data.

6.2 Tag awareness campaign

According to the recommendations provided by the Steering Committee in all meetings, the GBYP started a tag awareness campaign, for the purpose of improving the tag recovery and reporting rates. This activity, which was carried out by ICCAT and SCRS for all species since various years, needed to be strengthened and further

improved, particularly after the start of the massive tagging activities by the GBYP. For this reason, it was decided to find a specific slogan, a dedicated logo, two types of posters and a leaflet, to be translated in Arabic, English, French, Greek, Japanese, Italian, Portuguese, Spanish and Turkish, and distributed capillary in the entire ICCAT Convention area for the purpose of reaching all stakeholders in all fisheries. A Call for Tenders was issued on July 28, 2011, and three bids were received. One bid was partially awarded and the first report was submitted on September 23, 2011 and the drafts of the various designs are now available. The final version will be available soon for printing the material before completing the tagging campaign. The tagging awareness campaign is coupled by a tag rewarding campaign strongly recommended by the Steering Committee. It was decided to improve the ICCAT annual lottery with GBYP rewards for tags recovered from bluefin tuna and regularly reported to ICCAT. High level rewards will be given for the recovery of each electronic tag from bluefin (1000 Euros) or for additional prizes for the annual ICCAT tagging lottery (an annual prize of 1000 Euros for the first tag drawn and two prizes of 500 Euros each, respectively for the second and third tags drawn, to be delivered during the ICCAT Tag Lottery. Within the same item, the ICCAT Secretariat and the GBYP coordination are working to detect an attractive design for the T-shirts to be used as rewards for each conventional tag recovered. It is also considered very important to provide immediate feedback to the tagging teams and the tag recovery person, informing both of them about the history of each tag.

7. Biological and genetic sampling and analyses

Biological and genetic sampling and analyses have been planned from Phase 2. The details were discussed during a specific operational meeting held at the ICCAT Secretariat on February 17, 2011, which was attended by 42 scientists. The meeting discussed in depth all the various aspects and suggested having a common scheme. The Steering Committee, on the same day, endorsed this suggestion and recommended issuing a Call for Tenders for a "Biological Sampling Scheme" to be used to more precisely establish the sampling levels in the various areas and fisheries in the Phase 2 activity. The Call was issued on March 11, 2011, and only one bid was received, which was awarded to a consortium of 13 institutions from 8 countries on July 14, 2011.

Taking into account that some areas and fisheries included in the "Biological Sampling Scheme" cannot be sampled due to concurrent geo-political factors, the sampling activity under contract includes now a total of 1950 samples, including 50 larvae, 1300 for genetic tissue, otoliths and spines, and 600 for genetic tissue, otoliths, spines and gonads. A first report was received on September 24, 2011 and about 1000 tunas have been sampled as of that date, while the analytical works had already started.

The GBYP activity will be supported by a twin programme carried out by NOAA-NMFS, which will focus the research activities on the western Atlantic Ocean.

8. Modelling approaches

To ensure that modelling work would be started this year, the GBYP issued a Call for Tenders on March 15, 2011 for Stock Assessment Modelling, for a first set of contracts. These were: (a) one contract for a risk analysis to identify the main perceived sources of uncertainty related to assessment and advice, and (b) two contracts to help develop new assessment and advice based on various data sets being collected and the new knowledge being gained under the GBYP. Unfortunately, only one bid was received for the second theme. Two contracts were awarded on April 5, 2011 and the methodologies were presented at the ICCAT Working Group on Stock Assessment Methods (WGSAM) on June 27-July 1, 2011, where one day (June 28) was devoted to bluefin tuna issues. The preliminary reports on the work done were presented at the Bluefin Tuna Species Group on September 29, 2011. Additional work was developed by a team of SCRS scientists together with Dr. Laurie kell of the ICCAT Secretariat and presented at the WGSAM.

9. Cooperation with ROP

The GBYP coordination, together with the ICCAT Secretariat, is maintaining the contacts between the two consortiums in charge of the biological sampling and tagging and the ROP observers, for strengthening the cooperation and providing opportunities.

10. Definition of GBYP publication policy, editorial and data rules

The GBYP publication policy, along with editorial and data use rules adopted in Phase 1 were updated by the GBYP Steering Committee during the last meeting (June 26-July 1, 2011). They are available on the ICCAT web site at: http://www.iccat.int/GBYP/en/PubRules.htm

11. GBYP web page

The ICCAT-GBYP web page, which was created in the last part of Phase 1, is usually regularly updated with all documents produced by GBYP; in some cases, due to the huge workload, some sets of documents are posted all together. The updating also includes the budget page, where all contributions (monetary of in kind) are regularly listed, to ensure full transparency.

12. Following activities

The next phases of the Atlantic-Wide Research Programme for Bluefin Tuna will mostly include activities able to provide fishery independent data and indices within the time-frame of the whole programme and in agreement with the GBYP general plan adopted by the SCRS and the ICCAT Commission. Additional activities will be developed for the modelling approaches.

The Steering Committee and the GBYP Coordination agreed to continue the discussion during the SCRS meeting, where the various options will be discussed and selected, with the necessary budget variations. It is to be noted that the current budget figure is very far from the budget figure adopted by the Commission in 2009 for Phase 3, which was on the order of about 6.3 million Euros and this is caused by the announcement of the reduced contribution available from some CPCs.

GBYP Phase 3 (still temporarily under the reduced minimum budget perspective) will include, in principle, the following activities:

1) **Coordination**.
2) **Data mining, data retrieval and data elaboration**, including data input in the ICCAT database.
3) **Aerial surveys,** including the updating of the aerial survey design and the third year survey on spawning aggregations. Based in the results of the analyses of the 2010 and 2011 aerial surveys data, the Steering Committee recommended, and the SCRS approved, the extension of the survey area in 2012 and forward as the only way to obtain reliable independent indices of spawners from aerial surveys to be used for monitoring the stock. This extension will imply additional costs on the order of 1.2-255 million Euros per year[1] for more than one year (up to and including 2022 considering CV=0.4); the figure in the budget includes the minimum amount for conducting an extended survey and the additional activities required by the Steering Committee). Without the adequate financial support and the guarantee of flight permits these surveys would not secure obtaining reliable results.
4) **Tagging**, including conventional tagging, a limited electronic tagging (50 tags) and activities to improve tag reporting, with the related rewards; a recapture campaign was also requested by the Steering Committee and approved by the SCRS;
5) **Biological sampling**, including hard parts sampling for ageing and micro-constituent analysis, genetic sampling and related analysis.
6) **Modelling,** including two workshops, risk analysis, alternative MF and modelling trials.

The GBYP Phase 3 budget and activities will be revised by the Steering Committee and the SCRS in the last part of Phase 2, according to the updated budget perspectives and the research needs. The provisional calendar for the meetings in Phase 3 will be defined after these decisions.

[1] The Steering Committee noted that, in addition to the budgetary implication, any type of survey has serious scientific problems if the coverage will not include all the areas where the bluefin tuna spawning activity is usually occurring with the highest intensity, e.g., the far eastern Mediterranean Sea. If the new budget proposed or the permits to operate in these areas are not guaranteed, then the survey should be suspended. At the same time, the commitment for the aerial survey should be for a number of years sufficient to provide a reliable trend.

Table 1. GBYP reduced minimum budget for Phase 2 (2010-2011) and Phase 3 (2011-2012).

GBYP PHASE 2 (2010-2011)		*GBYP PHASE 3 (2011-2012)*	
Allocation	*Amount (€)*	*Allocation*	*Amount (€)*
Coordination	453,00000	Coordination	463,980.00
Data mining, data recovery, data elaboration, Trap Symposium	149,000.00	Data mining, data recovery, data input and processing	133,000.00
Aerial survey (including updating design, workshop and training course)	465,000.00	Aerial survey (including updating design and the workshop)	1,370,000.00
Tagging (conventional, PITs, tag recovery and reporting, rewards)	890,000.00	Tagging (conventional, PATs, tag recovery campaign and reporting, rewards) and an operational meeting	1,776,000.00
Biological sampling (including hard parts, genetic sampling and analysis)	505,000.00	Biological sampling (including hard parts, genetic sampling and analysis) and an operational meeting	540,000.00
Modelling (workshop)	40,000.00	Modelling trials and two workshops	135,000.00
Total	**2,502,000.00**	**Total**	**4,417,980.00**

Appendix 6

ICCAT ENHANCED RESEARCH PROGRAM FOR BILLFISH
(Expenditures/Contributions 2011 & Program Plan for 2012)

Summary and Program objectives

The ICCAT Enhanced Research Program for Billfish, which began in 1987, continued in 2011. The Secretariat coordinates the transfer of funds and the distribution of tags, information, and data. The General Coordinator of the Program is Dr. David Die (USA); the East Atlantic coordinator was Mr. Paul Bannerman (Ghana), while the West Atlantic Coordinator is Dr. Eric Prince (USA).

The original plan for the ICCAT Enhanced Research Program for Billfish (ICCAT, 1987) included the following specific objectives: (1) to provide more detailed catch and effort statistics, particularly for size frequency data; (2) to initiate the ICCAT tagging program for billfish; and (3) to assist in collecting data for age and growth studies. During past Billfish Species Group meetings, the Billfish Species Group requested that the IERPBF expands its objectives to evaluate habitat use of adult billfish, study billfish spawning patterns and billfish population genetics. The Billfish Species Group believes that these studies are essential to improve billfish assessments. Efforts to meet these goals continued during 2011 and are highlighted below.

The program depends on financial contributions, including in-kind support, to reach its objectives. This support is especially critical because the largest portion of billfish catches are coming, in recent years, from countries that depend on the support of the program to collect fishery data and biological samples. In recent years most of the financial support came from ICCAT funds but in 2009 and 2010 there were also contributions from Chinese Taipei.

2011 Activities

The following is a summary of the activities of the Program; more details of activities conducted in the western Atlantic can be found in SCRS/2011/163. Ten observer trips onboard Venezuelan longline vessels were completed by July 2011 and some more may be completed before the end of the year. Sampling of Venezuelan artisanal catches also continued in the central coast of Venezuela. Biological sampling from both the pelagic longline and artisanal Venezuelan fisheries has continued collecting biological samples of sailfish for reproductive studies, and for white marlin and spearfish for genetic identification. This year this program recovered 7 tagged billfish by July 2011.

The IERPB continued to support Brazil in their collaboration with United States institutions for testing the performance of circle hooks on board commercial vessels, deploying pop-up satellite tags, tissue sampling for genetic identification of white marlin and spearfish, and fin spine sampling for age and growth studies. With IERPB support, Uruguay continued to collect samples this year for age, growth and genetic identification of billfish onboard longline vessels.

In West Africa the program continued to support a review of billfish statistics in Ghana, Senegal and Cote d'Ivoire. Improvements of catch records from these countries are reflected in the Task I tables for billfish, and were obvious during the blue marlin assessment and white marlin data preparatory meeting of 2011. Support of this program facilitated the estimation of relative abundance indices for blue marlin from Ghana, and studies of blue marlin spawning off Côte d'Ivoire. The program also profited from the cooperation with Spanish scientists that collected genetic samples of billfish on-board longline vessels for the study on white marlin and spearfish identifications and of U.S. scientists involved in the processing of genetic samples.

Documents that were produced in 2011 with the benefit of direct support of the IERPB were SCI/2011/021, SCI/2011/026, SCI/2011/033, SCRS/2011/034, SCRS/2011/049, SCRS/2011/050 and SCRS/2011/163.

2012 Plan and activities

The highest priorities for 2012 are to support the collection and preparation of data relevant to the upcoming white marlin stock assessment. Such priorities will require to:

- support the monitoring of the Uruguayan, Venezuelan and Brazilian longline fleets through onboard observers, reporting of conventional tags, and biological sampling,
- support the monitoring of the Venezuelan artisanal fleet,
- support the collection of biological samples in West Africa,
- support the collecting and processing of samples of billfish for genetic studies, and
- support the monitoring billfish catches from west African fishing fleets.

All these activities depend on successful coordination, sufficient financial resources and adequate in-kind support. Details of IERPB funded activities for 2012 are provided below. Some of these will complement general improvements in data collection made with the support of the ICCAT data improvement program.

Shore-based sampling

Sampling of artisanal and small scale fisheries to support the estimation of catch and effort statistics will be focused on fleets contributing the largest parts of the catch and/or those having traditionally provided the higher quality data in the past, to ensure the preservation of an uninterrupted time series of catch and relative abundance indices.

West Atlantic

Sampling at landing sites will be conducted for gillnet landings in central Venezuela.

Eastern Atlantic

Monitoring and sample collection will be supported for the artisanal fisheries of Ghana, Sao Tome, Côte d'Ivoire, and Senegal.

At-sea sampling

West Atlantic

Continued support will be provided to the sampling made onboard the Uruguayan, Venezuelan, and Brazilian vessels that have been supported in the past by IERPB.

Tagging

The program will need to continue to support the conventional tagging and recapture reporting conducted by program partners.

Biological studies

The biological sampling program for collecting and processing genetic samples from billfish, particularly white marlin and spearfish, will continue in 2012. This program will aim to determine the ocean-wide ratio of white marlin to roundscale spearfish, including how this ratio has changed through time. The later will be done by taking advantage of the spine collections (from Venezuela, Uruguay, Brazil, Spain, and the United States) collected in the past with the support of the IERPB. Additionally the program will this year fund and provide sample kits for additional collection of samples for genetic identification of white marlin and spearfish. These sample kits and corresponding instructions will be distributed to scientists that can facilitate collection of genetic samples of white marlin and spearfish.

Efforts to collect biological samples for reproduction, age and growth studies requires IERPB support to facilitate cooperation from fleets that are monitored with IERPB funds. The emphasis of biological sampling for age, growth, and reproductive studies will be directed at sailfish and longbill spearfish.

Coordination

Training and sample collection

Program coordinators need to travel to locations not directly accessible to promote IERPB and its data requirements. This includes travel to West African countries, as well as the Caribbean and South America by the

general coordinator and the coordinator from the west. Strong coordination and between activities of the IERPB and the ICCAT data fund and financial support from the data fund will continue to be required.

Program management

Management of the IERPB budget is assumed by the program coordinators, with the support of the Secretariat. Reporting to the SCRSC is responsibility of the coordinators. Countries that are allocated budget lines for program activities need to contact the respective program coordinators for approval of expenditures before the work is carried out. Invoices and brief reports on activities conducted need to be sent to the program coordinators and ICCAT to obtain reimbursement. These funding requests need to be done according to the ICCAT protocol for the use of funds from ICCAT (2011 Report of the Sub-Committee on Statistics (see **Appendix 7**).

2011 Budget and Expenditures

This section presents a summary of the contributions and expenditures for the ICCAT Enhanced Research Program for Billfish during 2011. The 2011 budget recommended by the Billfish Working Group for IERPB was €46,850.00. The contributions made to the IERPB for the 2011 program were an allocation of €30,600.00 from the regular ICCAT budget and a contribution of €8,000 from Chinese Taipei. Carryover funds remaining from previous year were €7,259.30 thus total funds available for 2011 were €45,859.30 **(Table 1)**. As a consequence most planned activities of the program will be able to be carried out. Expenditures to date in 2011 have been €17,011.00 but an additional €27,700.00 are already committed to other activities that have either taken place in 2011 or will take place between October and December. The estimated balance of the program at the end of 2011 will be €1,148.30€ **(Table 2)**.

In-kind contributions to the program continued to be made during 2011. INIA and the University of Oriente (Venezuela), *Universidad Federal Rural de Pernambuco* (Brazil), and *Instituto Dirección Nacional de Recursos Acuáticos* (Uruguay) have provided personnel time and other resources as in-kind contributions to the at-sea biological sampling program, thereby reducing the amount of funds needed for this activity from the ICCAT billfish funds. The *Instituto Español de Oceanografia* (Spain) contributed by paying for the costs of collecting and shipping biological billfish samples for genetic analyses collected on board Spanish vessels. The U.S. National Marine Fisheries Service funded a part of the cost of processing genetic samples for identification of white marlin and spearfish. Travel costs and personnel time of the program coordinators were absorbed by the U.S. National Marine Fisheries Service, the University of Miami, the Ghana department of fisheries and by the ICCAT Data fund.

2012 Budget and requested contributions

The summary of the 2012 proposed budget, totaling €45,850.00 is attached as **Table 3**. The Working Group requests that the Commission maintain its contribution of €30,600.00 for 2012 but that it increases to €35,000 for 2013 to cover increasing needs of the IERPB program (see **Table 4**). The requested contributions from ICCAT are necessary to fully implement the IERPB 2012 and 2013 program plans. During 2012 the Program will continue to require contributions of €14,100 from other sources, such as those so generously provided recently by Chinese Taipei, to achieve all its objectives.

The consequence of the Program failing to obtain the requested budget will be to stop or reduce program activities for 2012 including: (1) important at-sea observer trips in Venezuela, Uruguay and Brazil; (2) coordination travel for eastern coordinators; (3) sampling of artisanal fleets in the western and eastern Atlantic (4) sampling and processing of genetic, age and growth samples; (6) promotion of conventional tagging activities, including distribution of tag recovery incentives. All these activities are critical to continue the improvement of the information available to the SCRS for the assessment of billfish.

Conclusion

The IERPB has been credited for major improvements in the data supporting the last ICCAT billfish assessments. The Program needs to continue to facilitate the collection of biological and fishery information. The IERPB Program will continue to require support from ICCAT and other sources to operate and to address the needs of the Commission, specially the upcoming assessment meeting for white marlin. Although considerable benefits will accrue from various outputs of the ICCAT data improvement program, the IERPB is the only program that exclusively focuses on billfish. By having this focus it is in the best position to ensure that the

research and monitoring activities not covered by the ICCAT data improvement program are given some minimal resources. The IERPB is an important mechanism towards completing the goal of having the highest quality information to assess billfish stocks.

Table 1. Summary budget for 2011 for the Billfish Program.

Source	*Euros (€)*
Budget recommended by the Working Group	46,850.00
Balance at start of Fiscal Year 2011	7,259.30
Income (ICCAT Regular Budget and others)	38,600.00
Expenditures and obligations (for details see **Table 2)**	-44,711.00
Estimated Balance	**1,148.30**

Table 2. Detailed 2011 Budget & Expenditures (as of October 1, 2011).

		Euros (€)
Balance transferred from 2010		**7,259.30**
Income	**Total**	**38,600.00**
	ICCAT Commission	30,600.00
	Chinese Taipei	8,000.00
Available funds		**45,859.30**
Expenditures		**-17,011.00**
	Venezuela	-11,000.00
	Ghana	3,000.00
	Senegal	3,000.00
	Bank charges	-11.00
Balance (as of October 1, 2011)		**28,848.30**
Funds obligated until end of 2011		**-27,700.00**
	Uruguay	-2,000.00
	Brazil	-5,000.00
	São Tomé	-2,000.00
	Côte d'Ivoire	-3,000.00
	Tag rewards	-500.00
	Genetic samples	-15,000.00
	Bank charges	-200.00
Total estimated expenditures		**-44,711.00**
Estimated balance December 31, 2011		**1,148.30**

Table 3. Summary budget of the ICCAT Enhanced Research Program for Billfish for 2012.

Source	*Euros (€)*
Balance at start of Fiscal Year 2012 (estimated)	1,148.30
Income (Requested from ICCAT Regular Budget)	30,600.00
Other contributions)	13,100.00
Expenditures (see **Table 4)**	44,800.00
BALANCE	**48.30**

Table 4. Detail of expenditures planned for 2012.

Source	*Amount (€)*
STATISTICS & SAMPLING	
West Atlantic shore-based sampling:	
Venezuela	5,000.00
West Atlantic at-sea sampling:	
Venezuela	6,000.00
Uruguay	2,000.00
Brazil	5,000.00
East Atlantic shore-based sampling:	
Senegal	3,000.00
Ghana	3,000.00
Côte d'Ivoire	3,000.00
Sao Tome	2,000.00
Processing of Genetic samples *	10,000.00
Collection of genetic samples *	5,000.00
Lottery rewards – tagging billfish	500.00
COORDINATION	
Mailing & miscellaneous	100.00
Bank charges	200.00
TOTAL	**44,800.00**

Authorization of all these expenditures depends, on sufficient funds being available by ICCAT and from other contributions.
* Number of samples collected and processed will depend on the final budget of the Program.

Appendix 7

REPORT OF THE MEETING OF THE SUB-COMMITTEE ON STATISTICS
(Madrid, Spain, September 26-27, 2011)

1. Opening, adoption of Agenda and meeting arrangements

The Sub-Committee on Statistics met at the ICCAT Secretariat (Madrid, Spain) on September 26-27, 2011. The meeting was chaired by Dr. Gerald Scott and Dr. Guillermo Diaz served as rapporteur. The Agenda was accepted and adopted by the Sub-Committee **(***Addendum 1 to Appendix 7***)**.

2. Review of fisheries and biological data submitted during 2011

The Secretariat presented information held in the "Secretariat Report on Statistics and Coordination of Research in 2011" related to fisheries and biological data submitted in 2010, including revisions to historical data.

2.1 Task I (nominal catches and fleet characteristics)

Based on the percentage of CPCs that reported data on landings and those that reported data by the deadline, the Sub-Committee recognized that improvements in data reporting had occurred during the past few years. The Sub-Committee therefore requested the Secretariat to prepare some statistics demonstrating the observed improvement in data reporting. The Secretariat also noted an improvement in the reporting of fleet characteristics since 2005. Once again, the Sub-Committee acknowledged the improvement in reporting these data that has traditionally been overlooked by many CPCs and requested the Secretariat to explore the possibility of requesting CPCs the submission of historical fleet characteristic data.

As in previous years, the Sub-Committee once again discussed how to differentiate between non-reporting (no compliance) or the lack of reporting due to no catches. The Sub-Committee discussed the possibility of preparing electronic forms with a default value of 'zero landings' for all species or another suitable alternative, so CPCs only would have to update those species for which they have landings. Although this was viewed as a potential solution, there was some concern about the impact that such approach would have on the ICCAT databases by incorporating very large amounts of observations for 'zero catches'.

The Sub-Committee discussed extensively the deadlines of data reporting requirement. It was noted that the table prepared by the Secretariat that indicated compliance with data submission requirements did not take into consideration the specification of the data needs provided in the species work plans. Therefore, the Sub-Committee requested the Secretariat to review the table based on that information. Furthermore, the Sub-Committee discussed that tables showing compliance with data submission deadlines should only used the July 31 deadline. The Secretariat requested that the species work plans be specific enough with respect to data requests so to facilitate the work of the Secretariat.

The Sub-Committee also noted that although Ghana has reported data prior to the meeting on "Review of Ghanaian Statistics", the Secretariat's table showed that there were some concerns with Ghana's data submission. The Secretariat indicated that Ghana did not use the approved electronic forms for the submission of its data.

The Sub-Committee discussed that reviewing compliance with data submission requirements had resulted in drifting the role of the Sub-Committee from a scientific endeavour toward a role more related to a compliance committee. There was a general agreement that the Sub-Committee should be more involved on reviewing the submitted data for its scientific value for stock assessment purposes instead of only focusing on submission deadlines. The Sub-Committee generally agreed on the need to develop a system to better characterize the quality of the submitted data beyond if they were submitted by the deadline or not and recommended that future work of the Sub-Committee be oriented more toward data quality evaluations.

2.2 Task II (catch & effort and size samples)

Like with Task I data, the Sub-Committee acknowledged the improvements observed in the reporting of Task II data. However, the Secretariat noted that there are still cases when the Catch and Effort data are reported without

reporting effort or with unconventional effort units (e.g., longline effort expressed as number of fishing days). The Secretariat indicated that in these cases the data are still useful because they can be included in the CatDis estimation. However, the Secretariat indicated that in these cases it still follows up with these CPCs to attempt to obtain the correct information.

2.3 Tagging

After the presentation of the received tagging information, the Secretariat clarified that the Moroccan bluefin tuna tagging information was included in the EU Spain data as part of a collaborative project. Uruguay asked the Secretariat about reporting additional tagging information beyond the point of release and recapture such as more detailed information collected by the electronic tags and also maps. Canada informed the Sub-Committee that they have additional tagging information for 2010-2011 that still has to be reported. Similarly, Brazil indicated that it is preparing a comprehensive report with Brazilian tagging activities.

2.4 Trade information

The Secretariat summarized the available Trade-based information in the "Secretariat Report on Statistics and Coordination of Research in 2011". The Sub-Committee discussed that at present, these data are most applicable for compliance related issues, but that historically, at least for some species, data similar to these have been used to estimate unreported catch. Now that a wider array of species is being tracked, especially through the transhipment observer data, these data should be further evaluated for use in verifying catch reports. To do this, a fuller range of conversion factors for product to whole weight would be needed along with careful evaluation to avoid double counting of the same fish and to account for lags between time of capture and market.

2.5 Other relevant statistics

Observer programs

− Discussion relevant to Rec. [10-10]

The Secretariat presented a table summarizing the information received from different CPCs on their national observer programs. **Table 1** compares the reports received against the number of flag-gear combinations from which such reports might be expected under [Rec. 10-10]. At the time of the Sub-Committee meeting, only a low proportion of responses that could have been submitted have yet been received by the Secretariat. This information will be further reviewed by the 2012 SCRS in order to develop its response to the Commission as called for under [Rec. 10-10].

It was recommended that the Secretariat develop a simple form to be filled out by CPCs to better characterize and compare the different observer programs in addition to the table already developed by the Secretariat. This form should promote improved reporting by CPCs regarding the information requested under [Rec. 10-10].

The Sub-Committee interpreted [Rec. 10-10] to mean that reporting requirements of domestic observer coverage only applied to longline, purse seine, and bait boat fisheries.

The Sub-Committee requested those CPCs that have implemented or are experimenting with monitoring schemes alternative to observer programs for vessels less than 15 m (e.g., cameras, etc.) to present such information to the SCRS in 2012.

− Discussion Relevant to Rec. [10-04]

Information was received on the Moroccan observer program on the trap fishery which has 100% observer coverage. This information was referred to the Bluefin species group for preparation of a response to the Commission on this particular recommendation.

3. Updated report on the ICCAT relational database system

The "Secretariat Report on Statistics and Coordination of Research in 2011" provided an update on the ICCAT relational database system. The Sub-Committee acknowledged the progress made on data bases and noted the following.

E-BFT-VMS data

The Sub-Committee indicated that VMS data from Mediterranean purse seines and other vessels fishing for bluefin tuna could be used to identify spawning grounds. However, as previously indicated by the Sub-Committee, the 6 hr time interval between VMS reports does not have enough resolution to be used for more useful scientific purposes, such as evaluation of PS catch-effort patterns. The Sub-Committee recommended that VMS signals should be reported at no more than two hour interval. The Secretariat indicated that the presented data was filtered so data received from vessels docked in a port were not included. The Sub-Committee encouraged the Secretariat to use algorithms that can identify fishing activities from 'searching times'. It was also noted that the data presented by the Secretariat showed fishing activities in the Black Sea. The Secretariat clarified that these data could correspond to registered bluefin tuna vessels that were fishing for other species such as small pelagic species.

The Sub-Committee briefly discussed the value of requesting VMS data from other ICCAT fisheries and from VMS associated to FADs.

4. National and international statistical activities

The "Secretariat Report on Statistics and Coordination of Research in 2011" summarized the activities undertaken by the Secretariat regarding international statistical activities.

The Sub-Committee encouraged the Secretariat to continue with these efforts.

5. Report on data improvement activities

5.1 ICCAT-Japan Data and Management Improvement Project

Discussion of the JDMIP activities was deferred to Plenary.

5.2 Data Funds from [Res. 03-21] and other ICCAT funds

The Secretariat presented a series of proposed guidelines to standardize the use of and the process to access these funds. In general, the Sub-Committee agreed that some of the guidelines drafted by the Secretariat were not flexible enough to accommodate the needs of the SCRS. The Sub-Committee proposed that the guidelines for use and access to these funds as provided in *Addendum 2 to Appendix 7*, be further considered by Plenary for adoption.

5.3 Data recovery activities

The "Secretariat Report on Statistics and Coordination of Research in 2011" described a number of data recovery activities undertaken in this year. The Sub-Committee discussed a number of aspects of these activities, as follows.

The Sub-Committee reviewed the major finding of the intersessional meeting that reviewed the Ghanaian fishery statistics. It was recognized that some segments of the Ghanaian fleet seemed to have been underreporting their catches. The inter-sessional meeting indicated that for 2010 Ghana may have underreported a total of 20,000 t of tropical tunas, all species together. Furthermore, during the yellowfin tuna stock assessment carried out in 2011 it was concluded that the corresponding underreporting yellowfin tuna catch would have an impact on the results of the assessment which would result in a worsening of the estimated stock status. Therefore, the Sub-Committee recognized the need to solve this particular issue with respect the Ghanaian Task I reported data. The Sub-Committee was also concerned about the effect of this underreporting with respect to bigeye tuna.

In the case of bluefin tuna landing updates for Turkey and Algeria, there is no documentation supporting the proposed revisions and these data have not been used in any assessments, yet. Therefore, approval of these revisions is pending upon the receipt of supporting documentation. S. Tome submitted revisions for 2005-2007 for several species. This was a reclassification of landings by species, and the amount of total remained the same. Although documentation supporting the changes has been provided by S. Tome, such document has not yet been reviewed by the SCRS. Pending this review, the Sub-Committee recommended adoption of these revisions since

they identified total landings at species level, compared to the aggregated values previously available. The Sub-Committee requested the Secretariat to contact these CPC to request the missing supporting documents.

[Senegal provided new shark landings data from its artisanal fisheries. However, the Sharks Species Group has not reviewed these data or the supporting document yet. Pending that review, the Sub-Committee recommended adoption of these revisions as they are at the species level and provide much finer resolution than previously available].

Revisions or new submission

− C&E data

Regarding the updates to the C&E data base, it was questioned if the different flags proposing revisions provided documentation supporting the changes to be made. The Secretariat indicated that, in some cases, the changes corresponded to data that was reported as NEI and then reclassified with a flag. This information is not new, and it has been used in past assessments as NEI (PS and BB only). In the case of Venezuela, the updated data corresponded to data that was resubmitted using the electronic forms. The changes to the Ghanaian data are pending approval by the species group, but these data were used in the most recent yellowfin stock assessment in sensitivity runs. EU-Portugal (mainland) submitted a revision of data (LL) now reported by 1x1, but there is no supporting documentation yet available. The Sub-Committee recommended that this finer-scale data be admitted to the data base, pending adequate documentation. In summary, the revised data submitted by Venezuela, Trinidad Tobago, and EU-Portugal is missing the supporting documentation and, therefore, it cannot be incorporated to the ICCAT database yet, although the Sub-Committee recommended these data revisions be incorporated into the database as soon as adequate documentation is made available.

− CAS or Size data

During the Yellowfin Tuna Stock Assessment Session, Japan submitted revised CAS of YFT-LL for the period 1995-2010. Documentation supporting the review of the data was also provided during the yellowfin tuna assessment in an SCRS document. The Sub-committee inquired if the newly applied methodology could be extended to other species caught by the Japanese longline fleet and recommended that Japanese scientists consider if the methodology used for yellowfin tuna is also appropriate for other species.

5.4 BFT-E Observer data

These data should be reported by the company in charge of the observer program during the Bluefin Tuna Species Group meeting and as such, was not commented upon by the Sub-Committee.

5.5 Weekly catch reports

The Sub-Committee considered this a compliance issue, although the data may provide some basis for validation of recent year catch for use in projections.

5.6 Transhipment observer data

Transhipment observer data has been used in the past for bigeye tuna to identified IUU. It was noted that the data is reported using a variety of product types (fillet, etc.). The Sub-Committee indicated that there is a need to develop conversion factors and to identify method to avoid double counting the same fish. It was indicated that in the development of such conversion factors it will be necessary to take into consideration that these factors are most probably fleet specific. The Sub-Committee also requested clarification of the different product definition. It was suggested that an analysis of using transhipment data to validate landing and to identify the limitation of these approach should be conducted by the trade specialists.

The Sub-Committee was concerned regarding commenting on issues that are related more to compliance than to science being the transhipment data one of them. The Sub-Committee emphasized the need to look at these data as a scientific tool instead of using them to make compliance determinations.

6. Review of publications and data dissemination

The "Secretariat Report on Statistics and Coordination of Research in 2011" provided a summary of publications and data dissemination efforts over this year. The Sub-Committee acknowledged this work and approved the progress made.

6.1 Review of the results of the ICCAT-ALR publication agreement

The Sub-Committee recommended that the ICCAT-*Aquatic Living Resources* publication agreement be continued.

6.2 Development of shark and other species identification sheets

The Sub-Committee was informed that the shark identification sheets would be available in the coming week. The Sub-Committee applauded the progress made on this topic and remained anxious to view the final product. The Sub-Committee agreed with the recommendation from the Billfish Species Group to develop ID cards for Istiophorids.

7. Review of progress made for a revised ICCAT manual

The Sub-Committee supported the Secretariat's proposal to contract out the development of the LL gear chapter of the *ICCAT Manual*. The Sub-Committee agreed with the recommendations to update the description of white marlin and spearfishes (RSP, *Tetrapturus georgei*, SPF, *Tetrapturus pfluegeri*) and to expand the description of several shark species to the corresponding chapter.

8. Consideration of recommendations from 2011 inter-sessional meetings

The Recommendations from inter-sessional meetings referred to the Sub-Committee are contained in *Addendum 4 to Appendix 7*. Discussion points raised by the Sub-Committee are reported below.

8.1 Recommendations of the Working Group on the Organization of the SCRS

The Sub-Committee endorsed the recommendations of the Working Group. The Sub-Committee noted in particular, the following:

− *Increase analytical and data base management support at the Secretariat.*

The recommendations for increased data base, analytical, and by-catch coordination support were endorsed by the Sub-Committee and were recommended to Plenary. These positions should be included in the 2012 Budget of the Secretariat, but because the proposed budget was already circulated in July and only included the by-catch coordinator position, it presents a difficulty. The timing between preparation of the Budget and the identified needs of the SCRS needs to be better coordinated. The Sub-Committee recommended the SCRS Chair and Executive Secretary consult on procedures to avoid such difficulties.

− *Quality assurance and transparency*

The Sub-Committee endorsed the recommendations for use data fund to contract help to develop stock assessment documentation during meetings and to invite experts from other tRFMOs to participate in our stock assessments.

8.2 ICCAT-GBYP Symposium on Trap Fisheries for Bluefin Tuna

The Sub-Committee could not endorse the recommendation to keep traps open after quotas were achieved without further consideration and justification offered by the Bluefin Tuna Species Group.

8.3 Tropical Tuna Species Group Inter-sessional Meeting on the Ghanaian Statistics Analysis (Phase II)

The Sub-Committee endorsed the recommendations of the Ghanaian statistics working group and recommended Plenary to adopt them.

8.4 Atlantic Yellowfin Stock Assessment Sessions

The Sub-Committee discussed and endorsed the recommendation to use market based information to validate logbook catch reports and recommended expanding such approaches to other species, when such information is available.

8.5 Sharks Data Preparatory Meeting for the Application of the Ecological Risk Assessment

The Secretariat indicated that the tagging database was missing a number of shark tagging information from the United States, and they are currently working directly with scientists from this CPC to solve this issue. The Sub-Committee agreed that these data should be acquired as soon as possible and inquired if the reporting of tagging data should still be done through a CPC's tagging correspondents. In response, the Secretariat indicated that there was still a list of tagging correspondents, but it should be reviewed and updated as appropriate with the help of the CPCs.

The Sub-Committee also asked for clarification with respect to the recommendation of exploring methods to estimate shark catches from purse seines fisheries. It was indicated that there are some publications that indicated the existence of shark by-catch in purse seine fisheries, and therefore the need to quantify these catches since the majority of shark catch information is only from longline fisheries. The Sub-Committee recommended that such estimates should be incorporated into the ICCAT data base as soon as possible.

8.6 Inter-sessional Meeting of the Sub-Committee on Ecosystems

The Sub-Committee recommended that the Sub-Committee on Ecosystems should continue to develop the protocols for collection of by-catch data.

The Secretariat asked about what species will be considered as "by-catch" for the purpose of reporting. The Sub-Committee on Ecosystems pointed out the lack of consensus on a "by-catch species". The Sub-Committee on Statistics indicated that the focus should be on quantifying the total catch regardless of if a particular species is considered target catch or by-catch.

8.7 GBYP Steering Committee Meeting

It was indicated that in the case of bluefin tuna there is a precedent that requires a minimum of 10% sampling. It was indicated that for some large fisheries a 10% sampling effort might not be necessary and instead of quantity it is more important to obtain representative samples from the different fishery strata.

The Sub-Committee reiterated that there is a need to quantify the quality of the information reported and the quality/representativeness of size samples from different fisheries is a question that fits within this issue. It was commented that a 10% sampling could be adopted as a general rule that could be revised on a fisheries basis. It was also indicated that for the future analysis to better characterize the level of sampling that will provide information to improve management recommendations should be conducted. However, this decision still does not address the problem of assuring that the collected samples are representative.

8.8 2011 Blue Marlin Stock Assessment Session and White Marlin Data Preparatory Meeting

There is information available on marlin by-catch by European purse seine fisheries which could be used to validate the information that has already been reported to ICCAT. It was indicated that using observer data estimates of total marlin by-catch in this fishery have been obtained; however, the estimates have a large level of uncertainty.

The Sub-Committee also indicated that a recommendation emphasizing the need to report live releases could be included to the list of general recommendations.

9. Implication of data deficiencies

9.1 Current data catalogues of major species by stock

The Secretariat presented to the Sub-Committee the updated data catalogues (**Table 2**). The Sub-Committee indicated that cross checking Task I landing with size reports is a good approach to identify data deficiencies.

9.2 Implications of identified deficiencies in future stock assessments

The Sub-Committee agreed that these deficiencies should be discussed by each species group, particularly by those that conducted an assessment in 2011.

9.3 Proposals for data recovery plans and improvement on data collection systems

There was a recommendation of improving data sharing and collection from entities that collect data on Mediterranean albacore. Similarly, there was a proposal to continue with efforts to collect shark historical data.

10. Review of existing data submission formats and procedures

The Sub-Committee discussed the need of forms to submit seabird, sea turtle, other by-catch, and observer data. It is expected that this task will be taken by the by-catch coordinator. The Secretariat indicated that it only received observer data from one CPC. The Sub-Committee recommended that CPCs report observer data to help the Secretariat to develop electronic forms for the submission of this type of data. The Sub-Committee approved the Secretariat's recommendation of adding spearfish to the list of main ICCAT species.

11. Future plans and recommendations

11.1 Infrastructure and technology

The Group acknowledged the important improvements carried out by the Secretariat with respect to infrastructure and related support. It noted that additional improvements to the databases should be pursued.

11.2 Data bases

Documentation of database structures and data quality issues that are not to be addressed in 2011-2012 are a reflection of the Secretariat's increasing work load. It was suggested that if the Secretariat increases accessibility to the data bases, the species working group could do their own data extractions and therefore allowing the Secretariat to focus their effort on other areas. The Secretariat commented that increasing data accessibility and developing the corresponding documentation is a time consuming task and that the current ICCAT schedule does not permit the Secretariat to conduct this type of work. However, the Secretariat is slowly moving into that direction. The Secretariat also indicated that because the data base documentation is not completed it will be difficult for scientists that are not familiarized with the details of the data bases to extract the proper data for particular analysis. This particular situation emphasizes the recommendation of the Sub-Committee on the need to provide more support to the Secretariat in the form of more staff.

12. Other matters

12.1 Third Joint Meeting of the Tuna RFMOs (Kobe III)

The SCRS Chair presented to the Sub-Committee information on the last Kobe III meeting held in La Jolla, USA, in July of the present year. The explanation of the Chair focused on the science discussions in the meeting. The discussions focused on the review of past Kobe recommendations on science, the Joint Technical Working Group on By-catch, and specific issues to be considered by the Kobe III participants. The Technical Working Group prepared a work plan that included the harmonization of data collection among tRFMOs, identification guides, and release protocols among tRFMOs and to develop a centralized by-catch data base. The specific science issues that were discussed during the meeting included data confidentiality rules and addressing common issues in RFMO's scientific bodies. The Secretariat indicated that it has already been contacted by the Joint

Technical Working Group on By-catch to request information on the ICCAT by-catch metadata base in order to integrate it into a common system (BMIS) and it is pending SCRS approval for this activity. The Sub-Committee recommends Plenary that this activity be conducted as soon as possible.

12.2 Sport fishing information

The Sub-Committee inquired if the Secretariat has received any more information on sport fishing. The Secretariat indicated that some CPCs continue reporting their sport fishing catches which could be reported to the Commission. In addition, the Secretariat indicated that no new questionnaires with sport fishing information have been submitted by any CPC.

In view of this, the Sub-Committee updated a response to the Commission drafted by the 2010 Committee, but which was not taken up by the Commission's Working Group on Sport and Recreational Fishing (*Addendum 4 to Appendix 7*).

13. Adoption of the report and closure

After review by the Sub-Committee, the report was adopted and the meeting was closed on 27 September 2011. The Convener thanked all participants for their work.

Table 1. Metiers for which observer programs might be expected under the definitions of Rec. [10-10]. Green shaded cells represent metiers for which reports responsive to Rec. [10-10] have been received and reviewed at the Sub-Committee on Statistics meeting in 2011. Blank cells represent metiers for which such reports might be expected based on recent (2000s) reported catches for these flag-gear combinations indicated. Grey cells indicate flag-gear combinations for which no recent (2000s) catches have been reported and therefore such reports are not expected. This information is not necessarily applicable for compliance issues.

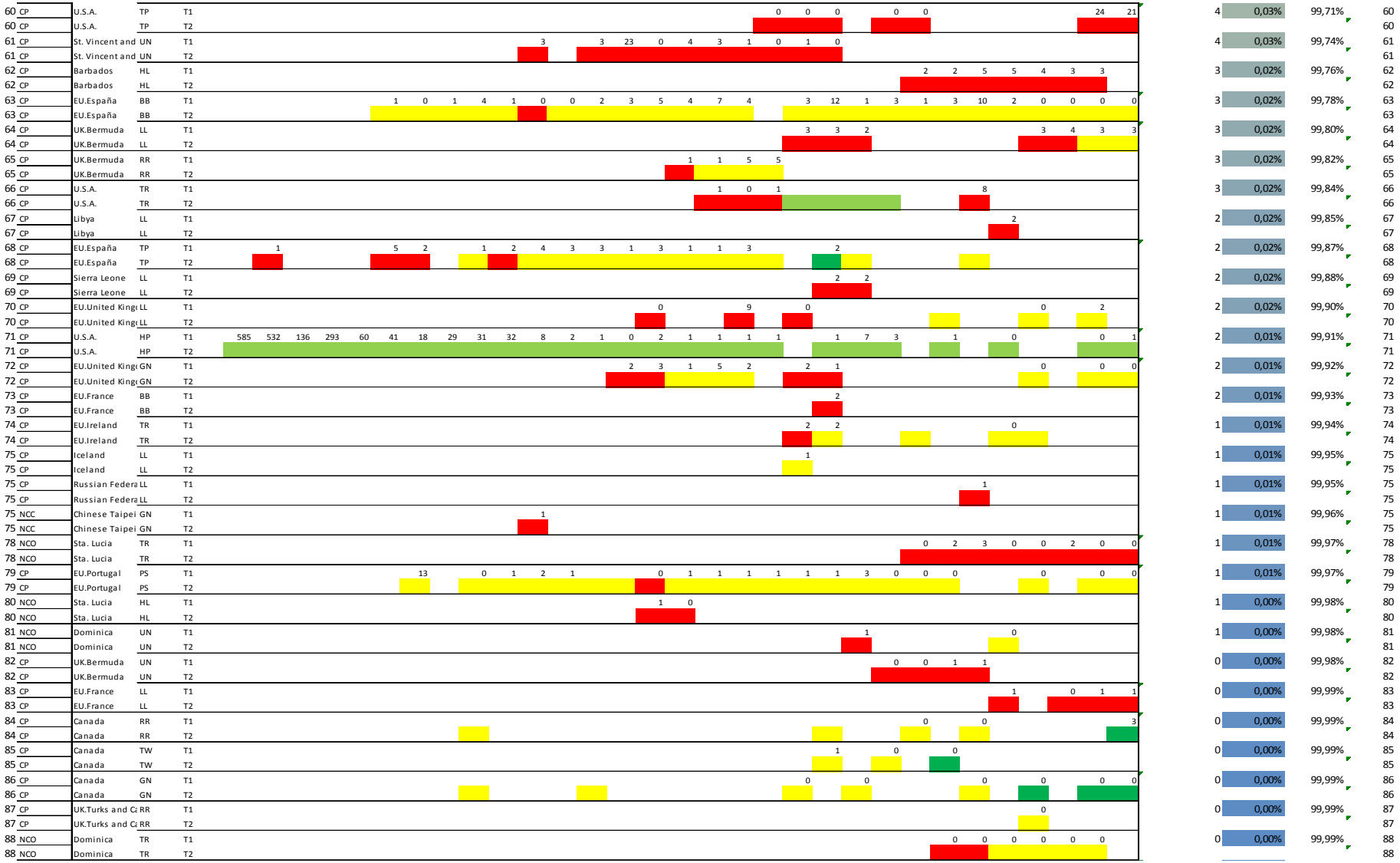
		GearGrp		
Status	Flag	BB	LL	PS
CP	Algerie			
	Angola			
	Barbados			
	Belize			
	Brasil			
	Canada			
	Cape Verde			
	China P.R.			
	Côte D'Ivoire			
	Croatia			
	Egypt			
	EU.Bulgaria			
	EU.Cyprus			
	EU.Denmark			
	EU.España			
	EU.Estonia			
	EU.France			
	EU.Germany			
	EU.Greece			
	EU.Ireland			
	EU.Italy			
	EU.Latvia			
	EU.Lithuania			
	EU.Malta			
	EU.Netherlands			
	EU.Portugal			
	EU.Sweden			
	EU.United Kingdom			
	FR.St Pierre et Miquelon			
	Gabon			
	Ghana			
	Guatemala			
	Guinea Ecuatorial			

		GearGrp		
Status	Flag	BB	LL	PS
CP	Guinée Conakry			
	Iceland			
	Japan			
	Korea Rep.			
	Libya			
	Maroc			
	Mexico			
	Namibia			
	Norway			
	Panama			
	Philippines			
	Russian Federation			
	S. Tomé e Príncipe			
	Senegal			
	Sierra Leone			
	South Africa			
	St. Vincent and Grenadines			
	Syria Rep.			
	Trinidad and Tobago			
	Tunisie			
	Turkey			
	U.S.A.			
	UK.Bermuda			
	UK.British Virgin Islands			
	UK.Sta Helena			
	UK.Turks and Caicos			
	Uruguay			
	Vanuatu			
	Venezuela			
NCC	Chinese Taipei			
	Colombia			
	Guyana			
	Netherlands Antilles			

Table 2. SWO-N. Catalog of northern Atlantic SWO Stock available: Task I (T1, in tonnes) and Task II (T2 availability; yellow= t2-CE only; light green= t2-SZ only; dark green= T2-CE + SZ) statistics, between 1980 and 2010. For t2sz, either size frequencies and CAS were considered.

1	CP	EU.España	LL	T1	3810	4013	4554	7100	6315	7431	9712	11134	9600	5696	5736	6506	6351	6392	6027	6948	5519	5133	4079	3993	4581	3967	3954	4585	5373	5511	5446	5564	4366	4949	4147	5249	34,52%	34,52%	1
1	CP	EU.España	LL	T2																																			1
2	CP	U.S.A.	LL	T1	5015	3986	5271	4510	4666	4642	5143	5164	6020	5855	4967	4399	4124	4044	3960	4452	4015	3399	3433	3364	3316	2498	2598	2757	2591	2273	1961	2474	2405	2691	2525	3286	21,61%	56,13%	2
2	CP	U.S.A.	LL	T2																																			2
3	CP	Canada	LL	T1	1794	542	542	960	465	550	973	876	874	1097	819	953	1487	2206	1654	1421	646	1005	927	1136	923	984	954	1216	1161	1470	1238	1142	1115	1061	1166	1176	7,73%	63,86%	3
3	CP	Canada	LL	T2																																			3
4	CP	EU.Portugal	LL	T1					7	15	448	984	612	292	463	757	497	1950	1573	1593	1702	902	611	559	536	480	631	697	1319	900	949	778	741	604	1054	912	6,00%	69,86%	4
4	CP	EU.Portugal	LL	T2																																			4
5	CP	Japan	LL	T1	1167	1315	1755	537	665	921	807	413	621	1572	1051	992	1064	1126	933	1043	1494	1218	1391	1089	759	567	319	263	575	705	656	889	935	778	1047	892	5,87%	75,73%	5
5	CP	Japan	LL	T2																																			5
6	NCO	NEI (ETRO)	LL	T1									76	112	529																					529	3,48%	79,21%	6
6	NCO	NEI (ETRO)	LL	T2																																			6
7	CP	EU.España	GN	T1						4	3		194	949	646	124																				385	2,53%	81,74%	7
7	CP	EU.España	GN	T2																																			7
8	NCC	Chinese Taipei	LL	T1	134	182	260	272	164	152	157	52	23	17	269	577	441	127	507	489	521	509	286	285	347	299	310	257	30	140	172	103	82	89	88	292	1,92%	83,66%	8
8	NCC	Chinese Taipei	LL	T2																																			8
9	CP	EU.Portugal	SU	T1																			161	217	194	252	134	335					6	293	0	199	1,31%	84,97%	9
9	CP	EU.Portugal	SU	T2																																			9
10	CP	Maroc	LL	T1	136	124	91	125	79	137	178	192	195	219	24	92	41	27	7	28	35	239		35	38	264	154	223	255	325	333	229	428	720	963	184	1,21%	86,18%	10
10	CP	Maroc	LL	T2																																			10
11	CP	EU.España	UN	T1													316	202	150		20															172	1,13%	87,31%	11
11	CP	EU.España	UN	T2																																			11
12	CP	Senegal	LL	T1																												174	138	195	180	169	1,11%	88,42%	12
12	CP	Senegal	LL	T2																																			12
13	CP	Canada	HP	T1			12	128	34	35	86	78	24	150	92	73	60	28	22	189	93	89	240	18	95	121	38	147	87	193	203	267	258	248	176	128	0,84%	89,27%	13
13	CP	Canada	HP	T2																																			13
14	CP	China P.R.	LL	T1														73	86	104	132	40	337	304	22	102	90	316	56	108	72	85	92	92	73	124	0,82%	90,08%	14
14	CP	China P.R.	LL	T2																																			14
15	CP	Brasil	LL	T1																					117											117	0,77%	90,85%	15
15	CP	Brasil	LL	T2																																			15
16	CP	Trinidad and To	LL	T1				21	26	6	45	151	42	79	66	71	562	11	180	150	158	110	130	138	41	75	92	78	83	91	19	29	48	30	21	108	0,71%	91,56%	16
16	CP	Trinidad and To	LL	T2																																			16
17	CP	Senegal	UN	T1																									108	108						108	0,71%	92,27%	17
17	CP	Senegal	UN	T2																																			17
18	NCO	NEI (MED)	UN	T1		12					14	3	131	190	185	43	35	111																		94	0,61%	92,89%	18
18	NCO	NEI (MED)	UN	T2																																			18
19	CP	U.S.A.	GN	T1							49	54	120	524	535	82	86	92	88	74	78	0	36		0		0		0			0		0		77	0,50%	93,39%	19
19	CP	U.S.A.	GN	T2																																			19
20	CP	Maroc	GN	T1											19	9	4	2	13	32	322	13	179	60	51	243	64	98	76	9						75	0,49%	93,88%	20
20	CP	Maroc	GN	T2																																			20
21	CP	EU.France	UN	T1	5	4			1	4	4				75	75	75	95		38	97	164						32	102	178	0	46	14	3	1	71	0,47%	94,35%	21
21	CP	EU.France	UN	T2																																			21
22	CP	EU.France	TW	T1															13	13					60		74	138			91			12	32	57	0,38%	94,72%	22
22	CP	EU.France	TW	T2																																			22
23	NCO	Grenada	LL	T1																1							54	88	73	56	30	26	43			46	0,30%	95,03%	23
23	NCO	Grenada	LL	T2																																			23
24	CP	Korea Rep.	LL	T1	284	136	198	53	32	160	68	60	30	320	51	3	3	19	16	16	19	15								51	65	175	157	3		46	0,30%	95,33%	24
24	CP	Korea Rep.	LL	T2																																			24
25	CP	Belize	LL	T1																												9	1	112	106	41	0,27%	95,60%	25
25	CP	Belize	LL	T2																																			25
26	CP	EU.France	GN	T1															33	33			80	76	61								0	0	0	40	0,27%	95,86%	26
26	CP	EU.France	GN	T2																																			26
27	CP	U.S.A.	HL	T1														38			0	1		5	9	9	12	21	23	35	33	125	94	125	223	38	0,25%	96,11%	27
27	CP	U.S.A.	HL	T2																																			27
28	CP	EU.Ireland	GN	T1														7			15	15	119	61	32	14										38	0,25%	96,36%	28
28	CP	EU.Ireland	GN	T2																																			28
29	CP	FR.St Pierre et M	LL	T1																							10	3	36	48		82	48	17		35	0,23%	96,59%	29
29	CP	FR.St Pierre et M	LL	T2																																			29

30	CP	Venezuela	LL	T1	192	24	25	35	23	51	84	86	2	2	4	73	101	68	60	45	74	11	7	9	30	12	25	29	46	48	15	19	5	8	16	34	0,23%	96,81%	30
30	CP	Venezuela	LL	T2																																			30
31	CP	U.S.A.	RR	T1																	6	11	5	21	16	2	22	6	25	61	53	68	76	32	67	29	0,19%	97,00%	31
31	CP	U.S.A.	RR	T2																																			31
32	CP	Mexico	LL	T1														6	14		22	14	28	24	37	27	34	32	44	41	31	35	34	32	35	28	0,19%	97,19%	32
32	CP	Mexico	LL	T2																																			32
33	CP	Senegal	GN	T1																														28	11	28	0,18%	97,37%	33
33	CP	Senegal	GN	T2																																			33
34	CP	Vanuatu	LL	T1																									35	29	14					26	0,17%	97,54%	34
34	CP	Vanuatu	LL	T2																																			34
35	NCO	Cuba	UN	T1												23	27	16	50	86	7	7	7	7												26	0,17%	97,71%	35
35	NCO	Cuba	UN	T2																																			35
36	CP	Côte D'Ivoire	LL	T1																														25	30	25	0,16%	97,88%	36
36	CP	Côte D'Ivoire	LL	T2																																			36
37	CP	Barbados	LL	T1																	33	16	16	12	13	19	10	19	24	39	34	23	36	17	13	22	0,15%	98,02%	37
37	CP	Barbados	LL	T2																																			37
38	NCO	Liberia	UN	T1	5	38	34	53		24	16	30	19	35	3		7	14	26	28	28	28	28	28												21	0,14%	98,16%	38
38	NCO	Liberia	UN	T2																																			38
39	CP	EU.Portugal	HL	T1						6	7	10	5	7	10	15	45	11	20	23																21	0,14%	98,30%	39
39	CP	EU.Portugal	HL	T2																																			39
40	NCO	Grenada	UN	T1									56	5	1	2	3	13			4	15	15	42	84											20	0,13%	98,43%	40
40	NCO	Grenada	UN	T2																																			40
41	CP	St. Vincent and	LL	T1																						22	22	7	7	7		51	7	34	13	20	0,13%	98,56%	41
41	CP	St. Vincent and	LL	T2																																			41
42	CP	EU.France	PS	T1																			30	28										0	1	19	0,13%	98,68%	42
42	CP	EU.France	PS	T2																																			42
43	CP	Panama	LL	T1																				17												17	0,11%	98,80%	43
43	CP	Panama	LL	T2																																			43
44	CP	Philippines	LL	T1																						1	4	44	5		8		22	28		16	0,10%	98,90%	44
44	CP	Philippines	LL	T2																																			44
45	CP	Maroc	PS	T1											14	4	3	8	5	7	98	10	10	11	22	9	1	1	1							14	0,09%	98,99%	45
45	CP	Maroc	PS	T2																																			45
46	CP	U.S.A.	TW	T1											9	42	24	16	24	25	20	8	6	8	11	3	4	6	8		4	6	8		2	13	0,08%	99,07%	46
46	CP	U.S.A.	TW	T2																																			46
47	NCO	Cuba	LL	T1	278	227	254	410	206	162	636	910	832	87	47												10	3	3	2	2					11	0,07%	99,15%	47
47	NCO	Cuba	LL	T2																																			47
48	NCO	Seychelles	LL	T1																					10											10	0,06%	99,21%	48
48	NCO	Seychelles	LL	T2																																			48
49	CP	Venezuela	GN	T1										2	5	2	2	5	9	9	11	9	30	21	14	9	9	16	7	7	7	11	6	5	7	10	0,06%	99,28%	49
49	CP	Venezuela	GN	T2																																			49
50	CP	EU.Ireland	LL	T1																			9													9	0,06%	99,33%	50
50	CP	EU.Ireland	LL	T2																																			50
51	CP	U.S.A.	UN	T1	25	12	3	17	23	22											26	12	9	4	1	2	8	5	7	11	8	9	9	7	7	8	0,06%	99,39%	51
51	CP	U.S.A.	UN	T2																																			51
52	CP	Maroc	TP	T1				1			3	5	1	3	34	5	21	2	11	12	7	5	2	13	3	7	4	7	3		8	8	2	4		8	0,05%	99,44%	52
52	CP	Maroc	TP	T2																																			52
53	CP	EU.Portugal	UN	T1		5	4	3											6																	6	0,04%	99,48%	53
53	CP	EU.Portugal	UN	T2																																			53
53	CP	Senegal	HL	T1										1		6	6																			6	0,04%	99,52%	53
53	CP	Senegal	HL	T2																																			53
53	CP	Senegal	TR	T1																												6				6	0,04%	99,56%	53
53	CP	Senegal	TR	T2																																			53
56	CP	U.S.A.	PS	T1																						5										5	0,03%	99,60%	56
56	CP	U.S.A.	PS	T2																																			56
57	CP	UK.British Virgi	LL	T1																									4	4	7		3			5	0,03%	99,63%	57
57	CP	UK.British Virgi	LL	T2																																			57
58	NCO	Faroe Islands	LL	T1																				5	4											5	0,03%	99,65%	58
58	NCO	Faroe Islands	LL	T2																																			58
59	CP	EU.Ireland	TW	T1																			4	18	1	3	5	12	1	1	2	2	2	1	1	4	0,03%	99,68%	59
59	CP	EU.Ireland	TW	T2																																			59




89 CP EU.Portugal BB T1 15 8 7 6 7 1 0 0 0 0,00% 100,00% 89
89 CP EU.Portugal BB T2 89
90 NCO Dominica HL T1 0 0 0 0 0 0,00% 100,00% 90
90 NCO Dominica HL T2 90
91 CP Canada TL T1 0 0 0,00% 100,00% 91
91 CP Canada TL T2 91
92 CP EU.Portugal TP T1 0 0 0 0 0 0 0 0,00% 100,00% 92
92 CP EU.Portugal TP T2 92
93 NCO Dominica GN T1 0 0 0,00% 100,00% 93
93 NCO Dominica GN T2 93
94 CP EU.France TN T1 0 0 0 0,00% 100,00% 94
94 CP EU.France TN T2 94
95 CP EU.Netherlands TW T1 0 0 0,00% 100,00% 95
95 CP EU.Netherlands TW T2 95
96 CP EU.France HL T1 0 0 0 0,00% 100,00% 96
96 CP EU.France HL T2 96
97 CP Trinidad and To SU T1 0 0 0,00% 100,00% 97
97 CP Trinidad and To SU T2 97
98 CP Senegal SU T1 0 0 0 0,00% 100,00% 98
98 CP Senegal SU T2 98
99 CP EU.United King HL T1 0 0 0,00% 100,00% 99
99 CP EU.United King HL T2 99
999 CP Canada HL T1 999
999 CP Canada HL T2 999
999 CP Canada UN T1 91 19 999
999 CP Canada UN T2 999
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999 CP U.S.S.R. SU T2 999
999 NCO Japan (foreign LL T1 999
999 NCO Japan (foreign LL T2 999
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999 NCO Mixed flags (KR LL T1 999
999 NCO Mixed flags (KR LL T2 999

Addendum 1 to Appendix 7

Agenda of the Sub-Committee on Statistics

1. Opening, adoption of Agenda and meeting arrangements
2. Review of fisheries and biological data (new and historical revisions) submitted during 2011
   2.1 Task I (nominal catches and fleet characteristics)
   2.2 Task II (catch & effort and size samples)
   2.3 Tagging
   2.4 Trade information (BFT Catch Documentation Scheme; SWO/BET Statistical Documents)
   2.5 Other relevant statistics (North Atlantic detailed data including discards and effort statistics
3. Updated report on the ICCAT relational database system
4. National and international statistical activities
   4.1 International and inter-agency coordination and planning (FAO, CWP, FIRMS)
   4.2 National data collection systems and improvements
5. Report on data improvement activities
   5.1 ICCAT/Japan Data and Management Improvement Project
   5.2 Data Funds from [Res. 03-21]
   5.3 Data recovery activities
   5.4 BFT-E VMS data
   5.5 BFT-E observer data
   5.6 BFT-E weekly catch reports
   5.7 Transhipment observer data
6. Review of publications and data dissemination
   6.1 Review of the results of the ICCAT-Aquatic Living Resources publication agreement
   6.2 Development of sharks identification species sheets
7. Review of progress made for a revised ICCAT Manual
8. Consideration of recommendations from 2011 inter-sessional meetings
9. Evaluation of data deficiencies pursuant to [Rec. 05-09]
   9.1 Current data catalogues of major species by stock
   9.2 Implications of identified deficiencies in future stock assessments
   9.3 Proposals for data recovery plans and improvements on data collections systems
10. Review of existing data submission formats and procedures
    10.1 Formats and e-FORMS improvement (to account for current fishery practices)
    10.2 Improvements to the ICCAT coding system
    10.3 Rules applied to historical data revisions
    10.4 Rules used to determine deadlines for submitting statistics
    10.5 Other related matters
11. Future plans and recommendations
12. Other matters
13. Adoption of the report and closure

Addendum 2 to Appendix 7

Protocols to Follow for the Use of Data Funds & Other ICCAT Funds

Introduction

Among the existing ICCAT funds, some like those available in the JDIMP or the EU Fund for Capacity Building, have their own user protocol defined by the Steering Committee or by the terms of reference of the corresponding contracts. In other cases, the Secretariat establishes the criteria in collaboration with the SCRS.

Considering that these funds were created to support the active participation in the work of the SCRS of scientists of countries with less resources, this document aims to define the objectives of funding and to establish protocols for more fluid and productive usage. The proposal has been developed based on the most recent recommendations and requirements of the SCRS.

The lines defined in this document and the protocols established will be applied to those funds available that do not have their own protocol.

Use of funds

Three large groups are considered: Improvement of Statistics, Capacity Building, and Supporting Work of the SCRS

1. Improvement of statistics

The improvement of statistics can be considered at various levels:

1.1 Recovery of historical data. The reconstruction of historical data series is fundamental, both for the overall assessment of the resources, and for the analysis of fishery dynamics. This section would include:

- Data searches and incorporations from various sources.
- Computerization of the data (e.g., logbooks) which are available in other formats (in paper copy, etc.).
- Data analysis, including sampling systems, observer programs, etc.

1.2 Development of support material. Sampling and observer programs require additional information such as observer manuals, species identification sheets, etc. The funds could be used for the preparation and publication of this material.

1.3 Development of programs for data entry and processing. The development of data entry and processing programs is essential and the funds should finance this work.

In any of the abovementioned sections, and if so warranted, the funds can be applied to hire experts or to finance the travel expenses of the Secretariat's staff to carry out tasks to support the work teams involved. These tasks can be achieved through data analysis, support *in situ* for the collection of information and sampling, observers, development of support material, development of data processing programs, etc.

These funds would also be used to finance the participation of scientists from countries that do not have their own means to be able to participate in the SCRS meetings.

Protocol for the allocation of funds

To finance the improvement of statistics the following conditions must be met:

1. There should be an explicit recommendation from the SCRS or a formal approval by the SCRS Chair on the need and/or interest of the data to be recovered, development of support material and/or development of the data processing programs, i.e. explicitly referring to the identification of the period to be recovered, the fishery, type of data, type of support material, data processing programs, etc.

2. The SCRS, through the corresponding Species Groups and the Sub-Committee on Statistics (SC-STAT), or the SCRS Chair will develop a work plan.

3. The SCRS or the SCRS Chair will define the procedure to carry out the work plan (e.g., hiring of experts, funding local teams, etc.).

4. The Secretariat will facilitate the process defined in the work plan.

5. The decision on the selection/approval of the projects and contracting experts will be made by the SCRS or the SCRS Chair. The selection of the experts will be made by the Secretariat after consulting the SCRS Chairman and, if contemplated in the defined procedure, with a Selection Committee.

The conditions for financing the participation of scientists at SCRS would be the following:

1. Pertain to developing countries that do not participate by their own means.

2. Present a request, within a deadline defined in the protocol approved by the SCRS in 2010, including a detailed description of the applicant's contribution to the meeting.

3. The Secretariat will process the request and, after obtaining agreement from the rapporteurs of the Species Groups involved and/or from the SCRS Chairman, will carry out the necessary procedures in accordance with the protocol approved by the Committee.

4. The invited scientists are expected to participate actively in the meeting and likely present scientific documents.

2. Capacity building

The Working Group on the Organization of the SCRS noted a decreasing trend in the participation of scientists of CPCs in the work of the SCRS and stressed the need to strengthen their active involvement in this work. One of the causes pointed out by the Group referred to the increasing complexity of the models used and the difficulty to access them. Faced with this, the Group stressed the need to establish capacity building policies which continually develops skills that will result in an overall understanding of the assessment procedures that are carried out within the SCRS.

In this sense, the third meeting of tuna RFMOs insisted on the need to coordinate efforts among the different organizations to develop a more efficient training policy.

In line with these recommendations, the funds could be used to:

2.1 Develop training programs structured by levels and impart training courses.

2.2 Develop supporting learning materials (manuals, applications, web pages, etc.). This section could include both the development of specific applications such as the payment of fees for the use of the material already developed, as well as potential expenses linked to a tutorial in training modules.

2.3 Exchange of scientists between research centres. In 2011, for the first time, a scientist from a developing country spent training time at the IRD-IFREMER centre in Sète.

2.4 Finance the participation at the SCRS meetings of scientists from countries which do not have their own means to support the participation of this scientist in the meetings.

The financing of participants at training courses will be limited to scientists from countries which do not have their own resources to support its participation. However, the funds can be applied towards hiring experts to give courses and/or to develop the learning material, independent of the degree of development of their country of origin.

Protocol for the allocation of funds related to Capacity Building

1. A training course may be requested by a developing Country and/ or may be proposed by the SCRS;

2. When requested by a developing country, a work plan for the training Course should be submitted for the approval by the SCRS or by the SCRS Chair. When proposed by the SCRS, the corresponding Species Groups and/or the Sub-Committee on Statistics will develop a work plan.

3. The SCRS or the SCRS Chair with the Secretariat will define the procedures to carry out the work plan (e.g., hiring of experts, funding local teams, etc.), in coordination with the relevant developing State.

4. The Secretariat will facilitate the process defined in the work plan.

5. The decision on the selection/approval of the projects and contracting experts will be made by the SCRS Chairman, in coordination with, if contemplated in the defined procedures, a Selection Committee and in consultation with the Secretariat.

In the case of a request for a stay at research centres, the protocol shall remain the same as above; however it will include some additional conditions:

- The request, which must be presented at least two months before initiating the stay, should include:

  a) A justification supporting the stay and a work plan describing the activities to be undertaken.
  b) A letter of consent from the director of the center where the researcher works.
  c) A letter from the director of the center accepting the scientist's stay.
  d) In case a visa is required, the applicant should negotiate this directly with the country of the center where he /she will carry out the stay.
  e) ICCAT will not provide any health and/or accident insurance during the stay.

- Following the stay, a document must be presented to the SCRS including a detailed description of the work carried out during the stay and the results obtained.

3. Support the work of the SCRS

One consequence of the decreasing participation of CPC scientists at SCRS meetings is that the Secretariat has increased its participation during the meetings of the SCRS, which went from supporting the work carried out by the SCRS scientists to, in some cases, carrying out a major part of the assessment work. This situation does not correspond with the philosophy of the work of the SCRS or with the structure and means which the Secretariat has available. This preparatory work would be particularly indicated in the application of integrated or similar statistical models which require a large volume of data. The current ICCAT funds could support the work of the SCRS in different ways:

3.1 Contracting experts to develop models, analysis, data preparatory work, and/or participate in the assessments.

3.2 Financing the participation of external experts at the SCRS meetings. In the case that the expert is associated with a tRFMO, such participation would have a double benefit of a peer review (ICCAT Performance Review recommendation) and encouraging the coordination and exchange among tuna RFMOs (Kobe III recommendation).

As in the section above, financing could be applied to any expert who meets the required conditions.

Protocol for the allocation of funds

1. The SCRS Chair, after consultation with the appropriate subsidiary body of SCRS, should specify the profile of the experts in detail, the work to be carried out and, in some cases (e.g., for peer review) provide the Secretariat with a list of potential reviewers.

2. The SCRS Chair, after consultation with the appropriate subsidiary body of SCRS and in consultation with the Secretariat, will define the procedure to carry out the work plan (e.g., hiring of experts, funding local teams, etc.).

3. The Secretariat will facilitate the process defined by the SCRS or SCRS Chair.

4. The decision on the selection/approval of the projects and/or contracting experts will be made by the SCRS or the SCRS Chair. The contracting of the experts will be made by the Secretariat after consulting the SCRS Chairman and, if contemplated in the defined procedure, with a Selection Committee.

Addendum 3 to Appendix 7

Recommendations from Inter-sessional Meetings
Referred to the Sub-Committee on Statistics

2011 ICCAT South Atlantic and Mediterranean Albacore Stock Assessment Sessions

– The Group recommended continuing the work towards integrating the various growth estimate attempts for the Mediterranean albacore. If possible, by including the original datasets in the various works being published so far.

– It was recommended to further investigate on the nature and magnitude of the historical trap catches of albacore in southern Portugal, as well as implications for the assumed stock structure.

– The Group noted that information on some albacore fisheries exists (e.g. FAO, GFCM, Eurostat) which is not incorporated into the ICCAT database. Moreover, the group detected some datasets with either too small (<30 cm in 2009) or too large (>150cm) individuals reported, or important catches by "unclassified" gears. The group emphasizes the need for complete and accurate Task I and Task II data from the main fisheries catching albacore in the Atlantic and the Mediterranean in order to be able to give adequate management advice. Thus, it recommends that all CPCs make an effort to revise the available information and submit it to ICCAT, following the ICCAT standards, before the next assessment.

Meeting of the Working Group on the Organization of the SCRS

Secretariat support for SCRS

– **Further additions to data management staff at the Secretariat should be made to assure that current and future demands, which are likely to increase further, for rapid processing and summarization of the needed information sets is possible**. The pace of increasing demand on just the database management aspects for the Secretariat has occurred at double the rate of the addition of staffing to deal with the increased workload of the Secretariat. This is especially true since the mid-2000s with rapid increases in the amount of information the Secretariat is expected to process and rapidly summarize.

– **Given the success realized following the requirement that Task I and II data be submitted in specific electronic formats, a similar requirement for compliance information should be implemented.** Although compliance issues are not normally within the purview of the SCRS, it is clear that the workload associated with compliance monitoring, compounded by the fact that the vast majority of compliance documentation is submitted in paper/pdf rather than in a standard electronic format, has adversely impacted the ability of the Secretariat to fulfil SCRS data processing needs in a timely and complete manner.

Quality assurance and transparency

– **In support of further quality assurance and transparency, a checklist for stock assessment documentation should be developed and implemented to improve the current situation and allow easy location of the model inputs, software, and outputs (including the underlying data supporting tables and figures).** As the complexity of stock assessment workshops has increased, the amount of documentation needed to support the management advice provided to the Commission has increased. There is wide variability in the quality and quantity of documentation, including the basic input data, models applied, and outputs from the assessments. In addition, stricter guidelines streamlining reports (both detailed and executive summaries) need to be implemented in order to improve the quality of the documentation and advice provided.

– **Collaboration between tRFMOs scientific committees should be further enhanced as such collaboration provides a good basis for quality assurance through peer review and exchange of expertise and experience**. In line with the outcomes of the Kobe2 (Barcelona) discussions, benefits from joint, horizontal working groups devoted to cross-cutting issues such as seabird by-catch and data standardizations issues, should be pursued.

ICCAT-GBYP Symposium on Trap Fisheries for Bluefin Tuna

- The historical data series from the tuna trap fishery archives that have been recovered in the last two years provide an important improvement of the ICCAT data base. The Symposium recommends that further details be made available by national scientists, for a better understanding of the natural fluctuations of the stock, and to improve the standardised CPUEs taking into account the most relevant variables.
- It is also recommended that these traps be considered as "ICCAT Tuna Observatories", by increasing their full cooperation with ICCAT and its scientific programs, by providing full access to their detailed catch and effort data, by providing that biological sampling can be carried out, and by allowing the tag and release of bluefin tunas.
- For standardizing the CPUE series from trap fisheries, it is recommended that:
  - Records be kept of landed fish as well as released fish from the traps.
  - Records be kept of size and/or age information of the fish caught, and indices be developed by age or age groups if there are changes in the size distribution of fish caught in the traps.
  - Regional-wide studies be promoted on the trends of catch rates at size-age from different tuna traps.
- The Symposium participants also recommended that these traps be kept open for a time period long enough to maintain the consistency of their long-term statistical series.

Tropical Tuna Species Group Inter-Sessional Meeting on the Ghanaian Statistics Analysis (Phase II)

- The Group recognized the extraordinary work conducted by Ghanaian scientists with very limited resources for sampling and collection of fishery statistics corresponding to the Ghanaian fleet fishing tropical tunas. However, taking into consideration the relevance of tropical tuna catches landed in Tema by this fleet and fleets of other nationalities and the very limited material and human resources currently available, the Group remains concerned. While some positive steps have been taken Ghana to address staffing and infrastructure issues previously identified by SCRS, current levels are not yet sufficient to fully meet data collection obligations for Task I and II statistics for the overall fleet.
- The Group found that for several fleet segments, very little sample data were available and only partial or no total annual catch was available through official data collection mechanisms. The behaviour of certain segments of the fleet, which includes transfer of catch at sea to carrier vessels for landing at various ports, prevents adequate sampling of catch (by gear) and makes access to logbooks at port, difficult, if not impossible, to achieve for some fleet segments. While the Group made attempts to estimate catch and size characteristics for those fleet segments, these estimates remain highly uncertain. The Group is concerned that a fraction of the Ghanaian fleet behaves in ways that could be considered in contravention of the objectives of the ICCAT Convention. In particular, because obligatory data collection and reporting is generally not possible under the current practices, proper monitoring of the full fleet activity is not carried out.
- The Group reemphasized the SCRS view of convenience for the Ghanaian sampling program to follow, as closely as possible, the sampling scheme protocol used in the EU fishery in order to facilitate the joint analysis of standardized data. In that sense, as different teams are responsible for the Ghanaian and European purse seine sampling in Côte d'Ivoire, it would be convenient to continue enhancing collaboration and coordination between both groups.

Improvements in data collection infrastructure and procedures to fully address data reporting obligations

- The Group recommends development of a permanent structure, adequately equipped, with the necessary human resources, in charge of collecting detailed information on the tropical tuna fisheries (Task I, Task II (C/E) and sampling of catches (Task II size, biological parameters).

- The Group recommends the Ghanaian authorities make the necessary efforts to conduct a proper monitoring of the activities of their fleet in order to guarantee the necessary coverage for the collection of statistical data required. Such monitoring should include at-sea observations, including sampling catches, as well as collection of complete and accurate fishing logbooks from the vessels.
- Furthermore, the Group recommends that data collection protocols be instituted in Ghana which in make it possible to sample catches landed, regardless of flag, as is the process used in Abidjan.

Mechanisms for meeting data obligations

- The Group recommended that mechanisms to improve capacity for meeting data collection and reporting obligations, including industry financial contributions or inter-governmental arrangements, be instituted to enhance financial support for staffing and infrastructure improvements needed to meet the above recommendations.

Technical recommendations

- The Group noted a difference in the percentage of skipjack sampled on Ghanaian landings by scientists and at the cannery. This divergency in species composition remains unexplained. The Group recommended that an intensive multispecies sampling scheme should be done in Tema, validating in parallel the tunas sampling and data entries done by scientists and at the cannery. This comparative sampling should be done under the responsibility of a scientist fully experienced in multispecies tuna sampling.

- The Group noted a relative lack of larger yellowfin tuna in the sample records from Ghana for a series of years. While the Group found that very large yellowfin are infrequently encountered in the Ghanaian fleet, compared to the European purse seine fleet, it was discovered during a site visit to Ghana and in subsequent discussion, that while larger fish are sampled, they are measured in a different way and recorded on separate sheets, which may not have been computerized. The Group recommended that all measures of fish should be on the same sheet, to avoid loss of these measures.

- The Group noted that there are some observer data now available and becoming available for the tropical tuna fleets for characterizing size composition and potentially species composition of the catches as well. Currently these data are not used in the processes for estimating species and size composition of the catches for the European fleet because of concerns about their potential bias. The TGG recommends that observer data be fully analyzed and compared to port sampling information to judge the adequacy of current observer sampling protocols for these purposes.

- The Group noted that the metrics used for comparing Ghanaian and European fleet performance make use of somewhat different components of the catch. For Ghanaian vessels landing in Tema, *"market fish"* which do not go to canneries are recorded and officially reported in Task I data. For European vessels and Ghanaian vessels landing outside of Tema, the landed fish which do not go to canneries are characterized as *"faux poisson"* but are not recorded or officially reported as part of Task I. While there is now ongoing sampling to estimate *"faux poisson"*, it is not yet considered part of official Task I. The TGG recommends that official Task I statistics should include all sources of fishery induced mortality and that CPCs endeavour to achieve this recommendation.

- The Group also noted that the procedures used during the meeting for re-estimating Ghanaian species and size composition made use of both newly available observations and assumptions for time-area combinations where no direct observations were available. While the Group considered the assumptions used to be plausible and resulting in a substantial improvement in the available Task II data base, there are other assumptions that are also plausible and the Group did not have sufficient time to evaluate sensitivity of the outcomes to a range of plausible assumptions. The Group recommends that such evaluations be carried out in the future before accepting any one set of assumptions as the best available.

- The Group recommended working toward development of an improved and harmonized sampling and data processing process for the Ghanaian fleet. In this sampling scheme, it is necessary to separate free school from FAD sets in the data collection and processing. The data validation software (AKADO) needs to be English-language and the processing system made more user friendly and should be introduced into the ICCAT software catalogue as one means of validation. Furthermore, the Working Group recommended that data recovery efforts continue.

- The Group recommends that discrepancies identified between the ICCAT authorized vessel list and the results of in-field investigation of active vessels in the Ghanaian fleet be further evaluated.

Atlantic Yellowfin Stock Assessment Sessions

- The Group recommended that historical and present samples of size frequency (in contrast to raised and substituted size-frequency) be recovered and provided to the Secretariat in support of conducting stock evaluations that make use of the sampling fraction in calculations.

- Recalling the previous SCRS recommendation, the he Group reaffirmed that catch and catch at size necessary for fine-scale scientific analysis be reported by CPCs in at most 5x5 degree resolution.

- The Group recommended that procedures for collection of size samples should be reviewed to assure that there is no size bias in sampling, as the Group suspects that such size-bias may be occurring in certain fisheries.

- The Group recommended the evaluation of market information sources or other alternative ways to improve the accuracy of catch estimates coming from logbooks.

- The Group recommended re-evaluation of the length-weight and associated relationships which were developed on historical information. It is possible that such relationships have changed as the stock condition has changed over time.

Sharks Data Preparatory Meeting for the Application of the Ecological Risk Assessment

- Urge scientists to participate in the 2012 assessment of shortfin mako and comply with the deadlines for the submission of data and documents (see item 5).

- The Group recommended that the CPCs provide data to analyze conventional tag shedding rates.

- The information on tagging should specify the sex of sharks tagged by scientific personnel.

- Allow scientific observers to collect biological samples (vertebrae, tissues, reproductive tracts, stomachs) from species whose retention is prohibited by current regulations that are dead at haulback.

- The Group recommended that the CPCs explore methods to estimate catches of sharks in purse seine fisheries.

- The Group recommended that CPCs report shark Task II size data by sex since this information can be easily collected by observers in most cases.

- The Group suggested to incorporate the description of the 6 species of sharks that have been included in recent Recommendations (ALV, BTH, OCS, SPL, SPZ, SPM) in Chapter 2 of the ICCAT Manual in the by-catch species section.

Recommendations Pertinent to the Sub-Committee on Statistics from the Inter-sessional Meeting of the Sub-Committee on Ecosystems

- The Sub-Committee recommends that guidelines for the presentation and analysis of by-catch statistics be developed in conjunction with the Working Group of Stock Assessment Method (WGSAM) and that these guidelines be made available as part of the *ICCAT Manual*. Furthermore, the Sub-Committee should work with WGSAM to evaluate how these data can be used as part of a risk management advice framework.

- The Sub-Committee re-iterated the need for all CPCs to collect and provide by-catch data to the SCRS, and highlighted the need for further analysis combining species distribution and by-catch data to fill existing data gaps, and to monitor levels and impacts of by-catch.

- With regard to sea turtle by-catch mitigation, the Sub-Committee reminds the obligations of CPCs to provide the by-catch information as required in Rec. 10-09 in 2012.

- The Sub-Committee noted that the By-catch Coordinator position remains unfilled and strongly recommends that this position be recruited promptly. The Sub-Committee also recommended modifications to the job description (Section 5) to better reflect its needs at this time, and to facilitate the ability to recruit an individual with the appropriate skills.

- The Sub-Committee recommends that national scientists from CPCs provide available information which would facilitate to provide a response to the Commission regarding Resolution 05-11 (Sargassum).

- The Sub-Committee recommends that the Secretariat attempt to collate user manuals or protocols describing data collection from CPC observer programs. Also, an attempt should be made to identify historical changes to the data collection protocols that might complicate data analyses and interpretation.

GBYP Steering Committee Meeting

- *Excluding data of the year*. The Steering Committee discussed about the limits to be adopted in the data recovery policy, particularly taking into account the discussions raised after some proposals in Phase 2. It was recognised that although the ICCAT rules are very precise for Task I data, they do not define a minimum level of sampling for Task II data by fishery. This fact makes problematical a precise definition of the policy to be adopted for GBYP data recovery. The Coordinator provided some examples of data sets which are collected and provided according to the general rules under Task II, which are not very useful for scientific purposes. It was very clear that GBYP cannot pay for data that have been collected under national sampling schemes by ICCAT CPCs to fulfil their Task II obligations. It was also clear that many data are not usually provided to ICCAT even though they may be collected. This is because they are collected by various entities on their own costs and for various purposes. The Steering Committee recommended that a reasonable policy for GBYP is to limit the data recovery to data collected in previous years, excluding the data of the year. This policy would thus make a clear distinction between data recovery (which is a legitimate task under this part of the GBYP, and paying for the collection of data which are the responsibility of the CPCs (such as Task II). The Steering Committee also recommended that the focus in these cases should be on the last two decades and particularly for those data which could be directly used for stock assessment purposes, such as CPUEs or Task II data for fisheries poorly represented in the ICCAT bluefin tuna data base. At the same time, the Steering Committee recommended the GBYP Coordinator to contact the chair of ICCAT Sub-Committee on Statistics in order to initiate an exercise among all CPCs for establishing a minimum level of sampling for the provision of Task II data for bluefin (eventually this exercise could be extended to all species under the competence of ICCAT) and for eventually defining, in agreement with the scientists concerned, a minimum level of sampling coverage to be officially adopted by the ICCAT.

First Meeting of the Joint Tuna RFMO Technical Working Group on By-Catch

Data collection and harmonization

- The Working Group agreed that there should be minimum data standards, with data fields that are collected across all RFMOs with a view to allowing interoperability.
- All members of RFMOs are encouraged to improve the quality of data collection system to improve fisheries and by-catch assessments.
- All members of RFMOs are strongly encouraged to share data or information within RFMOs collected from observer and log book programs for the purposes of by-catch management and research.
- The Working Group will prepare a short report on data harmonization using all existing data forms from all tuna RFMOs by December 31, 2011. To facilitate this process, the IATTC forms will be circulated for a comparison with the other tuna RFMOs.
- Noting that there is a working group to be convened between IATTC and WCPFC on observer data harmonization, including by-catch, the Working Group recommends involving the other tuna RFMOs at this workshop.
- Seabird identification: the tuna Secretariats will provide ACAP with existing seabird identifications, and ACAP will develop a standardized identification guides. The drafts of the identification guides will be reviewed by the Working Group working group and Tuna RFMO working groups.
- Shark identification: the Working Group, with WCPFC and ICCAT taking the lead, will harmonize guidance for shark identification, in collaboration with the IUCN shark specialist group and others.

- Sea turtle identification: the Secretariats will provide the Working Group Chair with the materials currently in use for turtle identification so these can be harmonized and distributed to all tuna RFMOs.
- The Working Group should consider a process to develop harmonized marine mammal identification guides for the fisheries for which they are not available.

Blue Marlin Stock Assessment Meeting and White Marlin Data Preparatory Meeting

- The Group recommended on the need to stress that CPCs should report Task I and Task II for Inter-sessional meetings by the deadlines provided by the Secretariat.
- The Group recognized the important new catch estimates of blue marlin from FAD fisheries of Martinique and Guadalupe and recommended that detail of estimation be presented as an SCRS document in the next species group meeting. The Group also recommended that other Caribbean countries with FAD fisheries report detail specific billfish catches.
- The Group encouraged the Secretariat to reach out to other RMFO in the Greater Caribbean to explore sharing data pertinent to ICCAT fisheries.
- The Group strongly recommended that the Commission provide additional funding (50K Euros) to the Enhanced Billfish Research Program for a genetic study in order to accelerate the data acquisition and analysis for separating white marlin from spearfishes to be undertaken in the immediate future.
- The Commission should require the reporting of catches of white marlin and roundscale spearfish separated.

Addendum 4 to Appendix 7

Response to the Resolution by ICCAT to Establish a Working Group on Sport and Recreational Fisheries [Res. 06-17]

In 2006, the Commission resolved that the SCRS should establish a Working Group to evaluate sport and recreational fishing activities. The Working Group would:

a) Examine the biological and economic impact of recreational and sport fishing activities on ICCAT managed stocks and assess the level of harvest.

b) Based on available information, identify approaches for managing the recreational and sport fishing activities in ICCAT fisheries.

c) Report the results of deliberations to the Commission and, as appropriate, propose recommendations for next steps to manage the recreational and sport fishing activities in the Convention area. CPCs shall report prior to the Working Group meeting the techniques used to manage their sport and recreational fisheries and methods used to collect such data.

With regard to item (a), the group recognized that recreational and sport fishing activities can have considerable biological and economic impact on ICCAT managed stocks. Furthermore, these impacts are not currently estimable due to a general lack of data.

With regard to item (b), the group recognized that the evaluation of suitable management measures requires reliable statistics be reported by all CPCs with non-trivial recreational and sport fisheries, and would be further improved by concomitant socio-economic data. The group recommended enhanced efforts by CPCs to collect and report such information.

With regard to item (c), the CPCs that attended the group made reports on their sport and recreational fishing activities, and the techniques used to collect data and manage these activities. These reports have been compiled, and are summarized below.

Taking into account the need to improve stock assessments by obtaining reliable estimates of total removals (harvest + dead discards) of ICCAT managed stocks; the Committee reiterated its following recommendation:

1. In order to develop appropriate estimates of harvest and dead discards by recreational and sport fishing activities, the SCRS recommended that each CPC:

a) Identify the "universe" of recreational fishing participants.
b) Sample that universe with appropriate coverage to allow estimation of total removals with sufficient accuracy and precision.
c) Produce or obtain estimates of release mortality to facilitate the quantification of fish released alive that subsequently die due to interaction with fishery.

2. The Committee concluded that sufficiently accurate and precise estimates of total recreational removals require CPCs to collect the following information through national and/or regional sampling programs. This data would be retained by CPCs, but used to develop the estimates of total recreational removals that are reported to ICCAT. The following should be considered minimum standard practices. These are the essential components for estimation of Task I and Task II data to meet reporting obligations.

   a) Catch by species
   b) Length/Weight of landed fish
   c) Discards by species
   d) Length/Weight of discarded fish
   e) Disposition of discards (e.g. released alive and likely to survive, released alive but unlikely to survive, discarded dead, used for bait).
   f) Location and time of fishing trip
   g) Estimates of release mortality by species

The Group acknowledged that some CPCs have already developed successful sampling programs, and currently use data collected by these programs to report recreational Task I and Task II statistics to ICCAT. Several of these programs were identified by the group, and the methodologies were discussed. These issues will be further taken up at a future meeting of the Working Group on Stock Assessment Methods.

Appendix 8

REPORT OF THE MEETINF OF THE SUB-COMMITTEE ON ECOSYSTEMS
(Madrid, Spain – September 27-30, 2011)

The Meeting was held at the ICCAT Secretariat on September 27 to September 30, 2011. Mr. Cleo Small (BirdLife International) and Mr. Anton Wolfaardt (ACAP) volunteered to serve as rapporteurs.

1. Review of new scientific information

The Sub-Committee discussed and made recommendation regarding these documents. This discussion can be found in SCRS/2011/204.

Document SCRS/2011/150 provided an updated review of seabird by-catch mitigation measures for pelagic longline fisheries, undertaken by the Seabird By-catch Working Group of the Agreement on the Conservation of Albatrosses and Petrels (ACAP) in August 2011. The review includes the scientific evidence in support of the effectiveness of each mitigation measure, recommendations on appropriate combinations of measures, along with recommended technical specifications, monitoring requirements, and research needs.

Document SCRS/2011/151 presented a summary of the ACAP best practice advice for mitigating seabird by-catch in pelagic longline fisheries. Currently, no single mitigation measure can reliably prevent incidental mortality. The most effective approach is to use simultaneously weighted branchlines, night setting and bird scaring lines. It is recommended that these three measures should be applied in high risk areas such as the high latitudes of southern hemisphere oceans, and lower to mid-latitude fisheries of both the northern and south east Pacific, to reduce the incidental mortality to the lowest possible levels. Other factors such as safety, practicality and the characteristics of the fishery should also be recognised. ACAP best practice advice on bird scaring lines is that vessels >35m use two bird scaring lines, one on each side of the longline. For vessels <35 m, a single bird-scaring line, using either long and short streamers or short streamers only, has been found effective.

Current recommended minimum standard for branchline weighting configurations are:

- Greater than 45 g attached within 1 m of the hook or;
- Greater than 60 g attached within 3.5 m of the hook or;
- Greater than 98 g weight attached within 4 m of the hook.

On the basis of the evidence currently available, ACAP does not currently recommend the following as seabird by-catch mitigation options: line shooters, olfactory deterrents, hook size and design, side-setting, the use of blue-dyed bait and bait thaw status.

Document SCRS/2011/187 assessed the impact of the Uruguayan pelagic longline fishery on populations of albatrosses and petrels. The paper applied Productivity and Susceptibility Analysis (PSA) and the concept of "Potential Biological Removal" (PBR). This two-step approach allowed an estimate of the relative impact of the Uruguayan pelagic longline fleet for most of the populations or species of albatross and petrel that have high association with this fishery. Of 15 species addressed, 11 were fully evaluated, and a ranking of risk was obtained. The concept of PBR was applied to the eight most at risk species. The assessment found that the impact of fishing on populations could not be straightforwardly presumed from their by-catch rates. The results indicate that great albatrosses (*Diomedea* spp) and Atlantic yellow-nosed albatross *Thalassarche chlororhynchos* were more affected than the species caught in highest numbers by the fishery (i.e. black-browed albatross *Thalassarche melanophrys* and white-chinned petrel *Procellaria aequinoctialis*). Wandering albatross *Diomedea exulans* from South Georgia would be the population most affected by the Uruguayan fleet. This work should be seen as a case study of the fisheries operating in the southwestern Atlantic, particularly over part of the Brazil Malvinas Confluence (BMC). Considering the fishing effort that several pelagic longline fleets expend over the region of the BMC, this paper highlights that some populations of albatross and petrel are likely to be seriously affected.

Document SCRS/2011/198 presented seabird distribution maps based on seabird tracking data, interaction maps between longline fishery effort and seabird distribution, and data on the distribution of by-catch CPUE of seabird species in the South Atlantic, based on Japanese by-catch data, to identify by-catch hotspots. Tracking data indicate highest concentrations of the seabird breeding distribution in the area between 5-10W, 35-40S, and 35-

40S, 10W-15E, and also 35-60S, 55-65W during non-breeding. The available by-catch data confirm the distributions shown by the tracking data but there are exceptions in each species and degree of concentration of seabird distribution did not necessarily agree with the degree of CPUE in each species. The degree of interaction data was low level for the latitude 40-45S while CPUE of by-catch data was quite high. Interaction data showed concentration for latitudes 25-40S longitudes 55-40W, where there is no by-catch data. It was suggested that three methods should be integrated to define the hotspot. Distribution of by-catch CPUE in albatrosses was high especially off South African waters and in the south-eastern Indian Ocean. Thus, there two area and the SW Atlantic would be considered as risk area for seabird by-catch, and it is necessary to introduce appropriate mitigation measure there.

Document SCRS/2011/201 reported the results of a study to estimate seabird by-catch by Taiwanese vessels in the Atlantic. Sixty one trips with 6,181 observed sets on Taiwanese longline vessels in the Atlantic Ocean from March 2004 to February 2008 were used to record the interaction between seabirds and longline fisheries. At least twenty eight species of seabirds were sighted, including two species in the north, fifteen species in the tropics and thirteen species in the South Atlantic. Eight species were albatrosses, the group of greatest conservation concern. 198 seabirds of eight major species were caught and 23 were live-released. The major by-catch species included yellow-nosed albatross, black-browed albatross, wandering albatross, spectacled petrel and southern giant petrel in the southern Atlantic Ocean. Major by-catch areas were 20°~40°S, 10°W~15°E and 35°~45°S, 45°~55°W. The nominal by-catch per thousand hooks ranged from 0 in the North Atlantic Ocean to 0.064 in the Southeast Atlantic Ocean. The observer coverage rate was too low for an accurate estimate of seabird by-catch in the northern Atlantic Ocean. In the tropical area, the level of observer coverage was high and indicated the seabird by-catch rate was low with low risks for seabirds. As for the South Atlantic Ocean, by-catch rates were influenced by the number of birds sighted and location using generalized additive models (GAMs). Total ICCAT pelagic longline effort was used in the final GAM to predict total by-catch in the South Atlantic Ocean. The predicted annual by-catch number with the bootstrapped 95% confidence interval was from 3,446 to 6,083 per year by pelagic longline fleets from 2004 to 2008. The study highlights the need for all pelagic longline vessels operating south of 20S to use bird scaring lines and other mitigation measures in order to reduce seabird by-catch. Continued collection of those data could provide information on the effectiveness of the current conservation measures. For future research and conservation, more international cooperation on research and data sharing is critical to ensure the sustainability of marine ecosystems and fisheries.

Document SCRS/2011/206 presented a proposal by Japan for the application of seabird by-catch mitigation measures in the South Atlantic. This paper is thoroughly described in the document SCRS/2001/204. Unfortunately, the Sub-Committee could not properly evaluate this paper because it dealt with policy issues, rather than a scientific evaluation.

2. Tuna RFMO Joint By-catch Technical Working Group

The Sub-Committee discussed the outcomes of the first meeting of the Joint By-catch Technical Working Group (JBTWG), which was a one-day meeting held on 11 July 2011 during the KOBE 3 Meeting. The Sub-Committee reviewed the general recommendation for the standardization and harmonization of data collection and the list of research priorities and discussed their relevancy to ICCAT. The Sub-Committee also produced a list of research recommendations of high importance in the ICCAT fisheries. This discussion and is summarized in SCRS/2011/204.

3. Ecosystem considerations

A National Scientist from the United States presented progress made in describing the Oxygen Minimum Zone in the tropical Atlantic Ocean. This feature has expanded since the 1960s resulting in a reduced proportion of the Atlantic Ocean possessing sufficient dissolved oxygen for high-oxygen demand species such and yellowfin tuna and blue marlin. The expansion of this feature (both in depth and surface area) has implications for stock since it may alter catchability and/or carrying capacity as the fish become compressed in the surface waters where the dissolved oxygen remains sufficient.

4. Recommendations

Given current ICCAT requirements of a minimum of 5% observer coverage, and the need to collect and report data for a number of by-catch species, the SC-ECO recommends the development and implementation of capacity building programmes to improve sampling protocols, observer training and species identification (e.g. through identification guides or sending photos and samples to experts).

Appendix 9

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