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CONSERVATION of ATLANTIC TUNAS

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INTERNATIONAL COMMISSION FOR THE CONSERVATION OF ATLANTIC TUNAS

CONTRACTING PARTIES

(as of 31 December 2012)

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

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Panel No.	***PANEL MEMBERSHIP***	***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), Guatemala, Honduras, 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, Egypt, Equatorial Guinea, European Union, France (St. Pierre & Miquelon), Gabon, Guatemala, 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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PERMANENT WORKING GROUP FOR THE IMPROVEMENT OF ICCAT STATISTICS AND CONSERVATION MEASURES (PWG)	T. EL KTIRI, Morocco (since 19 November 2011)

ICCAT SECRETARIAT

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FOREWORD

The Chairman of the International Commission for the Conservation of Atlantic Tunas presents his compliments to the Contracting Parties of the International Convention for the Conservation of Atlantic Tunas (signed in Rio de Janeiro, May 14, 1966), as well as to the Delegates and Advisers that represent said Contracting Parties, and has the honor to transmit to them the ***"Report for the Biennial Period, 2012-2013, Part I (2012)"***, which describes the activities of the Commission during the first half of said biennial period.

This issue of the Biennial Report contains the Report of the 18th Special Meeting of the Commission (Agadir, Morocco, November 12-19, 2012) 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.

MASANORI MIYAHARA
Commission Chairman

REPORT OF THE STANDING COMMITTEE ON RESEARCH AND STATISTICS (SCRS)
(Hotel Velázquez, Madrid, Spain, October 1-5, 2012)

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REPORT OF THE
STANDING COMMITTEE ON RESEARCH AND STATISTICS (SCRS)
(Madrid, Spain - October 1 to 5, 2012)

1. Opening of the meeting

The 2012 Meeting of the Standing Committee on Research and Statistics (SCRS) was opened on Monday, October 1, 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 SCRS of 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 congratulated the Committee for the work conducted recently in very complex situations and the good results that were obtained. The Executive Secretary considered that 2012 is a year in which the SCRS advice and the courageous decisions taken by the Commission based on it have produced encouraging signals of improvement in the stock status. Mr. Meski highlighted that the SCRS work continues to be highly appreciated by our Commission and on the international level.

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 revised and adopted (attached as **Appendix 1)**. Stock assessments were carried out this year on Atlantic white marlin (WHM), shortfin mako (SMA), West Atlantic and East Atlantic and Mediterranean bluefin tuna (BFTW-BFTE).

The following scientists served as rapporteurs of the various species sections (Agenda Item 8) of the 2012 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 (West), J.M. Fromentin (East)
BIL	-	Billfishes	F. Arocha
SWO	-	Swordfish	J. Neilson, T. Frédou (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 24 Contracting Parties present at the 2012 meeting: Algeria, Brazil, Canada, Cape Verde, China, Côte d'Ivoire, Croatia, European Union, Ghana, Equatorial Guinea, Japan, Korea, Libya, Mauritania, Mexico, Morocco, Norway, Panamá, Russian Federation, Senegal, Tunisia, Turkey, 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 (*Convención Interamericana para la Protección y Conservación de las Tortugas Marinas*–IAC and International Council for the Exploration of the Seas - ICES), and non-governmental organizations (*Conseil Consultatif Régional de la Méditerranée*-CCR MED, *Confédération Internationale de la Pêche Sportive*–CIPS, Federation of Maltese Aquaculture Producers-FMAP, Federation of European Aquaculture Producers-FEAP, International Seafood Sustainability Foundation-ISSF, IWMC World Conservation Trust and The Pew Environmental Group were admitted as observers and welcomed to the 2012 SCRS) (see **Appendix 2**).

5. Admission of scientific documents

The Secretariat informed the Committee that 158 scientific papers had been submitted at the various 2012 inter-sessional meetings.

Besides the scientific documents, there are 7 reports of inter-sessional meetings and Species Groups, 38 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” which summarizes activities in 2012. This document was discussed at length during the Species Groups meetings and during the session of the Sub-Committee on Statistics. The report summarized the status of data submitted by the flag reporting States for Task I and Task II, tagging, and by-catch and discards for the 2012 statistical data obligations. The improvement in timely submissions and the increased resolution and volume of data submitted, in particular for Task II, was noted. This report also noted that starting in 2013 it will mandatory to report Task I nominal catch under the new format adopted by the Commission in 2010, using the species-specific sampling area definitions (available at http://www.iccat.int/Data/ICCATMaps2011.pdf).

This report also summarized the available data information for by-catch species (teleost and sharks) collected from diverse sources. It was noted that by-catch reports from national observer programs varied greatly in format and detailed information among CPCs. The Secretariat informed that with the collaboration of the Sub-Committee on Ecosystems, a by-catch database and the corresponding e-forms were being developed to facilitate the integration of these new data (see section on Ecosystem report for further details). The Secretariat noted that protocols or models for total by-catch estimation by the fleet(s) are not usually reported by the reporting CPCs. Finally, it was requested that the Secretariat Report also include other by-catch species, and seabirds in particular.

The Secretariat also informed on the activities carried out in 2012 in relation to publications, noting that since 2011, the *Biennial Report* includes a fourth volume which contains the Secretariat reports to the SCRS and other committees. Likewise, volumes 67 and 68 of the *Collective Volume of Scientific Papers* were published. Volume 67 contains the Report of the ICCAT-GBYP Symposium on Trap Fisheries for bluefin tuna. In addition, Chapters 2 and 3 of the *ICCAT Manual* were extended to include new descriptions of shark species and longline gear, and new billfish identification sheets were developed.

A summary of the activities carried out by the ICCAT/Japan Data Management and Improvement Project (JDMIP) was presented . This project continues to support port sampling developed in Tema (Ghana) and the eastern Caribbean (Venezuela), support for VMS programs in Ghana and Senegal, and training workshops on data collection and statistics reporting of ICCAT species. This program has also made financial contributions towards the participation of scientists from developing countries to SCRS meetings.

The Secretariat also informed on the use of the different ICCAT funds in 2012. Due to the approval by the SCRS in 2011 of the “Protocols to follow for the Use of Data Funds and Other ICCAT Funds”, the range of activities funded has been widely extended in 2012 to new activities in support of the SCRS work (i.e., peer review process, sea-turtle expert contract).

7. Review of national fisheries and research programs

In accordance with the format established in 2005 and revised in 2007, only information relative to new research programs was presented to the Committee. The Committee considered the need to include information of interest for its work, separating it from the Annual Report which, with its current structure, is more geared to providing information to the Commission on compliance. The Committee reiterated the need to follow the guidelines established for the preparation of the Annual Reports and to try to clearly define the contents under the various sections (scientific or compliance).

Algeria

The Algerian total catches of tunas and tuna-like species amounted to 1797 metric tons, broken down as follows: Swordfish 216 t, Atlantic bonito 355, skipjack 98 t, plain bonito 9 t, frigate tuna 1119 t. Catches were made mainly by artisanal vessels of the longline and purse seine type.

It is important to point out that the bluefin tuna fishing campaign for 2011 was not carried out.

The only size sampling was carried out on swordfish (*Xiphias gladius*) covering the west, central and eastern Algerian coast. It was not possible to carry out the sexing of fish.

As concerns statistics, mechanisms have been put in place for the collection of data on the fishing activity.

As regards research, areas of research were developed, mainly on bluefin tuna and swordfish by the implementation of biological sampling at landing sites.

Brazil

In 2011, the Brazilian tuna fleet fishing for tuna and tuna like fishes consisted of 583 vessels registered in 13 different ports; more than 83% (486) of those vessels has less than 20 m of length and the number of chartered vessels represented 2.6% (15) of total. The Brazilian catch of tunas and tuna-like fishes, including billfishes, sharks, and other species of minor importance (e.g., wahoo and dolphin fish), was 52,014.97 t (live weight). The majority of the catch was taken by baitboats (31,691.92 t; 61% of the total catch), with skipjack tuna being the most abundant species (29,322.07 t; 92.5% of the baitboat catches). The total catch of the tuna longline fishery was 11,673.72 t (22.4% of 2011 total catch), with swordfish (2,800.15 t), blue shark (1,912.6 t) and yellowfin tuna (1,793.82 t) representing almost 56% of longline catches. The total catch of white marlin and blue marlin was 59.66 t and 63.35 t, respectively. Part of the Brazilian catches (4,080.18 t; 7.8% of total catch) resulted from the fishing activities of small-scale fishing boats (378 vessels; 65% of total vessels) based mainly in Itaipava- ES (southeast coast) targeting a variety of species with different gears such as longline, handline, troll and other surface gears; the most targeted species of this fleet in 2011 was dolphin fish (2,048.61 t). In 2011, a total of 40,514 fish were measured at sea at landing and two silky sharks were tagged in the Saint Peter and Saint Paul Archipelago. Research continued on the incidental catches of seabirds by the Albatroz Project as well as the monitoring of sea turtle by-catch in the longline fisheries by the TAMAR Project.

Canada

In 2011, Canada landed 1,551 t of swordfish, 474 t of bluefin tuna, 28 t of albacore tuna, 137 t of bigeye tuna, and 50 t of yellowfin tuna. Canada also landed 37 t of shortfin mako, and 30 t of porbeagle.

Bluefin tuna research focused on post-release survival, environmental effects on catch rates, fish movement and migration. Ongoing natal origin investigations are also being conducted in cooperation with the GBYP, improving our understanding of the age and stock origin of the catch in Canadian waters. Swordfish research currently aims at completing collaborative studies of swordfish movements and migrations in the northwest Atlantic and completing a study with many other SCRS scientists, describing the recovery of the Atlantic swordfish stocks. An ongoing project is examining survival of loggerhead turtles caught in the swordfish longline fishery. Shark research for 2011 has focused on PSAT tagging, providing information on shortfin mako shark movements and preliminary estimates of post-release mortality. Additional projects involved blue shark catch rates and further improving bycatch mortality estimates in the large pelagic and groundfish fisheries. More details of the Canadian research program may be found in the Annual Report of Canada.

Cape Verde

The total preliminary catch in 2011 amounted to 16,011 tons, taken mainly by purse seine in the industrial or semi-industrial fishery and by hand line in the artisanal fishery. The fishing resources are exploited by an artisanal fishery with 1,239 boats and by an industrial or semi-industrial fleet with 91 larger size vessels (2011 survey). In the artisanal fishery, the proportion of sharks in the catch did not exceed 0.3% of the total landings at the national level. This indicates that there are by catches in the fishery directed at other resources. As concerns the industrial fishery, no licenses were granted and there were no reported landings. Based on the reports of catches by EU vessels sent to the DGP, it seems that sharks represent the group that most occurs in the catches. Over time, the sport fishery has become an activity of greater importance for economic, social, cultural and political development. However, unfortunately, there is no monitoring of this fishery yet. Billfish are caught in Cape Verde waters, mainly by EU vessels and by sport fishing. The foreign fleet authorized, operates in the Cape Verde EEZ, in accordance with fishing agreements or contracts. These vessels mostly pertain to the European Union and Asian countries. Cape Verde has the second highest catches of the sea turtle species (*Caretta caretta*) as well as the third largest population of this species in the world, after Oman and Florida. This species is studied in Cape Verde in the islands where there are the greatest quantities. However, Cape Verde´s s biggest problem is their capture on land, when they come to the beaches to reproduce, despite the annual catch prohibition. The catch of sea turtles by the nets of the national Cape Verde fleet is minor.

China (People's Rep.)

Longline is the only fishing gear used by the Chinese fishing fleet to fish tunas in the Atlantic Ocean. Thirty (30) Chinese tuna longliners operated in 2011, with a total catch of 4997.1 t including tuna, tuna-like species and sharks (in round weight), 1875.9 t lower than that of 2010 (6873 t). The target species were bigeye tuna and bluefin tuna, whose catches amounted to 3720.2 t and 35.9 t in 2011, respectively. Bigeye tuna was still the major targeted species in the Chinese catch, accounting for 74.4% of the total. Yellowfin tuna, swordfish and albacore were taken as by-catch. The catch of yellowfin tuna, swordfish, and albacore in 2011 amounted to 346.4 t, 322.2 t, and 181.0 t, respectively. 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. Two observers have been dispatched on board two Chinese Atlantic tuna longline fishing vessels since October, 2011. Data on target species and non-target species were collected during the observation.

Côte d'Ivoire

The Côte d'Ivoire tuna resources are mainly exploited by an international fleet of large French and Spanish tuna vessels within the framework of a fishing agreement between Côte d'Ivoire and the European Union. The landings of these tuna vessels at the fishing port of Abidjan are monitored by the IRD of France and the IEO of Spain, in collaboration with the *Centre de Recherches Océanologiques*-CRO (Center for Oceanographic Research).

Tunas, tuna-like species and sharks caught in Ivorian waters in 2011 amounted to about 2,892.378 t. The tunas are most numerous (87.77%), followed by tuna-like species s (10.47 %) and sharks (1.74%).

The catches were made by two vessels, one with Ivorian flag and the other a chartered vessel, and by the artisanal canoe fishery. These catches were comprised of 2,538.88 t of tunas, broken down as follows: 2,106.72 t of *Katsuwonus pelamis* (skipjack tuna), 385.06 t of *Thunnus albacares* (yellowfin tuna) and 47.1 t of *Thunnus obesus* (biggeye tuna). Sharks catches amounted to 50.53 t, as follows: *Sphyrna lewini* (hammerhead), the major shark species (34.63 t) followed by *Prionace glauca* (blue shark) 10.3 t, and *Isurus oxyrinchus* (shortfin make) 6.04 t. The associated species with 302.9 t, are essentially comprised of 145.44 t de *Xiplias gladius* (swordfish), 115.05 t of *Istiophorus albicans* (sailfish), 41.884 t of *Makaira nigricans* (blue marlin) and 0.52 t of *Tetrapterus albidus* (white marlin). Contrary to 2010, no North swordfish, South albacore and North albacore were caught. The collection of biological data on the major species, catch and effort statistics is carried out thanks to the collaboration between the CRO and the *Direction de l'Aquaculture et des Pêches*-DAP (Directorate of Aquaculture and Fishing). Côte d'Ivoire will now be a taking part in the statistical monitoring program as it has, since the end of 2011, a tuna purse seiner flying Ivorian flag.

Croatia

The total Croatian catch of bluefin tuna in 2011 was 375.03 metric tons (t). Of that amount, the total catch in the commercial fisheries was 371.99 t and in sport/recreational fisheries was 3.04 t. Of the total catch 4.45 t (1,20%) was discarded dead (mortality). Bluefin tuna catches in the commercial fisheries were mostly realized by purse seiners (366.00 t; 98.39%), while the remainder (5.98 t; 1.61%) was caught using hook and line gears.

The total Croatian catch of Mediterranean (Adriatic) swordfish in 2011 amounted to 6,098 kg.

Research was continued on the growth and reproductive biology of bluefin tuna. In order to improve the estimate of bluefin tuna biomass at the point of caging, a pilot programme on the use of a stereoscopic system has been tested. A national sampling program targeting bluefin tuna harvested from aquaculture facilities has been carried out. Research activities are under way aimed at estimating the impact of increased abundance of small bluefin tuna in the Adriatic on the small pelagic fishery.

Equatorial Guinea

In Equatorial Guinea, marine fishing is directed at coastal pelagic species, large oceanic pelagic species, coastal demersal species, and deep water demersal species.

The artisanal fishers of Guinea Equatorial mostly catch coastal and pelagic demersal species, except for the Island of Annobon, where the artisanal fishers catch oceanic pelagic species. The majority of the fishers use “cayuco” vessels measuring 4 to 10 m. The Island of Annobon permits the exploitation of its productive oceanic waters close to the coast, with the consequent development of a particular artisanal fishery in Equatorial Guinea especially directed at the catch of large oceanic pelagic species such as flying fish (*Exocoetus volitans*), wahoo (*Acanthocybium solandris*), yellowfin tuna (*Thunnus albacares*), sailfish (*Isthiophorus albicans*), skipjack tuna (*Katsuwonus pelamis*) and bigeye tuna (*Thunnus obesus*), among others.

Industrial marine fishing in Guinea Equatorial waters is carried out by foreign fleets, and there is purse seine tuna fishing carried out by freezer purse seiners that catch skipjack tuna 2,354 t (SKJ, *Katsuwonus pelamis*), yellowfin tuna 672 t. (YFT, *Thunnus albacares*), bigeye tuna 105 t (BET, *Thunnus obesus*), frigate tuna 57 t (FRI, *Auxis thazard euthynnus*) and albacore 0.19 t (ALB, *Thunnus alalunga*).

There are no updated studies on the fishing resources in the marine waters of Equatorial Guinea. In the 1980s, some research cruises (FAO) were carried out that estimated catches of 74.150 t/yr of fish and fishing products and, of that amount, 55.000 t/yr of tunas and tuna-like species.

The Captains of the fishing vessels that fish with marine industrial fishing licenses in Equatorial Guinea’s territorial waters regularly report, to the General Directorate of Fishing Resources, their corresponding catches by species after each fishing trip.

The VMS-Argos system, for monitoring purposes within Equatorial Guinea’s jurisdictional waters, is currently installed in the *Dirección General de Recursos Pesqueros*, under the Ministry of Fishing and the Environment.

European Union

The EU fleets caught 190,000 t of tuna and billfish in 2011, i.e., almost 40% of the total ICCAT catches. Catches in recent years have increased slightly compared to the 155,000 t in 2007, following the increasing catches of tropical tunas and the return of several purse seiners to the Atlantic since 2008, which had operated in the Indian Ocean. These catches remain well below the 300,000 t that were landed in the early 1990s by the same EU countries. Eight countries of the EU fish for tunas in the Atlantic and Mediterranean which, in descending order of catches in 2011, are as follows: Spain (117,000 t), France (43,500 t), Portugal (15,600 t), Italy (10,800 t), Greece (3,100 t), Ireland (3,600 t) with a fair amount of albacore catches, Malta and Cyprus. The major species caught by the EU countries in 2010 were skipjack with a strong increase in catches (74,000 t.) due to the current high price of this species, yellowfin (43,400 t), bigeye (25,000 t) and swordfish (21,700 t), albacore (20,100 t), and bluefin tuna (5,700 t). It is noted that while the 2011 catches of tropical tunas have been increasing slightly every year since 2007 (142,000 t as compared to 77,000 t in 2007), albacore, bluefin and swordfish catches are stable. All the traditional gears are operating in the EU: purse seiners, baitboats, longliners, hand lines, troll, driftnets, harpoons, pelagic trawl, traps and sport fishing.

Since 2001, the EU also generally and to a large extent finances the collection of biological data and a considerable amount of research on tunas by all its Member States. Routine biological sampling of the tropical tuna catches of European purse seiners is carried out in the Abidjan canneries and, since 2008, in the artisanal fisheries of the French Antilles. These statistics also serve to estimate the so-called "*faux poisson*" catches, all the species that are landed at the port of Abidjan by the international purse seiners destined for the local market. The Task I and II statistical data submitted to ICCAT in 2012 by the EU countries are generally complete and in accordance with the ICCAT rules. Further, it should be noted that the EU supports observer programmes on various fleets, the tropical purse seiners with about 10% of the fishing effort monitored by observers, and estimation of discards observed were submitted to the SCRS. Besides, 100% of the fishing days were observed on purse seiners fishing bluefin tuna in the Mediterranean. Also noteworthy is the considerable financial support again in 2011 and 2012 from the EU towards the ICCAT GBYP intensive research on bluefin tuna, a programme in which scientists from EU countries continue to play a very active role. Besides, the European Union has decided to carry out an extensive project on the historical catches of high seas sharks.

The active participation of European scientists at all the ICCAT scientific meetings and the large number of 2012 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 for example on, 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 by the for tuna resources, reduction of unwanted by-catches, modeling of high seas pelagic ecosystems, etc. The participation of scientists from EU countries is, for example, active in the framework of the CLIOTOP/GLOBEC programme, which has broad objectives regarding its tuna research, which is multi-disciplinary and worldwide and which is aimed at carrying out improved modelling of the sustainable exploitation of the tuna resources based on the environment and the ecosystems.

Ghana

The tuna industry in Ghana comprises both baitboats and purse seiners exploiting mainly skipjack (*Katsuwonus pelamis*), yellowfin (*Thunnus albacares*) and bigeye tuna (*Thunnus obesus*). Twenty two (22) baitboats and 17 purse seiners operated during the year under review fishing mainly within the EEZ of Ghanaian territorial waters. A total catch of 70,578 metric tons (t) of tunas was caught in 2011. Skipjack catches were the highest (72%) followed by yellowfin (15%), bigeye (6%) and other minor tunas (7%), respectively. Over 80% of the catches were off FADs and both fleets continued to collaborate sharing their catch. Statistical data (Task I, II, III, including logbook recoveries) for 2011 were sent to the ICCAT Secretariat via the AVDTH 3.2 software programme.

The recent inter-sessional meetings organized by ICCAT on improvements of Ghanaian statistics have contributed to a better understanding of the spatial-temporal distribution of the species. It is envisaged that further synthesis of the database since the re-introduction of the purse seine fleet in 1996 could improve the overall catch and species composition of the catch in relation to improved stock assessments.

An observer programme onboard the purse seine fleet was carried out in 2011. Monitoring of the artisanal driftnet operators for billfishes continued off the western coast of Ghana. Sailfish catches remained relatively stable whilst swordfish catches dropped to 60 t in 2011 from 130 t in 2010.

Japan

Longline is the only tuna-fishing gear deployed by Japan at present in the Atlantic Ocean. The final logbook coverage from the Japanese longline fleet was 90-100% before 2010. The current coverage for 2011 is estimated to be about 85%. In 2011, there were 19,700 fishing days, which was 73% of average value in the recent 10-year period. The catch of tunas and tuna-like fishes (excluding sharks) is estimated to be about 24,000 t, which is about 80% of the average catch of the past ten years. The most important species was bigeye, representing 56% of the total tuna and tuna-like fish catch in 2011. The next dominant species was yellowfin tuna which occupied 17% in weight; the third species was swordfish (9%). Observer trips were carried out on longline vessels in the Atlantic and a total of about 600 fishing days were monitored. In addition to the logbook submission mentioned above, the Fisheries Agency of Japan (FAJ) has set catch quotas for western and eastern Atlantic bluefin as well as for northern and 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) by radio or by facsimile. All Japanese longline vessels operating in the Convention area have been equipped with satellite tracking devices (VMS) onboard. In accordance with ICCAT recommendations, the FAJ has taken the necessary measures, by Ministerial Order, to comply with its minimum size regulations, time/area closures, etc. Each species statistical or catch document program has been conducted. Records of fishing vessels larger than 20 meters in length overall (LSFTVs) have been established. In 2011, because of the Tohoku earthquake, the FAJ did not dispatch patrol vessels to the North Atlantic to monitor and inspect Japanese tuna vessels and to observe fishing activities of other nations' fishing vessels. The FAJ has inspected landings at Japanese ports to enforce the catch quotas and minimum size limits. Prior permission from the FAJ is required in the case that Japanese tuna longline vessels transship tuna or tuna products to reefers at foreign ports or at sea.

Korea (Rep.)

In 2011, 16 Korean longliners were engaged in fishing for tuna and tuna-like species in the Atlantic Ocean. The total catches amounted to 4,614 metric tons (t), which was an increase of 20.4% as compared to the previous year. Bigeye tuna, yellowfin tuna and albacore comprised 60%, 11% and 3%, respectively, of the catches, Shark species were relatively high (10%) and reported at the species level.

For better implementing of the recent data requirement by tuna RFMOs, the Korean Distant Water Fisheries Development Act was revised and put into effect from July 2012. The Act includes logsheet formats to be reported with the catch of target species and by-catch species retained and discarded dead and alive, and reporting timing by RFMO. A Korean national observer program was started in 2002, under the responsibility of the National Fisheries Research and Development Institute (NFRDI), but has had some difficulties regarding welfares and salaries which caused a lack of the observers and an impediment to the implementation. To improve the situation, the observer program is being drafted for incorporation in the Distant Water Fisheries Development Act, which will then be administered by the Ministry with advice from the NFRDI on the design of the coverage and training in biological sampling.

Libya

In the 2012 fishing season, bluefin tuna was targeted by the Libyan fishing fleet in the Mediterranean Sea using only one type of fishing gear, purse seine. The total number of vessels engaged in the operation was 13 purse seiners. In 2011, Libya had no bluefin tuna fishing activity because of exceptional circumstances, while the total number of vessels that operated in the 2010 season was 16 purse seiners. No traps or fattening farms operated and no other tuna species were targeted by the Libyan fishing fleet in 2012. The total catch of bluefin tuna was 762.948 tons. The fishing operations for bluefin tuna took place in Libyan waters. ICCAT conservation measures were respected and VMS data were transmitted to ICCAT. National observers and ROPs were appointed on board each licensed fishing vessel to monitor and control the fishing activity.

Mauritania

In Mauritania, the tuna species are only targeted by the foreign fleets (Spanish, Senegalese and Japanese) fishing under a free license regime. This allows them to land their catches outside Mauritania. These species are also caught incidentally by the industrial pelagic vessels, one hundred percent foreign. The catches of these species reported by these fisheries are closely related with the sardinella catches (preferential prey) which are targeted by the fleets. These statistics show that the by-catch of small tunas taken by the small pelagics industrial fishery amounted to 15828 tons (t) in 2011 (an increase of almost 300% as compared to 2009) and is comprised mainly of *Sarda sarda* representing about 70% of the catch, against 12% for *Auxis* spp. and 18% for *Euthynnus* spp.

The reported catches by the artisanal and coastal fishery are steadily declining and are rather low. The total catch in 2011 was 114 t comprised mainly of *Scomberomorus tritor*, representing about 98% of the catch.

Mexico

Yellowfin tuna (*Thunnus albacares*) fishing in the Gulf of Mexico is carried out using semi-pelagic vessels with longline. Besides catches the target species, this activity also incidentally catches some other species, 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 highest catches reported in the months of May, June and July

The fishing effort of this fleet is directed at yellowfin tuna (*Thunnus albacares*), and such fishing in federal jurisdictional waters has required a fishing regime that guarantees the orderly and sustainable development of the fishery directed at this species and its by-catch. This is reflected in the Official Mexican Law NOM-023-PESC-

1996 which regulates the use of the tuna species by longline vessels in federal jurisdictional waters of the Gulf of Mexico and the Caribbean Sea.

The *Instituto Nacional de Pesca* (INAPESCA) is in charge of developing the scientific research on these fishing resources, and also is responsible for the research and collection of statistics on tuna fishing by longline in the Gulf of Mexico. The monitoring of this fishery is strengthened thanks to Program of on-board observers who record the biological, fishing and technical information on the fishery with observer coverage on every fishing trip.

In this regard, and based on information from this Program, 27 vessels were involved in 2011, and these carried out 326 fishing trips, and made 2,883 sets in which 1,771,514 hooks were used. The major fishing effort is exerted in May and August, while the least fishing effort is in the months of January, February and March.

In 2011, yellowfin tuna catches totaled 1,174 t, of which 98.18% corresponds to catches stored in the ship wells, 0.73% to dead discards and 1.09% to live discards. There was a reported by-catch of 289 t.

As concerns research work, it should be noted that in 2011 the project entitled "Spatial and temporal analysis of the catch and effort of the high seas Mexican longline catch in the Gulf of Mexico and its economic operation". The results of this project have strengthened the decision making and administration of the fishery. Moreover, research on fishing in collaboration with the United States continued, within the MexUS Gulf Project. The third campaign for the sampling of bluefin tuna eggs and larvae was carried out in the Gulf of Mexico and the Caribbean Sea to contribute to the scientific research of this species and to provide results for its administration and management in the Atlantic Ocean.

Morocco

The fishing of tunas and tuna-like species reached a production of 8,584 metric tons (t) in 2011 as compared to 10,722 t in 2010, i.e., a decrease of about 20% in terms of volume.

In 2011, bluefin tuna catches amounted to 1,237 t, a decline of 22% compared to 2010. Swordfish catches were 1,809t, which represents a decrease of about 30% compared to 2010. This decrease was mainly due to the reduction in the longline catches and to the prohibition of driftnets. With regard to the catches of bigeye tuna and yellowfin, these were on the order of 300 t and 240 t, respectively, i.e., an increase of 9% and 500%, respectively, compared to the previous year. Skipjack tuna catches reached 2,151 t, a decline of 8% compared to 2010.

The catches of small tunas have shown a 55% increase compared to 2010; of this amount, 55% are frigate tuna. Shark catches reached 1,082 t, of which 36% corresponds to shortfin make and 13% to common hammerhead.

Regarding scientific research, the year 2011 is marked by the active participation of the INRH in the ICCAT Atlantic-wide Research Programme for Bluefin Tuna (GBYP) in the following activities: (1) Recovery and analysis of historical data on Moroccan trap catches and those of the artisanal fishery targeting bluefin tuna; (2) Development of a biological sampling scheme for bluefin tuna across the entire Atlantic and the Mediterranean for the ICCAT-GBYP Programme; (3) Strengthening of the collection of size data (1200 fish sampled in 2011) and biological sampling necessary for the studies on the growth and structure of the bluefin tuna stocks (otoliths, muscle, etc.); and (4) Participation in the bluefin tuna electronic sampling program, coordination by ICCAT, in the Moroccan trap "Essahel".

As concerns Task II statistics, particular attention was given to small tunas exploited in the southern Moroccan Atlantic area, which resulted in the recovery of historical data related to this species for the period 2004-2009. The continuation of the collection of these data, over the short and medium-term, will improve our knowledge of the state of the stocks of small tunas within the scope of ICCAT.

Norway

There have been no catches of Atlantic bluefin tuna (*Thunnus thynnus*), Atlantic swordfish (*Xiphias gladius)* and Atlantic bonito (*Sarda sarda*) in Norway in 2011. 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. Norway participated at the SCRS annual science meeting in 2011.

Russia

Fishery. In 2011 and 2012 no specialized purse seine tuna fishery was carried out by Russian flag vessels. Trawl fishery vessels caught 1,062 t of tunas pertaining to four species and 2,293 t of Atlantic bonito as by-catch from the central-East Atlantic Ocean in 2011. In the first half of 2012 the trawl fishery vessels caught 365 t of tunas pertaining to two species and 316 t of Atlantic bonito.

Scientific research and statistics. In 2011, observers from AtlantNIRO onboard trawlers in the central-East Atlantic Ocean (area SJ71 according to ICCAT classification) collected biological and fishery material. The fish length and weight were measured and fish sex, the maturity stage of gonads and stomach fullness index were determined. Species of the "Small Tunas" group occurred in trawls as by-catch, in amounts from a few individuals to several tens. Material on frigate tuna, bullet tuna and Atlantic bonito was collected (7,948 specimens for mass measurements and 1,621 specimens for biological analyses).

Senegal

In Senegal, there are three types of fisheries that exploit tunas and tuna-like species. These are the industrial fishery comprised of six baitboats that mainly target tropical tunas, yellowfin tuna (*Thunnus albacares*), bigeye tuna (*Thunnus obesus*) and skipjack tuna (*Katsuwonus pelamis*) and one longliner that catches swordfish, the artisanal fishery (lines and nets) that catch small tunas, and the sport fishery that catches billfishes (marlins, swordfish, sailfish) and tunas. In 2011, the total catches of the Senegalese baitboats were estimated at 6118 tons (t). The catches have shown an increase as compared to 2010 (4606 t). Fishing effort in 2011 increase slightly, going from 1200 fishing days in 2010 to 1366 fishing days in 2011. As regards the longline fishery, catches in 2011 are estimated at 533 t (312 t in 2010). The catches are mostly comprised of swordfish (264 t) and sharks (216 t). With regard to the artisanal fisheries, the catches of all the species combined are estimated at 9024 t in 2011. There is again an increasing trend (8,719 t in 2010). For the sport fishery, catches are estimated at 81 t (288 t in 2010) with a fishing effort of 809 trips.

The sampling of tunas landed at the port of Dakar is still carried out by the team of samplers from CRODT. This work entails the collection of fishing statistics and samples of the different species of tropical tunas landed by the baitboats and purse seiners. This work is supplemented by information from various sources (Customs, boat owners, Directorate of Marine Fishing, etc.). As concerns artisanal fishing, sampling of the catches, effort and size of billfishes has been intensified in the major landing centers of the artisanal fishery, funded by the ICCAT Enhanced Research Program for Billfish (IERPB).

Tunisia

The management of tunas is governed mainly by the provisions of Law No. 94-13 of 31 January 1994 and their texts on implementation, specially the decree of 28 September 1995 on the organization of the fishing activity and the decree of 21 May 2008 relative to the organization of bluefin tuna fishing, as amended by the decree of 13 April 2010. The provisions of these decrees establish, in particular, the fishing period, the catching gear and the minimum catch size authorized.

In 2011, within the framework of the implementation of the provisions of Recommendation 10-04 on fishing capacity, Tunisia proceeded to a reduction in the number of bluefin tuna fishing vessels, from 42 to 23 vessels.

Further, in accordance with paragraphs 90 and 91 of the same Recommendation concerning the observer programme onboard tuna vessels and in the farms, Tunisia assured 100% observer coverage. The national and scientific observers carried out the tasks listed in paragraph 90 of the Recommendation, among them the sampling tasks. Of note is the ministerial decision decreed on 17 February 2011 regarding the provision of the national programme of observers from the administration and from research institutions to assure the monitoring of bluefin tuna fishing activities. A training session was organized for these observers, concerning Recommendation 10-04, on February 3 to 10, 2011.

The total catches of bluefin tuna in 2011 amounted to 851.482 t, i.e., 98.9% of the adjusted national quota of 860.180 t. Of these catches, 89.93% have been caged in farming installations and 9.18% of the catches have been exported alive to Turkey.

Turkey

During the course of 2011, the total catch of tuna and tuna-like fish amounted to 16,120.9 t. In 2011, Turkey's total catch of bluefin tuna, albacore, Atlantic bonito and swordfish were 527.5 t, 1,395.7 t, 10,018.9 t, and 189.6 t, respectively. The entire bluefin tuna catch was caught by purse seiners, the majority of which have an overall length 40-50 meters. The fishing operation was conducted intensively off Antalya Bay in the south of Turkey and in the eastern Mediterranean region. The highest bluefin tuna catch was obtained in May and fishing finalized in early June. Recommendations and resolutions imposed by ICCAT were transposed into 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 level. Major research activities in 2011 focused on bluefin tuna, swordfish and albacore.

United States

The total (preliminary) reported U.S. catch of tuna and swordfish, including dead discards, increased about 14% from 2010 to 2011, from around 8,600 metric tons (t) t to about 9,700 t. Swordfish catches increased from about 2,400 t to nearly 2,900 t, and landings from the U.S. fishery for yellowfin tuna increased from around 2,500 t to about 3,000 t. Skipjack tuna landings increased by about 30 t to 84 t, bigeye tuna landings increased by 174 t to nearly 750 t, and albacore landings increased by 134 t to nearly 450 t. U.S. bluefin tuna catches, on the other hand, decreased by 69 t to an estimated 884 t.

In 2011, the United States continued research on tuna, tuna-like species, and sharks in areas such as genetics, reproduction, age and growth, tagging, habitat utilization, and assessment modeling, among others; research was also conducted relevant to by-catch estimation and mitigation. Through the ongoing U.S. Atlantic conventional tagging program, 1,870 billfish (including swordfish) and 482 tunas were tagged and released during the year. Research was also conducted using electronic archival tags on movements and habitat utilization of billfish, tunas and sharks. The U.S. Pelagic Observer Program has a target coverage of 8% of the sets of the fleet, and in 2011 achieved nearly 11% coverage overall; in the Gulf of Mexico during the bluefin tuna spawning season, the expanded observer coverage observed approximately 77% of the longline sets. The bottom longline observer program collected data for 211hauls on 121 trips.

Uruguay

In 2011, tuna fishing effort in Uruguay decreased as compared to 2010. In 2011, the effort of the Uruguayan tuna fleet was reduced as compared to 2010. The total catch amounted approximately 1067 tons (t), with blue shark (724 t), swordfish (179 t) and shortfin mako (76 t) being the species most captured. Monitoring of catch and effort of the national fleet continued to be developed, based on information from the fishing sector and the observer program. Through the Observers Program, approximately 1 million hooks were observed, with priority on the identification of the catch, recording of sizes and sex determination. A total of 1,008 fish were tagged, the majority of which were blue shark. Experiments were carried out to evaluate mitigation measures of the incidental catch during commercial fishing operations and research cruises. Uruguay participated in and contributed several documents at various SCRS meetings, including the albacore stock assessment session (2 documents), blue marlin stock assessment session and white marlin data preparatory meeting (1 document), data preparatory meeting to apply ERA to sharks (7 documents), ecosystems (4 documents). Work continued on the implementation of the "National Plan of Action to Reduce the Incidental Catch of Sea Birds in Uruguay´s Fisheries" and the "National Plan of Action for the Conservation of Cartilaginous Fishes (Chondrichthyans) in Uruguay´s Fisheries". Work also continued to monitor third party flag vessels at port which was initiated in 2009, through a group comprised of civil servants from DINARA (OROPS). Inspections were carried out at port to determine the species that are landed at the port of Montevideo, their origin and monitoring the formal aspects of the vessels´ documentation. All the ICCAT Recommendations adopted during the 2011 Commission meeting have been transposed to Uruguayan law and are enforced by decree.

− ***Cooperating Parties, Entities and Fishing Entities***

Chinese Taipei

In 2011, the total number of longline vessel authorized operate in the Atlantic Ocean was 124, including 75 longliners targeting bigeye tuna and 49 targeting albacore. The total catch of tuna and tuna-like species of the longline fleet was estimated at 35,799 t in 2011. Tropical tunas (bigeye tuna, 13,732 t and yellowfin tuna, 1,768

t) were the most dominant species caught accounting for 43% of the total catch, and albacore (14,399 t) accounted for 40%. The Fisheries Agency has set catch quotas for Atlantic bigeye tuna, northern and southern Atlantic albacore, and for bycatch species, namely swordfish, blue marlin and white marlin. Catches of these species were well below catch limits allocated by the ICCAT for 2011. Statistics data, including fleets characteristics/Task I/Task II/size and bycatch data collected by observer program, was submitted to the ICCAT Secretariat within the required timeframe. In 2011, 27 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 2011 conducted by scientists included the researches of CPUE standardizations on bigeye tuna, yellowfin tuna, albacore, blue marlin and white marlin, the catch estimation of shark species, the incidental catch estimation of seabirds, sea turtles and cetaceans. The research results were presented at the regular meeting and inter-sessional working groups' meetings of 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. The catch table presented in this Executive Summary **(YFT-Table 1)** has been updated to include reported catches through 2011. Readers interested in a more complete summary of the state of knowledge on yellowfin tuna should consult the detailed report of the 2011 ICCAT Yellowfin Tuna Stock Assessment Session (Anon. 2012c).

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 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 (140 cm) than males (150 cm). Recent results from studies in the Indian Ocean tend to support this latter hypothesis. 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; 107,678 t is currently reported for 2010. The reported catches for 2011, as of the SCRS Plenary session, are 100,277 t. However, the actual 2011 catches may be substantially higher, as reports have not yet been received for some fleets. If these fleets realized catches at similar levels to those of 2010, total catch for 2011 might be around 105,000 t. The trends described below only consider the reported catch for 2011.

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 20% from that level to 78,066 t in 2011 **(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 declined since to a level of 6,391 t in 2011.

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 5,144 t in 2011. 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 2,311 t in 2011. Longline catches, which were 11,790 t in 1994, have fluctuated since between 10,059 t and 16,019 t, and were 9,634 t in 2011.

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.

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 had 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.

It was noted that significant catches of yellowfin tuna (over 1000 tons) were obtained in 2011 by EU purse seiners south of 15°S off the coast of West Africa (in association with skipjack and bigeye on FADs). This area is very special in its environment and low oxygen levels. This is the first time that yellowfin tuna catches have been obtained by purse seiners in this region, although this species was once dominant in the catches on Angolan baitboats until 1965. These unusual yellowfin tuna catches (**YFT-Figure 3**) warrant further analysis and any future catches in the area should be monitored.

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 considerably 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 4)**. Baitboat catch rate trends **(YFT-Figure 5)** 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 6)** 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 7**. 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 8**. 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 8**); the impact of this change in selectivity on estimates of MSY is clearly seen in the results from age structured models (**YFT-Figure 9**). 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 10**. 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 11)**.

In summary, 2011 reported catches are 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 2008-2011 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. Effect 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 this closure was less effective than previous moratoria in reducing the proportional catch of small fish harvest and avoiding growth overfishing.

In response to Committee advice that larger time/area moratoria are likely to be more precautionary than a smaller moratoria (providing that the moratoria are fully complied with), Recommendation 11-01 replaces the closure implemented by Rec. 04-01 with a new closure of surface fishing on FADs in the area from the African coast to 10ºS, 5ºW-5ºE during January-February in the Gulf of Guinea. This closure will be in effect for the first time in 2013. Rec. 11-01 also implemented a TAC of 110,000 t for 2012 and subsequent years.

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 catch levels on the order of110,000 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 harvests on FADs could have negative consequences for yellowfin and bigeye tuna, 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. The Committee notes that the closure implemented in Rec. 11-01 may be more effective than that implemented by Rec. 04-01.

When the provisional historical estimates of unreported purse seine catches are considered, estimates of current stock status and projections are 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)
2011 Yield [2]	100,277 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:

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

[Rec. 11-01] (in effect beginning in 2012):
- Time-area closure for FAD associated surface fishing; TAC of 110,000 t beginning in 2012
- Specific limits of number of longline and/or purse seine boats for a number of fleets

Other measures also impacting yellowfin tuna

[Rec. 09-01], para. 1 of [Rec. 06-01], [Rec. 04-01]:
- 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), 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 10ºW-20ºW.

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 actual 2011 catches may be substantially higher, as reports have not yet been received for some fleets. If these fleets realized catches at similar levels to those of 2010, total catch for 2011 might be around 105,000 t.
3 Median (10^{th}-90^{th} percentiles) from joint distribution of age-structured and production model bootstrap outcomes considered.

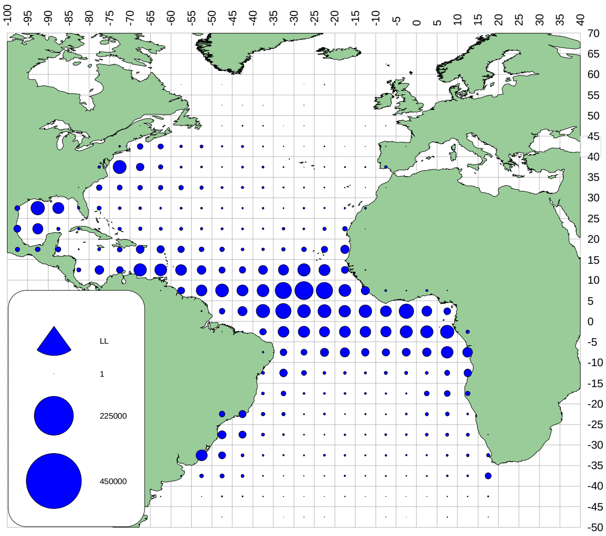
YFT-Table 1. Estimated catches (t) of yellowfin tuna (*Thunnus albacares*) by area, gear and flag.

			1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
TOTAL			145361	136265	162247	193536	166901	163762	162753	172584	153251	153043	137218	148566	140366	137354	164650	140279	125590	119972	107234	106564	99619	109590	119572	107678	100277
	ATE		113379	101671	125345	160805	130004	126050	124009	124369	117977	119987	104877	117647	109656	101730	124327	110619	100608	88735	81166	78292	75452	91466	100563	85766	80868
	ATW		31982	34594	36902	32731	36897	37712	38745	48215	35274	33056	32341	30919	30710	35623	40323	29660	24982	31238	26068	28272	24167	18123	19008	21912	19408
	MED		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
Landings	ATE	Bait boat	16750	16020	12168	19648	17772	15095	18471	15652	13496	13804	12907	17330	19256	13267	19071	13432	11513	15354	12012	10434	8896	11721	10949	8132	8261
		Longline	6624	8956	7566	10253	9082	6518	8537	14638	13723	14236	10495	13872	13561	11369	7570	5790	9075	11442	7317	7219	13437	8566	6326	5839	6391
		Other surf.	2932	2646	2586	2175	3748	2450	2122	2030	1989	2065	2136	1674	1580	2424	2074	1826	2540	2928	3062	3615	2726	1731	3964	1842	1559
		Purse seine	87074	74049	103025	128729	99402	101987	94880	92050	88770	89882	79339	84771	75260	74670	95612	89572	77481	59011	58776	57024	50392	69449	79324	69953	64658
	ATW	Bait boat	5468	5822	4834	4718	5359	6276	6383	7094	5297	4560	4275	5511	5349	6753	5315	6009	3764	4868	3867	2695	2304	886	1331	1436	2311
		Longline	14291	19046	17128	18851	13667	16594	11439	11790	11185	11882	11554	11671	13326	15760	14872	11921	10166	16019	14449	14249	13557	13192	13019	12659	9634
		Other surf.	5557	3692	3293	2362	3457	3483	4842	9719	12454	5830	4801	4581	5345	5241	7027	3763	6445	7134	5118	6880	5959	1973	3285	3590	2310
		Purse seine	6665	6034	11647	6800	14414	11359	16081	19612	6338	10784	11710	9157	6523	7870	13108	7966	4607	3217	2634	4442	2341	2067	1365	4219	5144
	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	0	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
Discards	ATW	Longline	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
Landings	ATE	Angola	51	246	67	292	510	441	211	137	216	78	70	115	170	35	34	34	34	34	111	0	405	98	98	98	
		Belize	0	0	0	0	0	0	0	0	1	0	3	0	0	5	0	0	0	0	0	0	0	0	0	273	195
		Benin	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	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	
		Cape Verde	2675	2468	2870	2136	1932	1426	1536	1727	1781	1448	1721	1418	1663	1851	1684	1802	1868	3236	7154	8112	4057	8413	5505	4492	5987
		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	139	156	200	124	84	71	1535	1652	586	262	1033	1030	1112	1056	1000	365	214	169	220
		Chinese Taipei	193	207	96	2244	2163	1554	1301	3851	2681	3985	2993	3643	3389	4014	2787	3363	4946	4145	2327	860	1707	807	1180	536	1469
		Congo	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	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	3183	6082	6110	3962	5441	4793	4035	6185	4161	0	1939	1368	7351	6293	5302	4413
		Côte D'Ivoire	0	0	0	0	0	0	0	0	0	0	2	0	0	673	213	99	302	565	175	482	216	626	90	470	385
		EU.España	66093	50167	61649	68603	53464	49902	40403	40612	38278	34879	24550	31337	19947	24681	31105	31469	24884	21414	11795	11606	13584	24409	32793	25560	20814
		EU.Estonia	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	17491	21323	30807	45684	34840	33964	36064	35468	29567	33819	29966	30739	31246	29789	32211	32753	32429	23949	22672	18940	11330	16115	18923	20280	22036
		EU.Ireland	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	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	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	
		EU.Portugal	278	188	182	179	328	195	128	126	231	288	176	267	177	194	4	6	4	5	16	274	865	300	990	554	452
		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	23	21
		Faroe Islands	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	12	88	218	225	225	295	225	162	270	245	44	44	44	44	0	0	0	0	
		Gambia	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	25	22	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Ghana	10830	8555	7035	11988	9254	9331	13283	9984	9268	11720	15437	17657	25268	17662	33546	23674	18457	15054	17493	11931	15463	14250	18355	12512	10754
		Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2906	5265	3461	3736	2603	3124	2803
		Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	892	892	199
		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	730	
		Honduras	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	4521	5808	5882	5887	4467	2961	2627	4194	4770	4246	2733	4092	2101	2286	1550	1534	1999	5066	3088	4206	8496	5266	3563	3041	3748
		Korea Rep.	1221	1248	1480	324	259	174	169	436	453	297	101	23	94	142	3	8	209	984	95	4	303	983	381	324	20
		Libya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	208	73	73	0	0	0	0	0	0	0	**0**
		Maroc	1529	0	0	0	0	0	0	0	0	0	0	0	0	0	0	79	108	95	183	95	102	110	110	44	272
		Mixed flags (FR+ES)	933	932	825	1056	2220	2455	2750	1898	1172	1166	981	1124	1369	1892	1427	599	992	1052	933	1063	655	626	459	533	700
		NEI (ETRO)	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)	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	35	14	72	69	3	147	59	165	89	139	85	135	59	28	11	1	9	90
		Norway	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	1858	1239	901	1498	7976	8338	10973	12066	13442	7713	4293	2111	1315	1103	574	1022	0	1887	6170	8557	9363	6175	5813	5048	4358

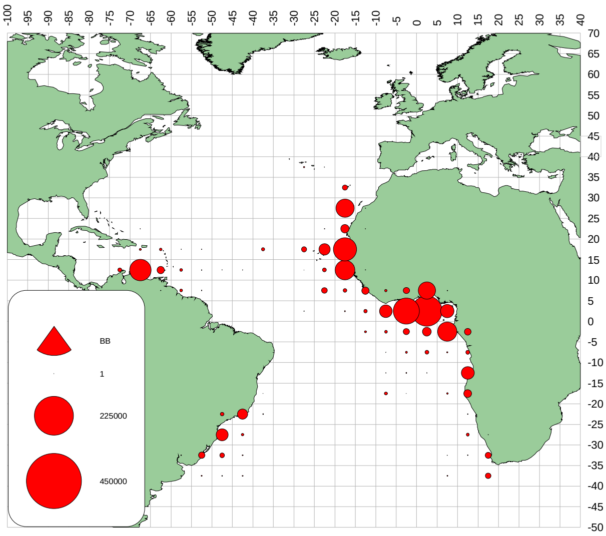
		Philippines	0	0	0	0	0	0	0	0	0	0	0	126	173	86	0	50	9	68	13	30	88	53	10	21	38
		Russian Federation	0	0	0	0	3200	1862	2160	1503	2936	2696	4275	4931	4359	737	0	0	0	0	4	42	211	42	33	0	
		S. Tomé e Príncipe	178	298	299	164	187	170	181	125	135	120	109	124	114	122	122	122	122	134	145	137	0	160	165	169	
		Senegal	0	0	2	90	132	40	19	6	20	41	208	251	834	252	295	447	279	681	1301	1262	819	588	1279	1212	1050
		Seychelles	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	68	137	671	624	52	69	266	486	183	157	116	240	320	191	342	152	298	402	1156	1187	1063	351	303	235	673
		St. Vincent and Grenac	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	14	0	101	209	83	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	
		U.S.S.R.	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	93	98	100	92	100	166	171	150	181	151	109	181	116	136	72	9	0	0	0	344	177	97	104	65	163
		Ukraine	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	24	145	483	450	331	23	10
		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	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	57	236	62	89	108	179	161	156	255	160	149	150	155	155	142	115	178	211	292	197	154	156	79	129	131
		Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	143	1164	1160	988	1785	3019
		Brasil	2266	2512	2533	1758	1838	4228	5131	4169	4021	2767	2705	2514	4127	6145	6239	6172	3503	6985	7223	3790	5468	2749	3313	3617	3499
		Canada	40	30	7	7	29	25	71	52	174	155	100	57	22	105	125	70	73	304	240	293	276	168	53	166	50
		China P.R.	0	0	0	0	0	0	0	0	0	0	0	628	655	22	470	435	17	275	74	29	124	284	248	258	126
		Chinese Taipei	709	1641	762	5221	2009	2974	2895	2809	2017	2668	1473	1685	1022	1647	2018	1296	1540	1679	1269	400	240	315	211	288	299
		Colombia	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	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	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	18	12	23	30	31	9	0	0	0	80	78	120	169	119	81	119	65	103	124	102	110	132
		Dominican Republic	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	1	3	2	1462	1314	989	7	4	36	34	46	30	171	0	0	0	0	0	1	84	81	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	
		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	0	0
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	151	60	88	179	260	99	127
		FR.St Pierre et Miquel	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	186	215	235	530	620	595	858	385	410	523	302	484	430	403	759	593	749	460	492	502	633	756	630	673	
		Jamaica	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	1647	2395	3178	1734	1698	1591	469	589	457	1004	806	1081	1304	1775	1141	571	755	1194	1159	437	541	986	1431	1539	1421
		Korea Rep.	236	120	1055	484	1	45	11	0	0	84	156	0	0	0	0	0	0	0	580	279	270	10	52	56	470
		Mexico	33	283	345	112	433	742	855	1093	1126	771	826	788	1283	1390	1084	1133	1313	1208	1050	938	890	956	1211	916	1174
		NEI (ETRO)	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)	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	3289	2192	1595	2651	2249	2297	0	0	0	0	0	0	5	0	0	0	0	0	0	2804	227	153	288	2134	
		Philippines	0	0	0	0	0	0	0	0	0	0	0	36	106	78	12	79	145	299	230	234	151	167	142	67	97
		Seychelles	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 Grenac	0	0	1	40	48	22	65	16	43	37	35	48	38	1989	1365	1160	568	4251	0	2680	2989	2547	2274	854	963
		Sta. Lucia	76	97	70	58	49	58	92	130	144	110	110	276	123	134	145	94	139	147	172	103	82	106	97	223	
		Trinidad and Tobago	0	1	11	304	543	4	4	120	79	183	223	213	163	112	122	125	186	224	295	459	615	520	629	788	
		U.S.A.	9661	11064	8462	5666	6914	6938	6283	8298	8131	7745	7674	5621	7567	7051	6703	5710	7695	6516	5568	7091	5529	2473	2788	2510	3015
		UK.Bermuda	25	23	22	15	17	42	58	44	44	67	55	53	59	31	37	48	47	82	61	31	30	15	41	37	100
		UK.British Virgin Islaı	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
		UK.Turks and Caicos	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**
		Uruguay	109	177	64	18	62	74	20	59	53	171	53	88	45	45	90	91	95	204	644	218	35	66	76	122	24
		Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	681	689	661	555	873	816	720	330
		Venezuela	11137	10949	15567	10556	16503	13773	16663	24789	9714	13772	14671	13995	11187	11663	18651	11421	7411	5774	5097	6514	3911	3272	3198	4783	4419
	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
		Maroc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Discards	ATW	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	0
		Mexico	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
		U.S.A.	0	0	0	0	0	0	0	0	0	0	0	0	167	0	0	0	0	0	0	0	0	0	0	0	

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.

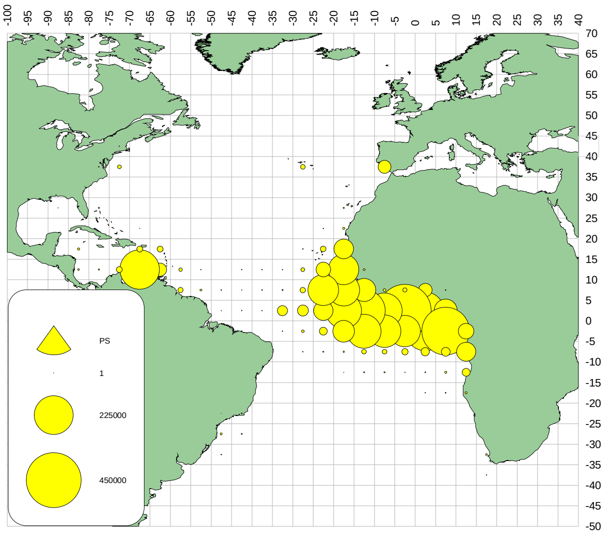
Constant Catch (t, in 1000s)	*Probability (%) that $B>B_{MSY}$ and $F<F_{MSY}$ in each year*													
	2012	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*	*2022*	*2023*	*2024*	*2025*
50	25	51	70	78	84	87	89	**91**	**92**	**93**	**94**	**95**	**95**	**96**
60	24	48	66	76	81	85	87	89	**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



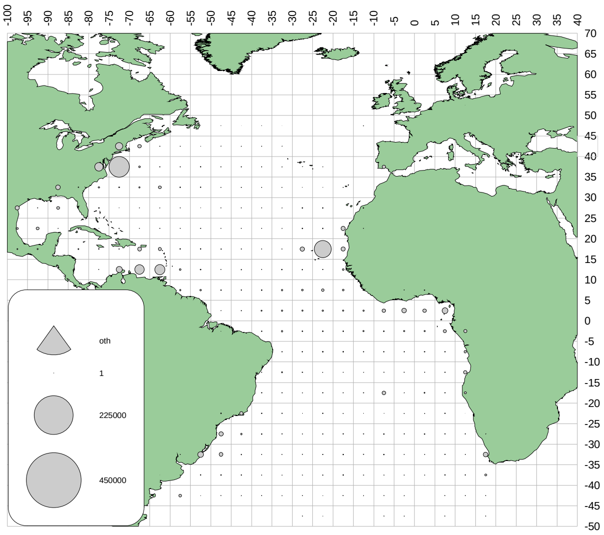
a. YFT (LL)



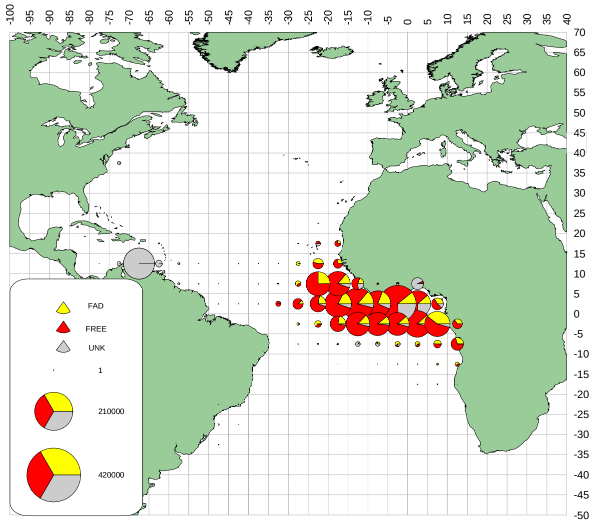
b. YFT (BB)



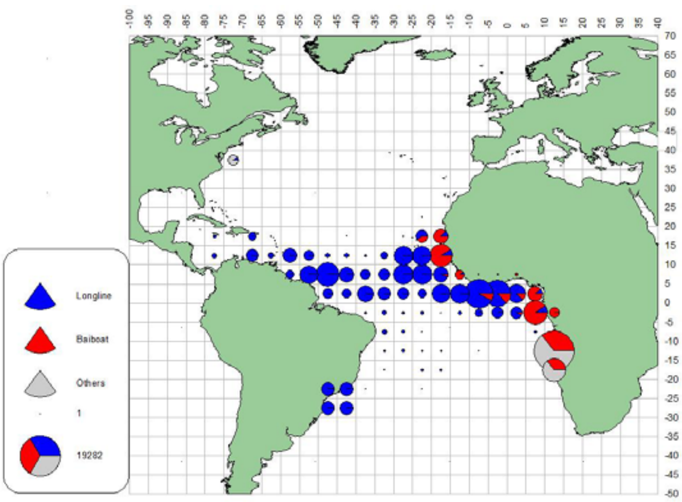
c. YFT (PS)



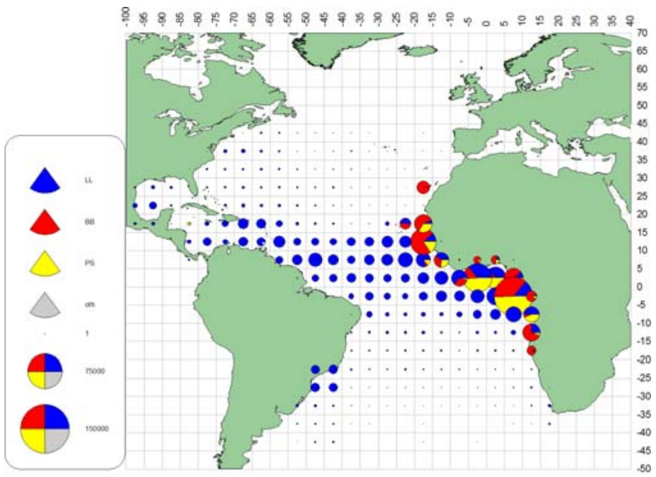
d. YFT (oth)



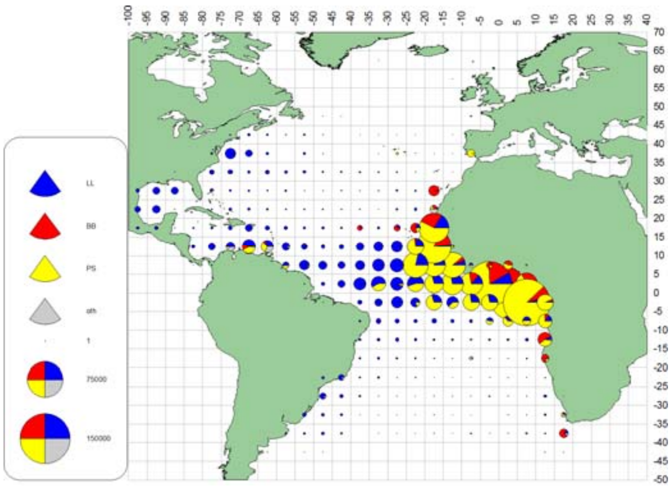
e. YFT (FAD/FREE 1991-09)



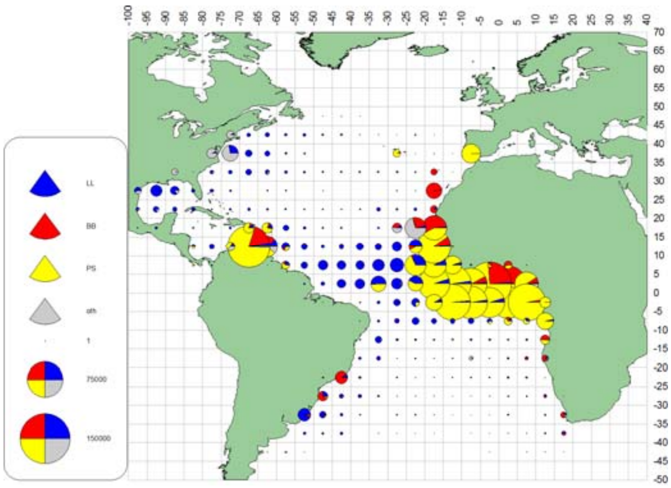
f. YFT(1950-59)



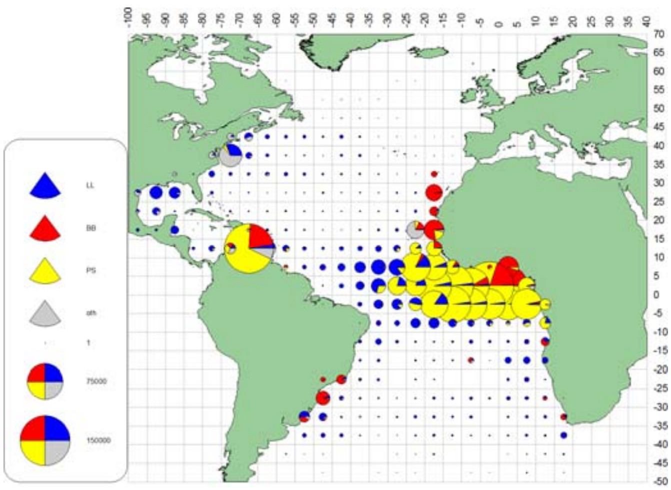
g. YFT(1960-69)



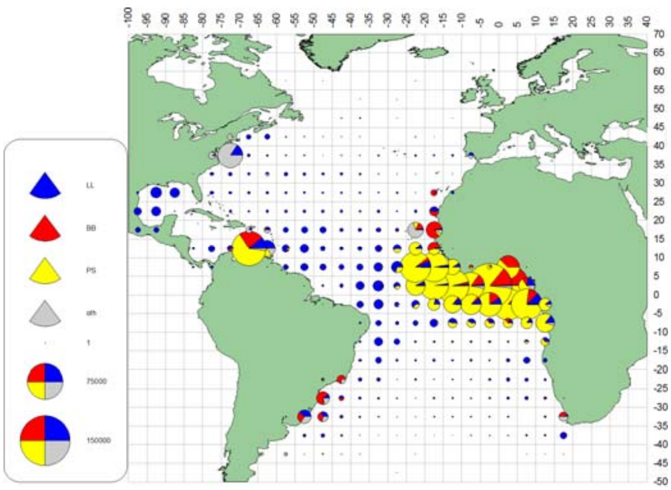
h. YFT(1970-79)



i. YFT(1980-89)

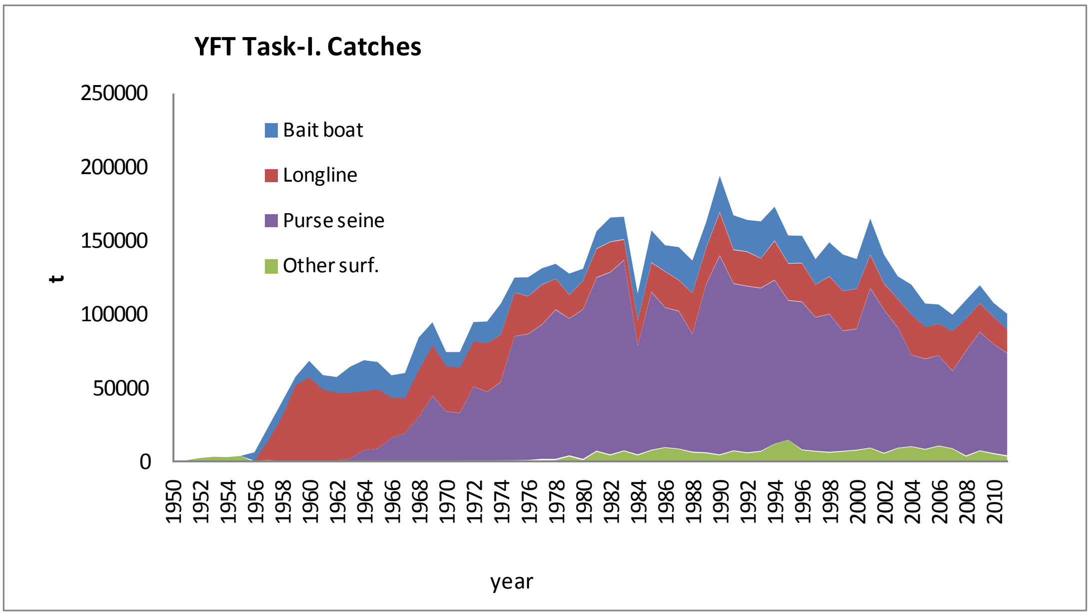


j. YFT(1990-99)

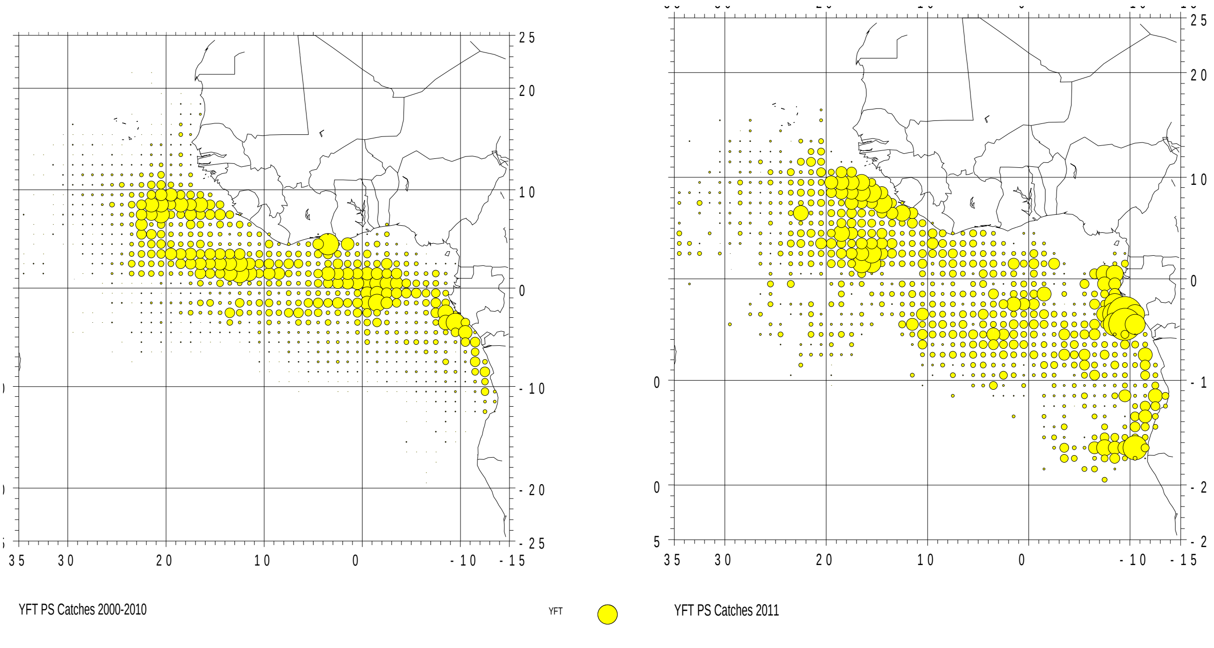


k. YFT (2000-09)

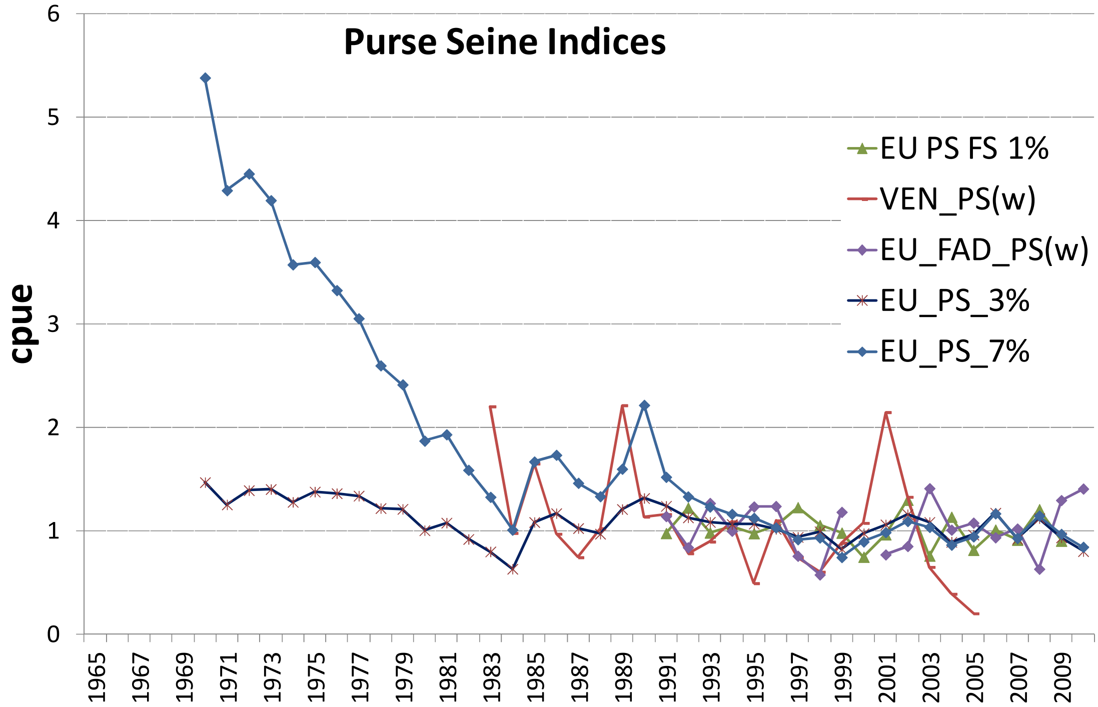
YFT-Figure 1. Geographical distribution of yellowfin tuna catches by major gears [a-e] and decade [f-k]. The symbols for the 1950s information (top left) are scaled to the maximum catch observed during the 1950s, whereas the remaining plots are scaled to the maximum catch observed from 1960 to 2009.



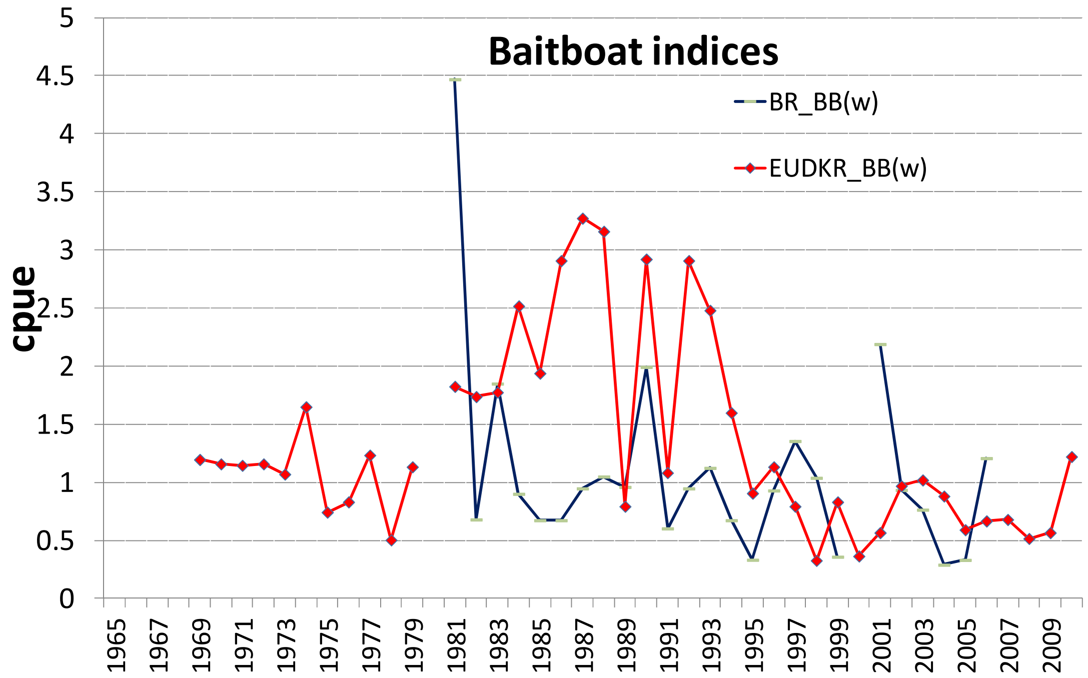
YFT-Figure 2. Estimated annual catch (t) of Atlantic yellowfin tuna by fishing gear, 1950-2011.



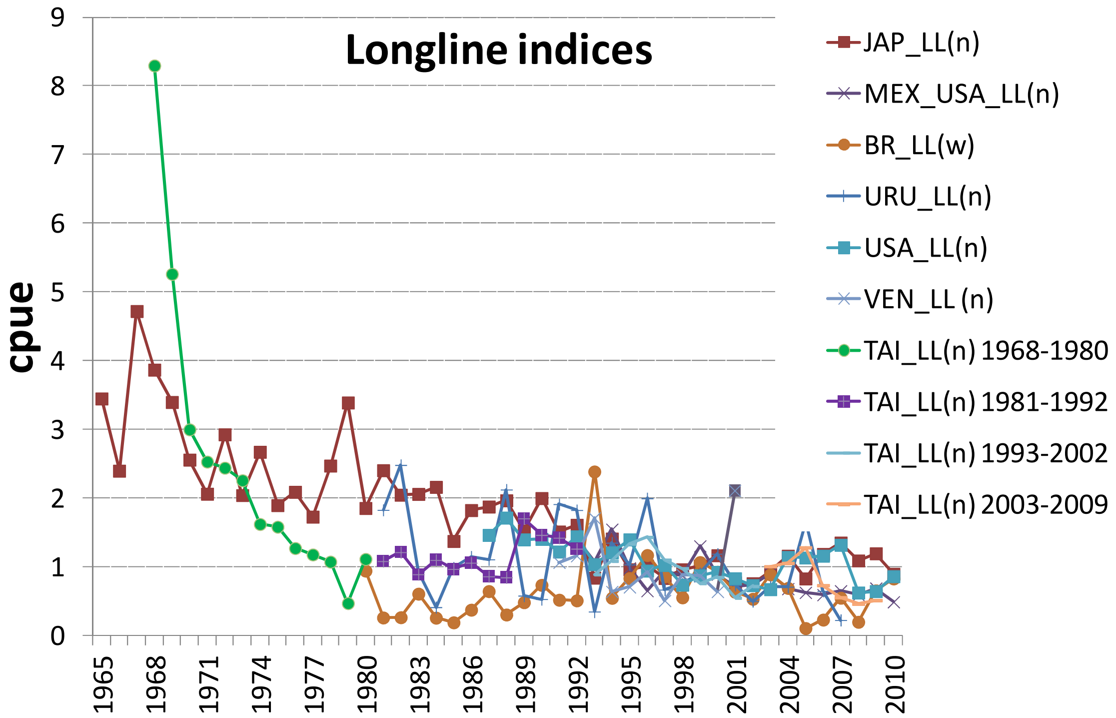
YFT-Figure 3. Comparison of the geographic distribution of EU purse catches of yellowfin tuna for the period 2000-2010 (left), and in 2011 (right).



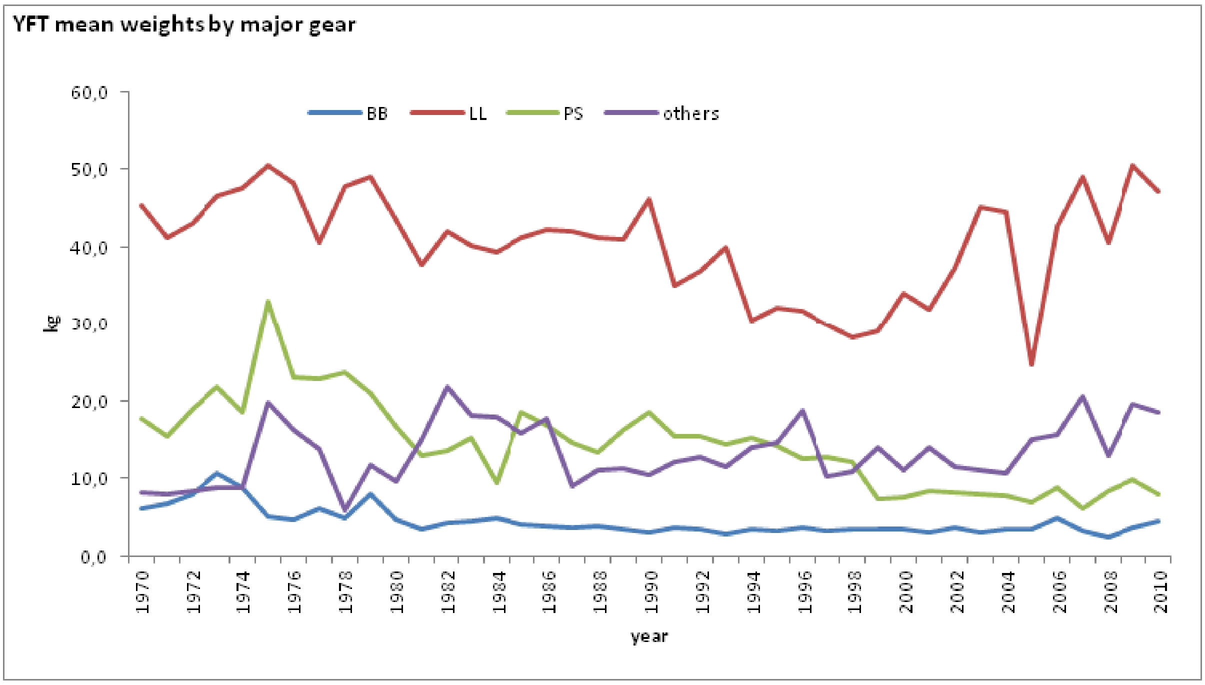
YFT-Figure 4. Yellowfin relative catch rate trends (both nominal and applying various annual increases in effectiveness) from purse seine fleets, in weight.

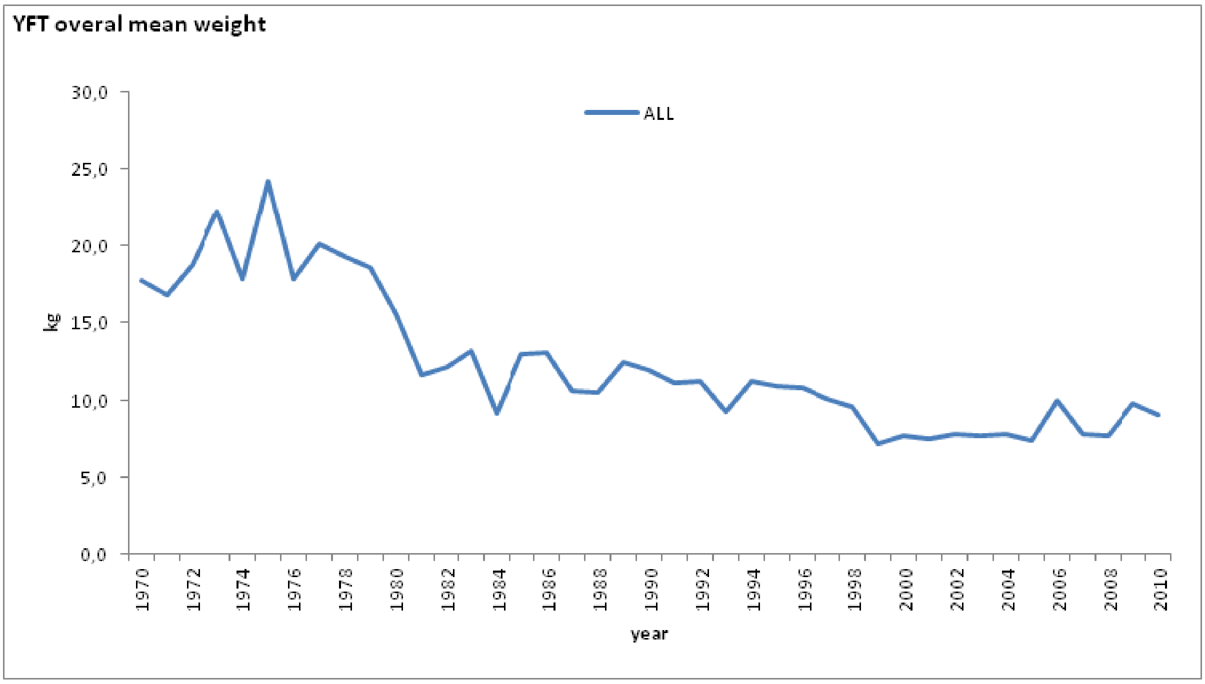


YFT-Figure 5. Yellowfin standardized catch rate trends from baitboat fleets, in weight.

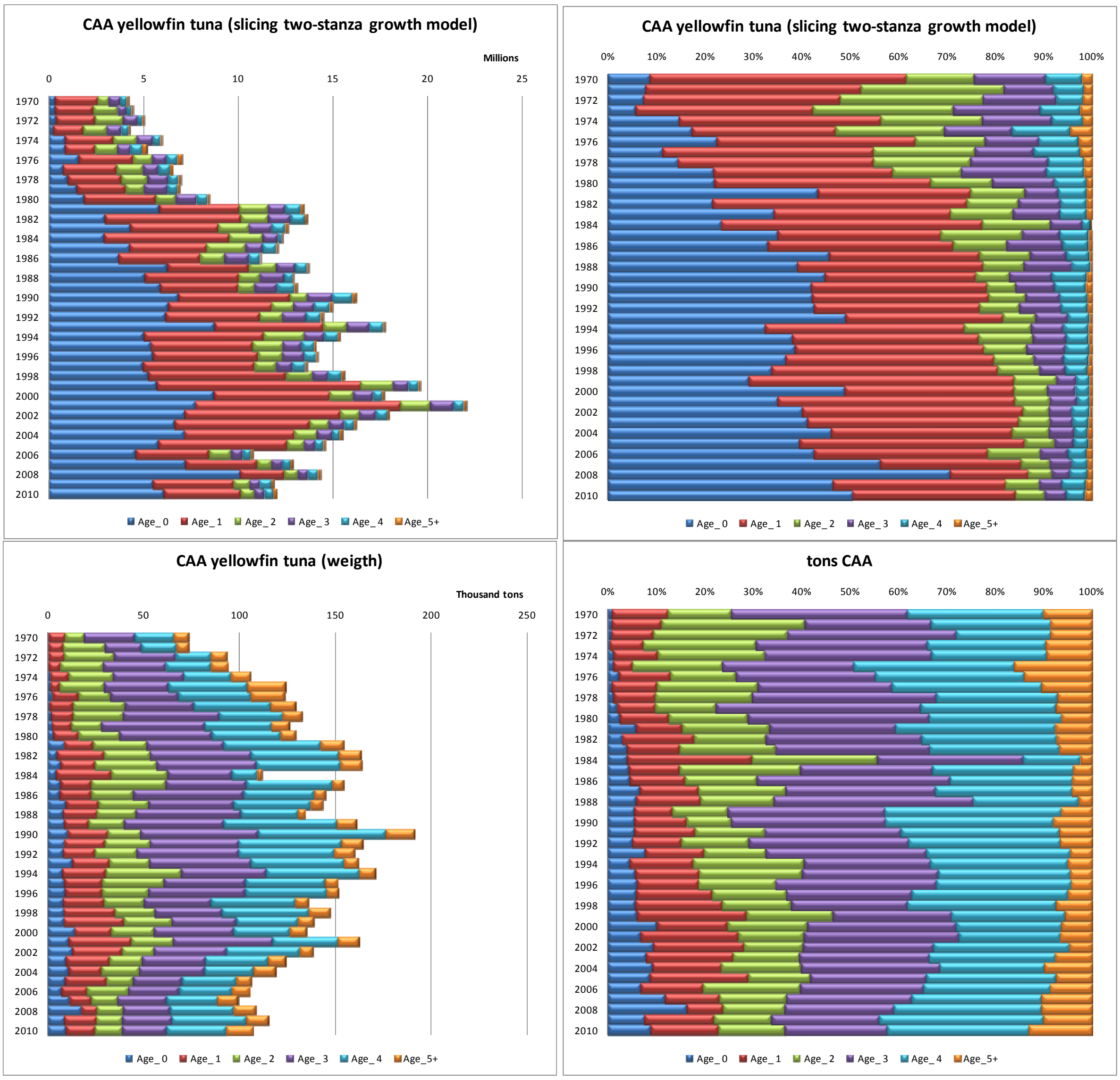


YFT-Figure 6. Yellowfin standardized catch rate trends from longline fleets, in weight (w) and numbers (n).

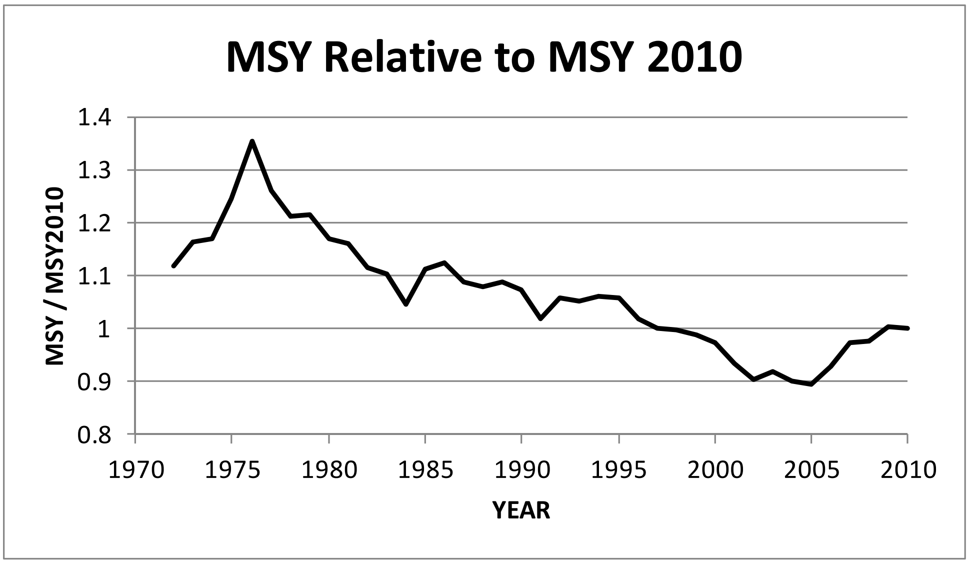




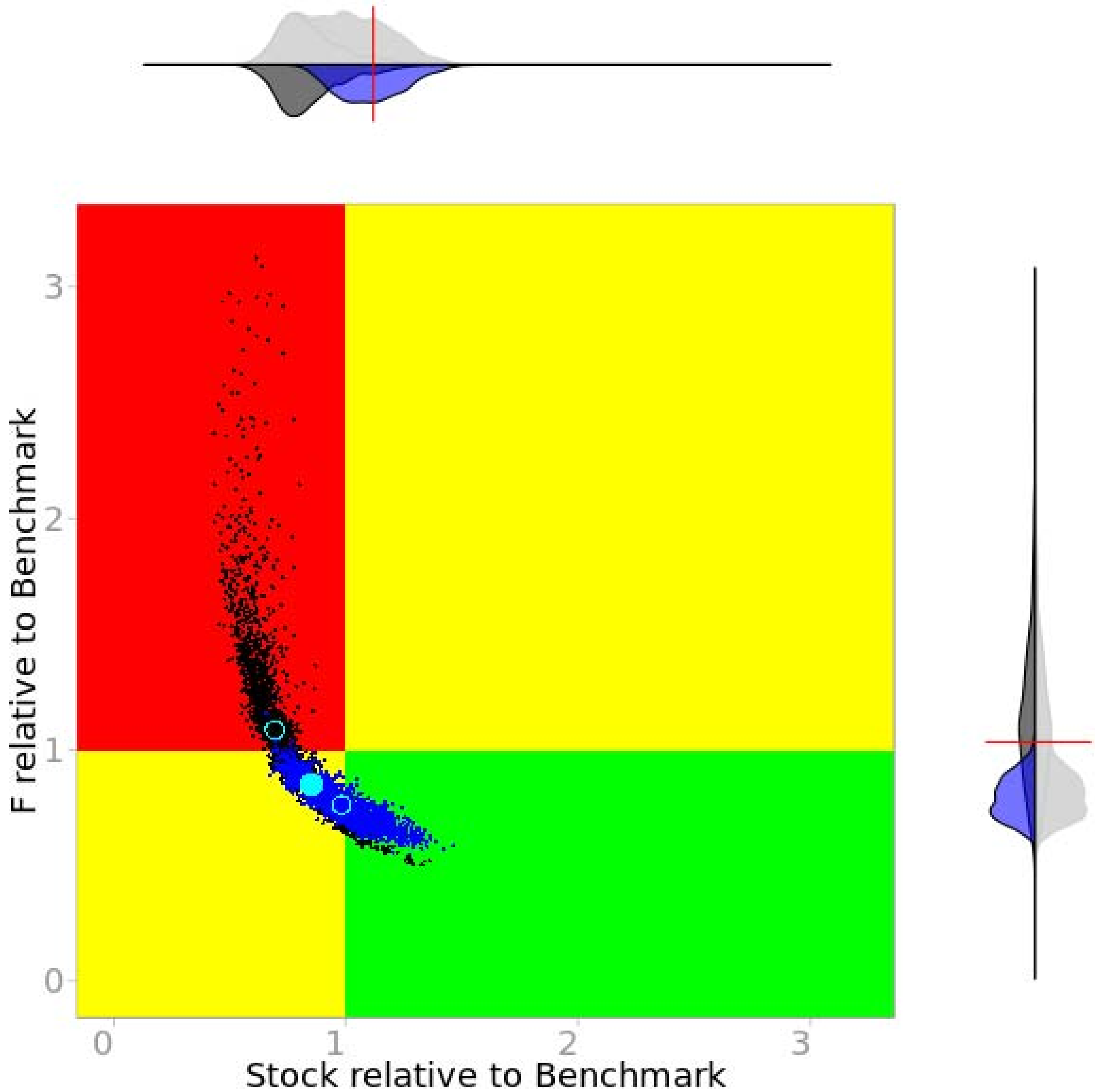
YFT-Figure 7. Trend in yellowfin tuna average weight by gear group (top) and total (bottom) calculated from available catch-at-size data. Purse seine averages are calculated across all set types (floating object and free school).



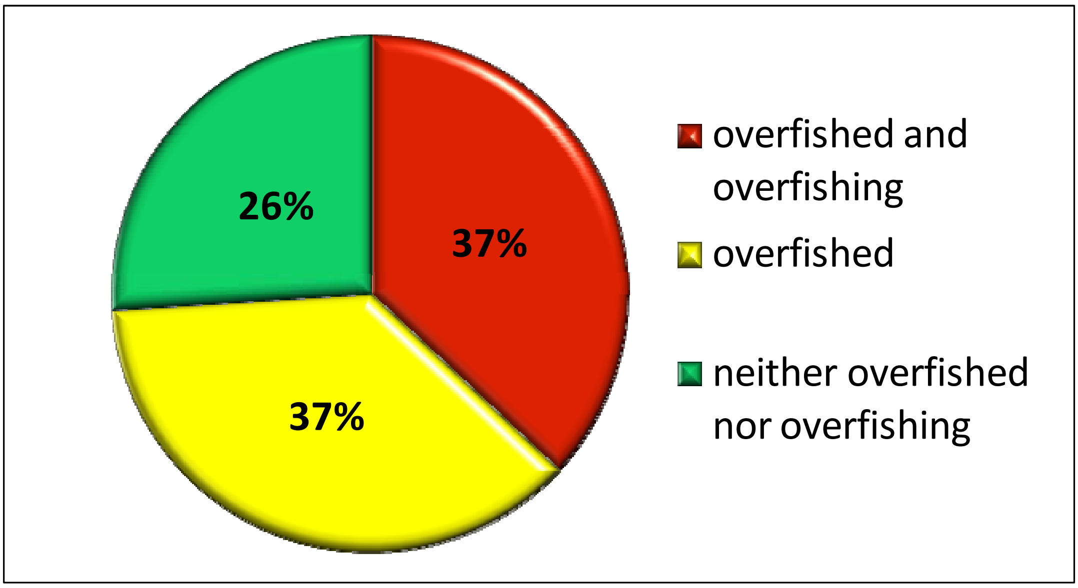
YFT-Figure 8. Distribution of Atlantic yellowfin catches by age (0-5+) in numbers of fish (top row) and in weight (bottom row) for 1970-2010.



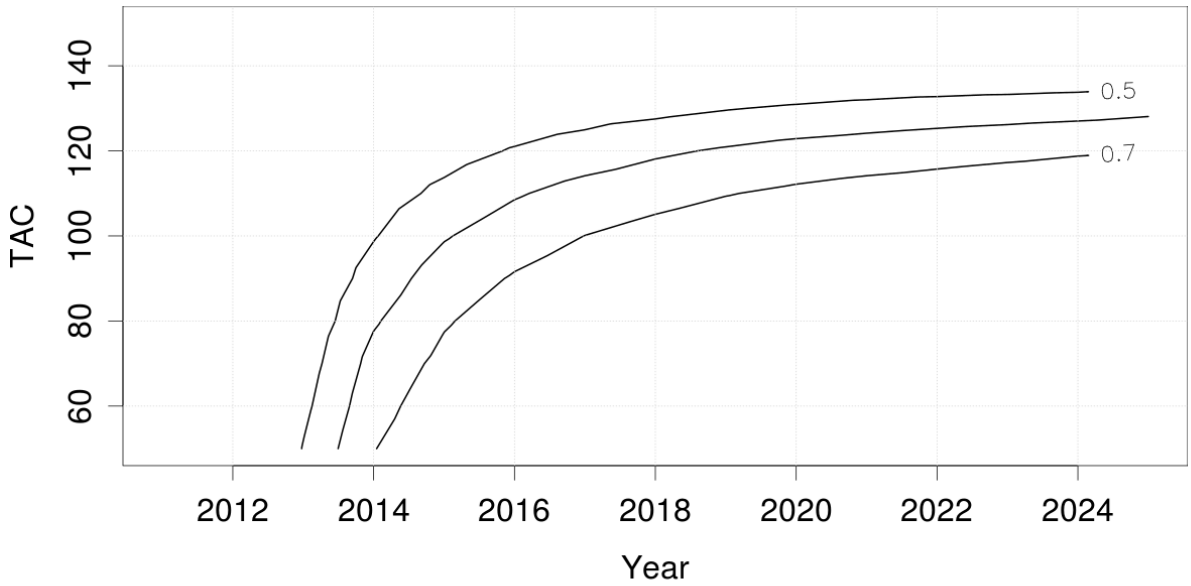
YFT-Figure 9. Estimates of historical MSY values, relative to the MSY estimated for 2010, for Atlantic yellowfin obtained through the age-structured model analysis, which considers the changes in selectivity that have occurred.



YFT-Figure 10. Current status (2010) of yellowfin tuna based on age structured and production models. The results are shown combined in a joint distribution. The clouds of points depict the bootstrap estimates of uncertainty for the most recent year (black=production model, blue=age structured). The median point estimate for each models results are shown in open (cyan) circles, and the median point estimate for the combined model results is shown as a solid (cyan) circle. The marginal density plots shown above and to the right of the main graph reflect the frequency distribution of the bootstrap estimates of each model with respect to relative biomass (top) and relative fishing mortality (right). The frequency distributions of the combined model bootstraps are shown in light blue. The red lines represent the benchmark levels (ratios equal to 1.0)



YFT-Figure 11. 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 12. 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. 2011E). 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. Recently, however, reports from other oceans suggest that growth rates of juvenile bigeye are lower than those estimated in the Atlantic. 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 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 weakens 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 Eu 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 2010-2011, 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 2011 is 77,795 t.

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 European and associated purse seiners operating in 2009, 2010 and 2011 was similar to the number operating in 2003-04 **(SKJ-Figure 7)**.

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 considerably 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 unreported 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 relatively 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 baitboats, and 4 kg 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. 2008b) 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. Effect 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 2005-2011 **(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 and/or misidentified 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 (2011) Yield[1]	77,795 t [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], [Rec. 10-01], and [Rec. 11-01]. − Total allowable catch for 2012-2015 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 (11), Korea (14), EU (269) and Japan (245). − Specific limits of number of purse seine boats; Panama (3), EU (34) and Ghana (13). − No fishing with natural or artificial floating objects during January or February in the area encompassed by the African coast, 10º S, 5ºE and 5ºW.

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 2011 reflect most recent data but should be considered provisional.

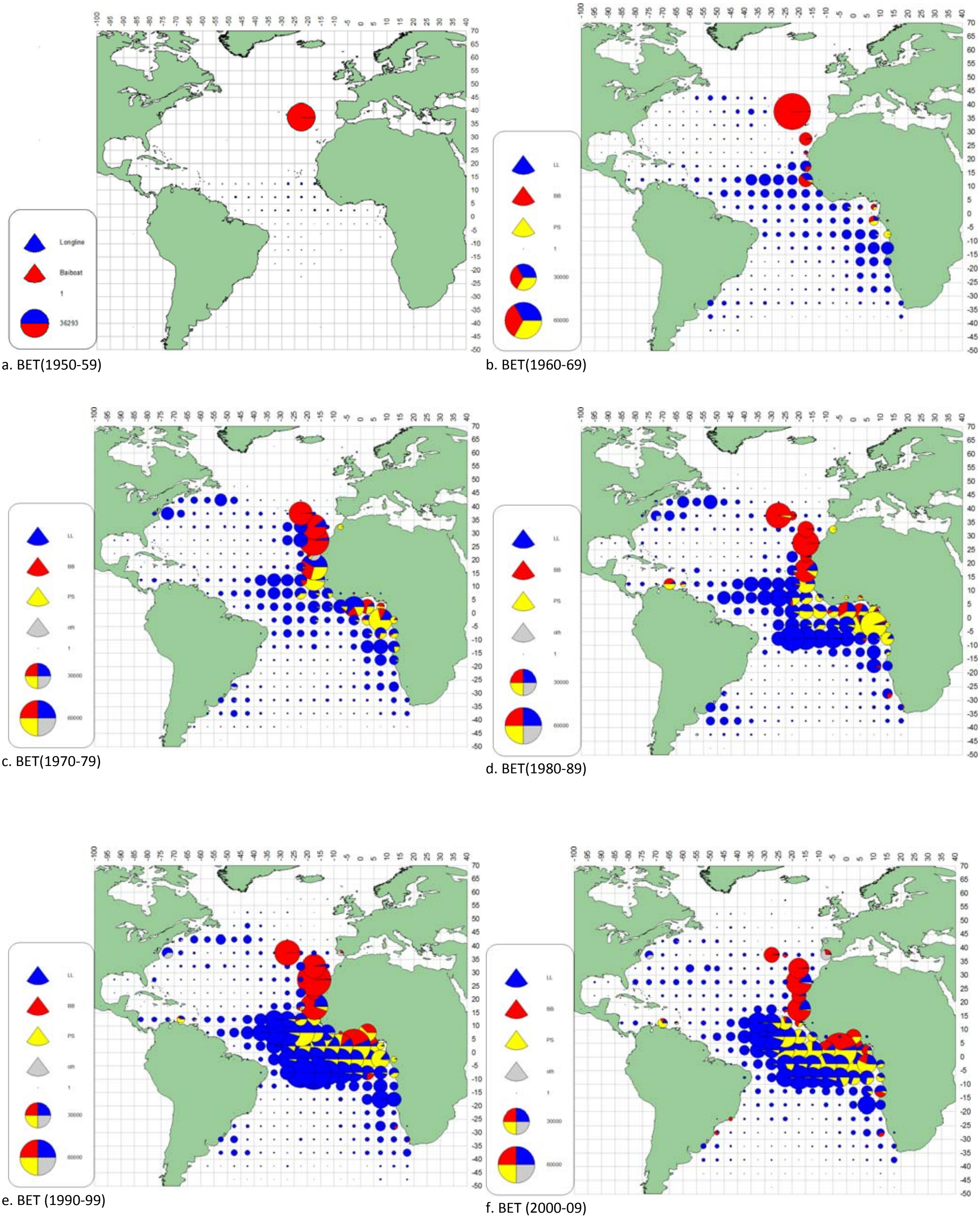
BET-Table 1. Estimated catches (t) of bigeye tuna (*Thunnus obesus*) by area, gear and flag.

			1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
TOTAL	A+M		57141	66148	78376	84901	96074	99374	112572	133630	126778	121689	109289	110438	128304	103646	94291	77225	92106	87054	72348	65888	79664	69342	81539	75710	77795
		Bait boat	13458	9710	12672	18280	17750	16248	16467	20361	25576	19059	21037	21377	25867	12629	15842	8756	13569	18940	15007	14671	15432	12359	14940	8968	11943
		Longline	35570	47766	58389	56537	61556	62403	62871	78934	74852	74930	68310	71856	76527	71193	55265	46438	54466	48396	38035	34182	46232	41063	43533	42515	37393
		Other surf.	626	474	644	293	437	607	652	980	567	357	536	434	1377	1226	1628	1138	1340	1301	716	552	447	224	274	458	916
		Purse seine	7487	8198	6671	9791	16331	20116	32582	33355	25782	27343	19406	16771	24533	18599	21556	20894	22731	18417	18590	16483	17553	15696	22792	23769	27544
		Angola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	476	75	0	0	0	0	0	
		Argentina	72	50	17	78	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Barbados	0	0	0	0	0	0	0	0	0	0	24	17	18	18	6	11	16	19	27	18	14	14	7	12	7
		Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	60	70	60	249	1218
		Benin	6	7	8	10	10	7	8	9	9	9	30	13	11	0	0	0	0	0	0	0	0	0	0	0	
		Brasil	756	946	512	591	350	790	1256	601	1935	1707	1237	644	2024	2768	2659	2582	2455	1496	1081	1479	1593	958	1189	1151	1799
		Cambodia	0	0	0	0	0	0	0	0	0	0	0	0	32	0	0	0	0	0	0	0	0	0	0	0	
		Canada	144	95	31	10	26	67	124	111	148	144	166	120	263	327	241	279	182	143	187	196	144	130	111	103	137
		Cape Verde	60	117	100	52	151	105	85	209	66	116	10	1	1	2	0	1	1	1	1092	1437	1147	1069	553	1164	1037
		China P.R.	0	0	0	0	0	0	70	428	476	520	427	1503	7347	6564	7210	5840	7890	6555	6200	7200	7399	5686	4973	5489	3720
		Chinese Taipei	1488	1469	940	5755	13850	11546	13426	19680	18023	21850	19242	16314	16837	16795	16429	18483	21563	17717	11984	2965	12116	10418	13252	13189	13732
		Congo	10	10	14	15	12	12	14	9	9	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Cuba	190	151	87	62	34	56	36	7	7	5	0	0	0	0	0	16	16	0	0	0	0	0	0	0	
		Curaçao	0	0	0	0	0	0	0	0	0	1893	2890	2919	3428	2359	2803	1879	2758	3343	0	416	252	1721	2348	2688	3441
		Côte D'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	790	576	47
		Dominica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	
		EU.España	9702	8475	8263	10355	14705	14656	16782	22096	17849	15393	12513	7110	13739	11250	10133	10572	11120	8365	7618	7454	6675	7494	11966	11272	14554
		EU.France	3905	4161	3261	5023	5581	6888	12719	12263	8363	9171	5980	5624	5529	5949	4948	4293	3940	2926	2816	2984	1629	1130	2313	3329	3507
		EU.Ireland	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	5036	2818	5295	6233	5718	5796	5616	3099	9662	5810	5437	6334	3314	1498	1605	2590	1655	3204	4146	5071	5505	3422	5605	3682	6920
		EU.United Kingdom	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	21	0	28	6	0	2	3	0	2	**0**
		Faroe Islands	0	0	0	0	0	0	0	0	0	0	0	0	11	8	0	0	0	0	0	0	0	0	0	0	
		Gabon	0	0	0	0	0	0	1	87	10	0	0	0	184	150	121	0	0	0	0	0	0	0	0	0	
		Ghana	1178	1214	2158	5031	4090	2866	3577	4738	5517	5805	9829	13370	17764	5910	12042	7106	13557	14901	13917	9141	13267	9269	10554	6769	4440
		Grenada	0	0	0	0	65	25	20	10	10	0	1	0	0	0	0	0	0	0	0	0	10	31	0	0	
		Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	998	949	836	998	913	1011	282
		Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	50	0	58
		Honduras	0	0	0	0	0	44	0	0	61	28	59	20	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	1	0	0	0	0	0	0	0	0	0	0	0	**0**
		Japan	18961	32064	39540	35231	30356	34722	35053	38503	35477	33171	26490	24330	21833	24605	18087	15306	19572	18509	14026	15735	17993	16684	16395	15205	12524
		Korea Rep.	4438	4919	7896	2690	802	866	377	386	423	1250	796	163	124	43	1	87	143	629	770	2067	2136	2599	2134	2646	2762
		Liberia	0	0	206	16	13	42	65	53	57	57	57	57	57	57	57	57	57	0	0	0	0	0	0	0	
		Libya	0	0	0	0	0	508	1085	500	400	400	400	400	400	400	31	593	593	0	0	4	0	0	0	0	**0**
		Maroc	8	0	0	0	0	0	0	0	0	0	0	0	700	770	857	913	889	929	519	887	700	802	795	276	300
		Mexico	0	0	0	0	0	0	1	4	0	2	6	8	6	2	2	7	4	5	4	3	3	1	1	3	1
		Mixed flags (FR+ES)	339	339	300	384	807	893	1000	690	426	424	357	409	498	688	519	218	361	383	339	386	238	228	381	0	609
		NEI (ETRO)	85	20	93	959	1221	2138	4594	5034	5137	5839	2746	1685	4011	2285	3027	2248	2504	1387	294	81	0	0	0	0	
		NEI (Flag related)	1406	2155	4650	5856	8982	6151	4378	8964	10697	11862	16569	24896	24060	15092	8470	531	0	0	0	0	0	0	0	0	
		NEI (UK.OT)	0	0	0	0	0	0	0	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Namibia	0	0	0	0	0	0	0	715	29	7	46	16	423	589	640	274	215	177	307	283	41	146	108	181	289
		Norway	0	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		Panama	5616	3847	3157	5258	7446	9991	10138	13234	9927	4777	2098	1252	580	952	89	63	0	1521	2310	2415	2922	2263	2405	3047	3462
		Philippines	0	0	0	0	0	0	0	0	0	0	0	1154	2113	975	377	837	855	1854	1743	1816	2368	1874	1880	1399	1267

Russian Federation	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	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	15	5	9	126	237	138	258	730	1473	1131	1308	565	474	561	721	1267	805	926	1042	858	239
Seychelles	0	0	0	0	0	0	0	0	0	0	0	0	0	58	0	162	0	0	0	0	0	0	0	0	
Sierra Leone	0	0	0	0	0	0	0	0	0	0	0	0	0	6	2	0	0	0	0	0	0	0	0	0	
South Africa	200	561	367	296	72	43	88	79	27	7	10	53	55	249	239	341	113	270	221	84	171	226	159	145	153
St. Vincent and Grenadines	0	0	0	0	0	1	3	0	0	4	2	2	1	1216	506	15	103	18	0	114	567	171	292	396	38
Sta. Lucia	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	22	7	12	12	6	2	86	23	6	33	33	33	0	0	0	0	0	0	0	0	0	0	0	0	
Trinidad and Tobago	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.	1074	1127	847	623	975	813	1090	1402	1209	882	1138	929	1263	574	1085	601	482	416	484	991	527	508	515	571	746
U.S.S.R.	1887	1077	424	95	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	0	0	0	0	0	0	1	1	0	0	0	0	0	0
UK.Sta Helena	5	1	1	3	3	10	6	6	10	10	12	17	6	8	5	5	0	0	0	25	18	28	17	11	190
Uruguay	204	120	55	38	20	56	48	37	80	124	69	59	28	25	51	67	59	40	62	83	22	27	201	23	15
Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	104	109	52	132	91	34	42	39
Venezuela	349	332	115	161	476	270	809	457	457	189	274	222	140	221	708	629	516	1060	243	261	318	122	229	85	264

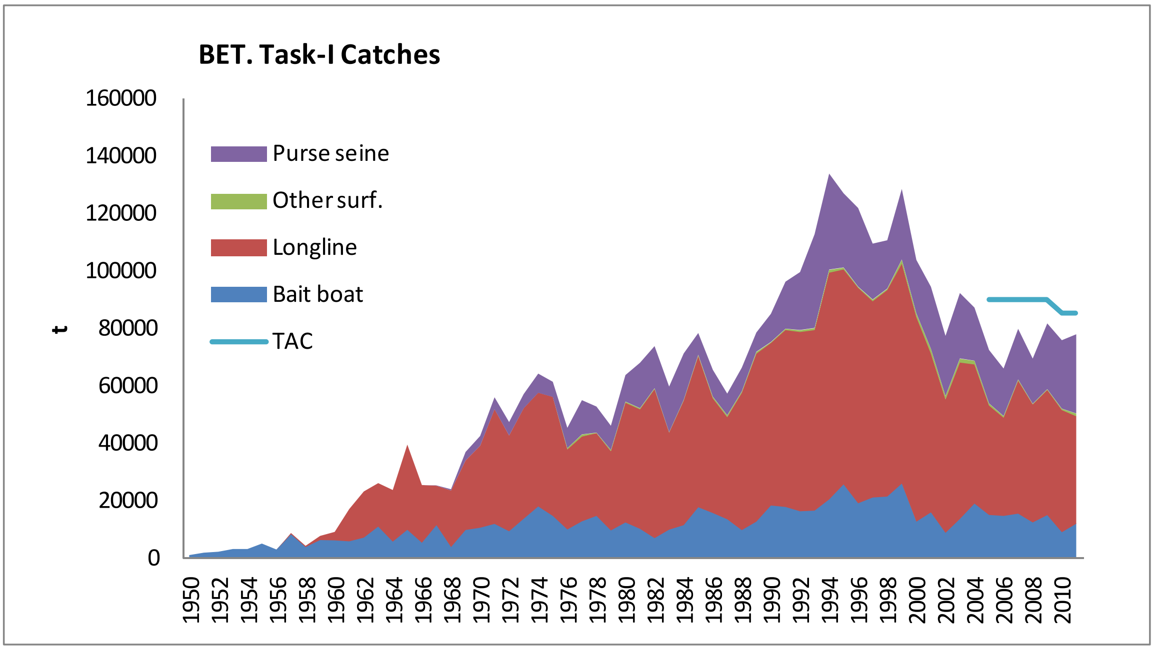
BET-Table 2. Estimated probabilities of the Atlantic bigeye tuna stock being above B_{MSY} and below F_{MSY} in a given year for TAC level ('000 t), based upon the 2010 assessment outcomes.

	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%



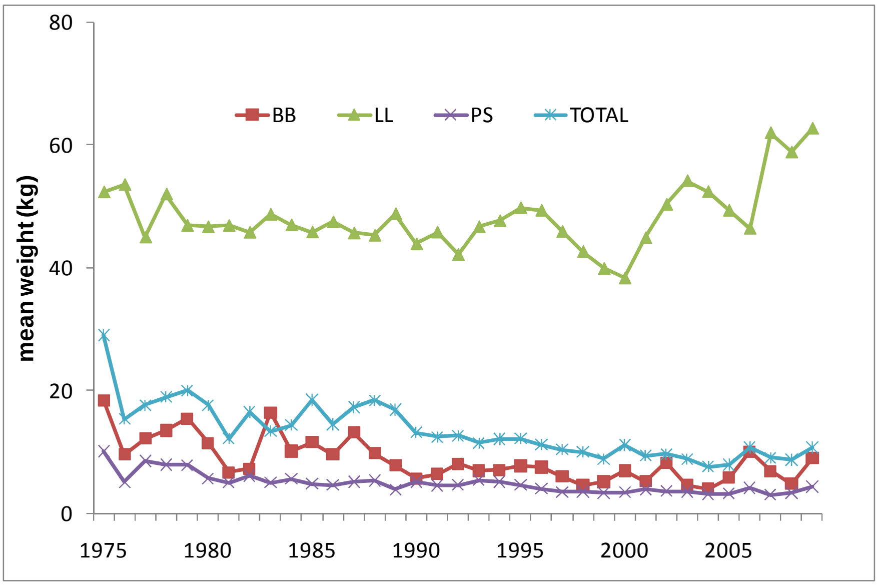
a. BET(1950-59)
b. BET(1960-69)
c. BET(1970-79)
d. BET(1980-89)
e. BET (1990-99)
f. BET (2000-09)

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.

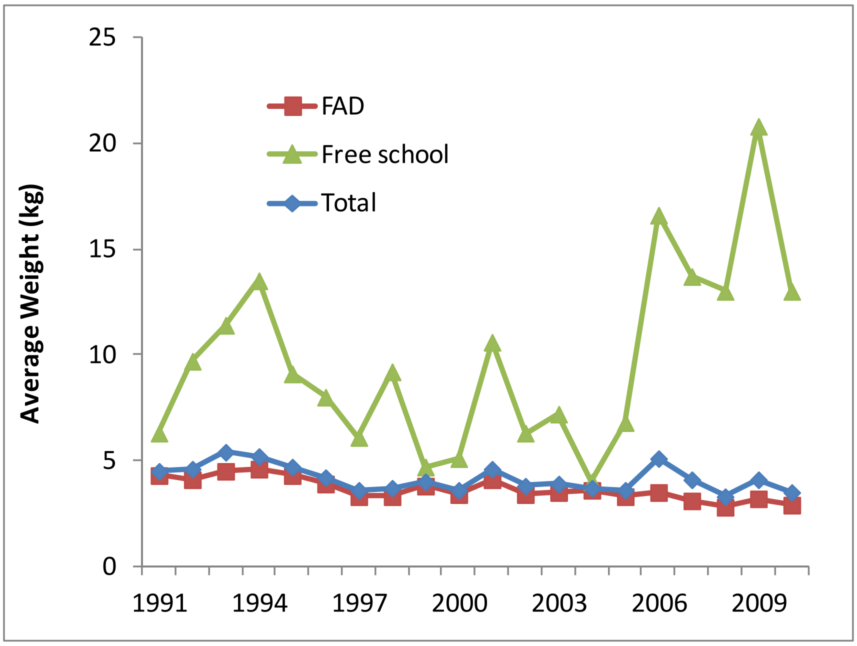


BET-Figure 2. Bigeye Task I catches for all the Atlantic stock, in tonnes. The value for 2011 represents preliminary estimates because some countries have yet to provide data for this year.

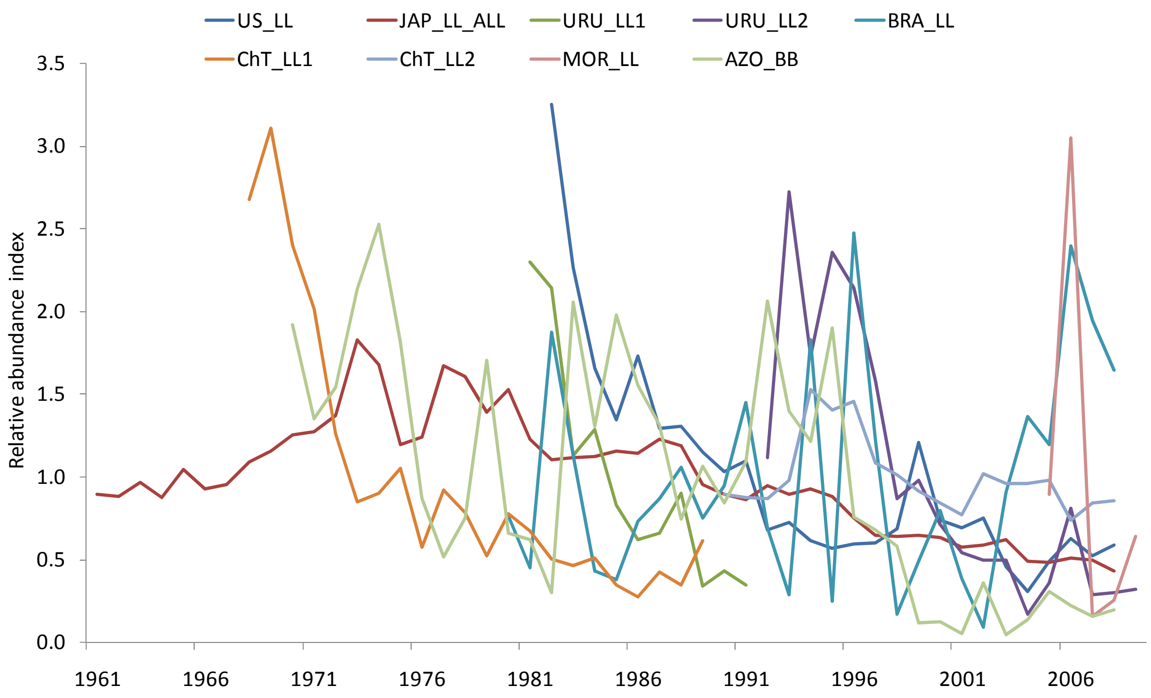
a)



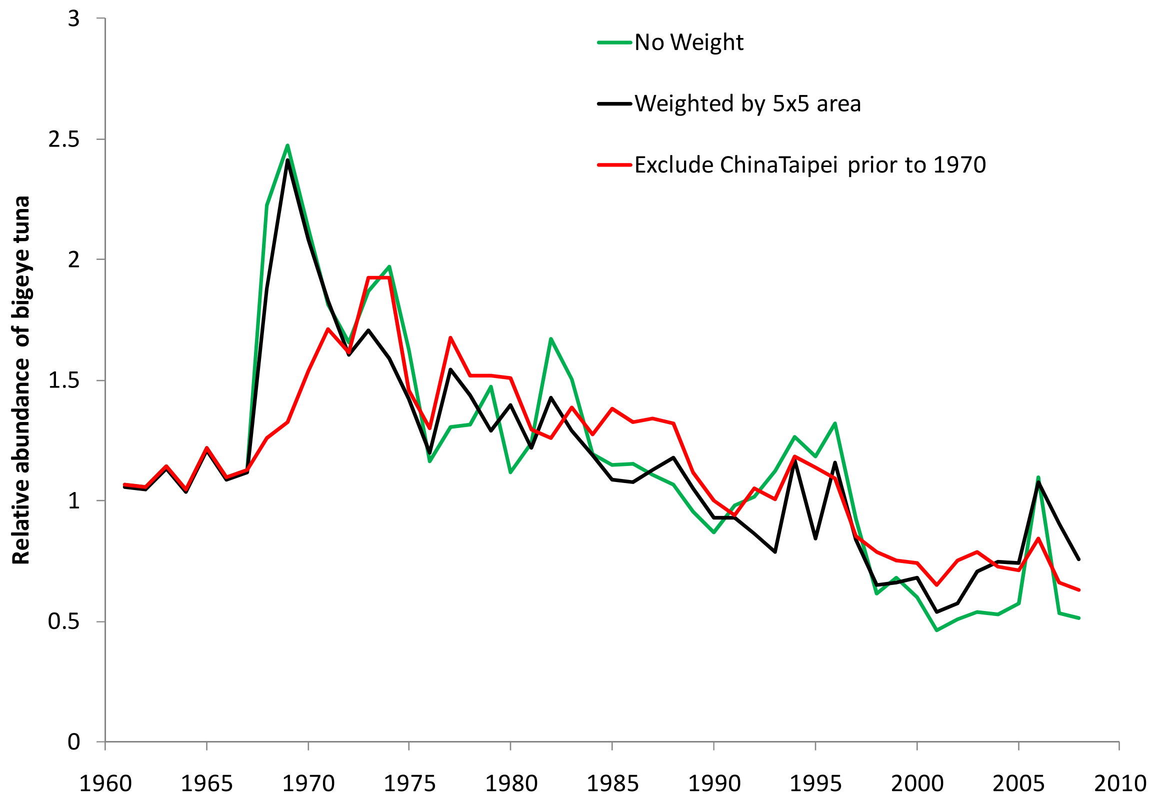
b)



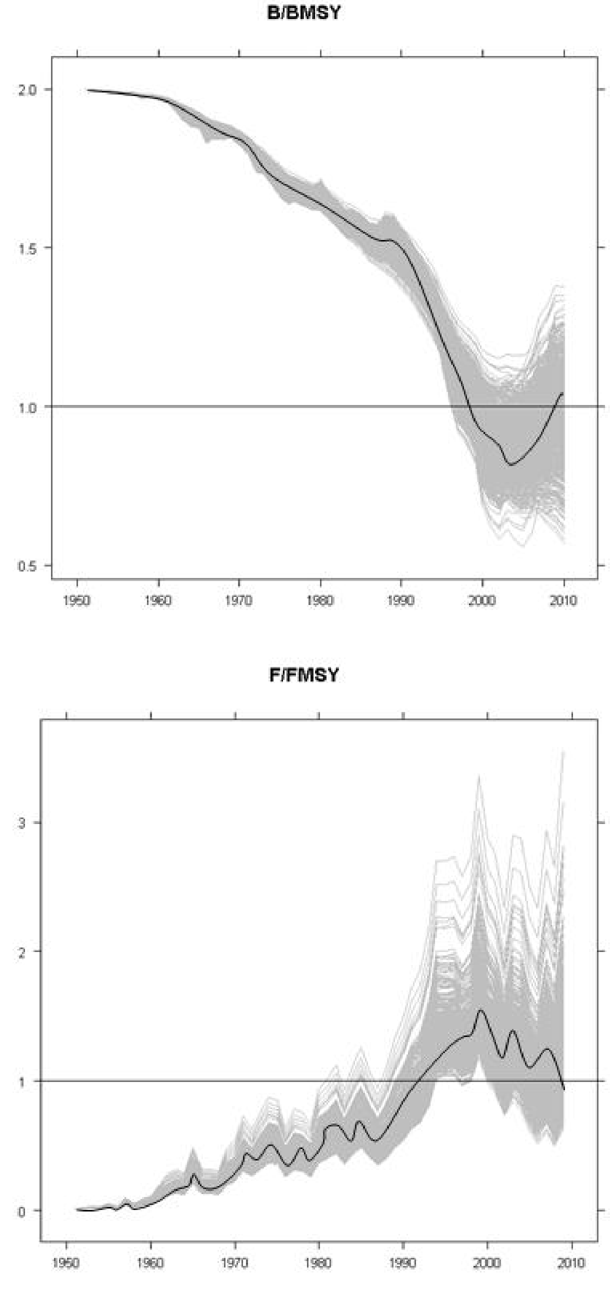
BET-Figure 3. Trend of mean weight for bigeye a) by major fisheries (1975-2009) based on the catch-at-size data, b) for European purse seiners (total) and separated between free schools and FAD associated schools (1991-2010).



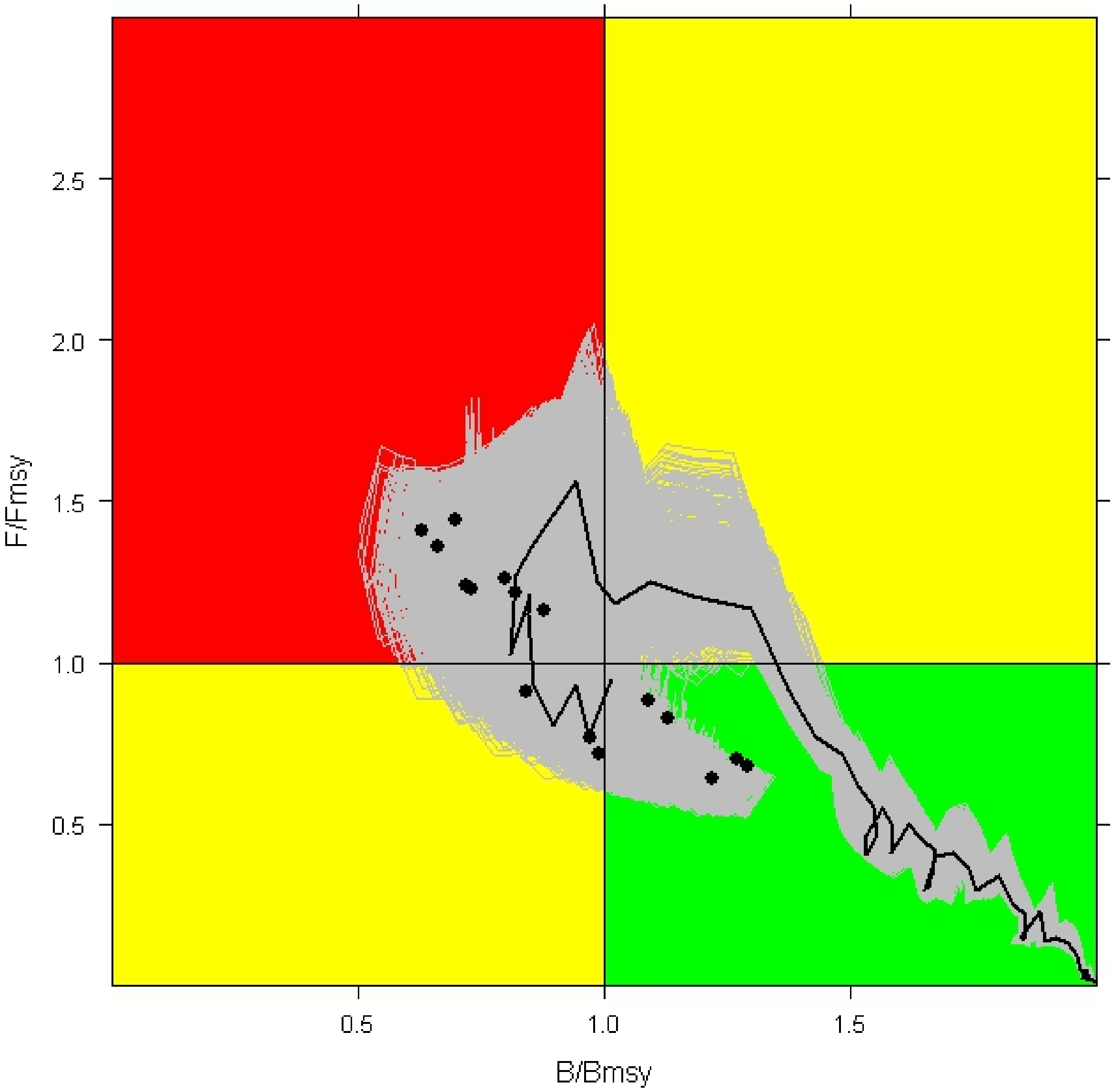
BET-Figure 4. Relative abundance indices for bigeye tuna. AZO_BB Azores Baitboat, BRA_LL, Brazil longline, ChT_LL1, Chinese Taipei longline 1968-1989, ChT_LL2 Chinese Taipei longline 1990-2008, JAP_LL Japanese longline, MOR_LL Morocco longline, UR_LL1 Uruguay longline 1981-1991, UR_LL2 Uruguay longline 1992-2008, US_LL USA longline.



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

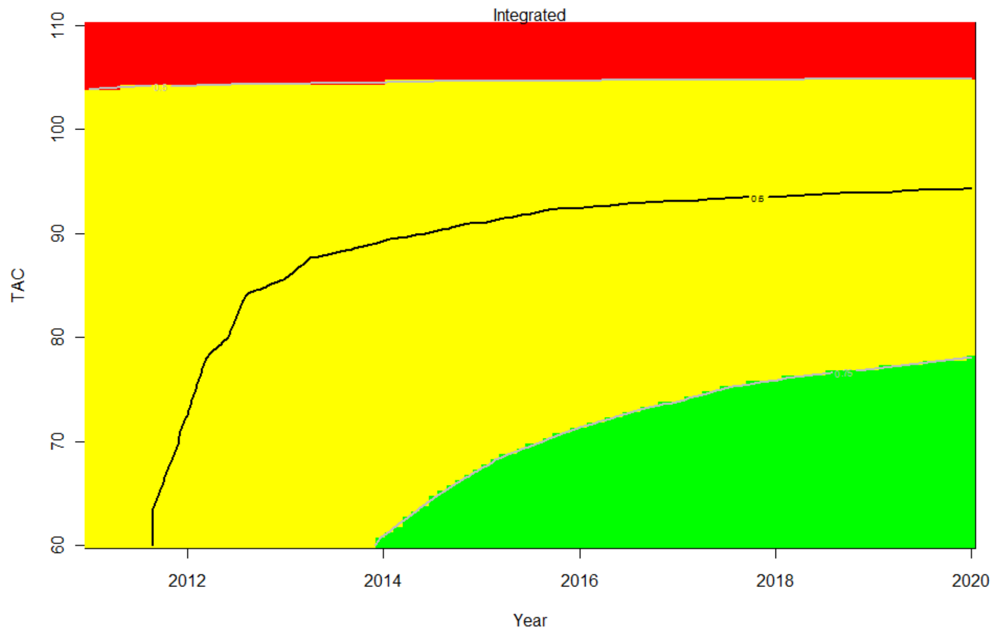


BET-Figure 6. Trajectories of B/B_{MSY} and F/F_{MSY} estimated from the logistic production model. Lines represent the 80% percentile of bootstrap results and thicker line the median.



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. The 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. Fishery indicators

The total catches obtained in 2011 in the entire Atlantic Ocean (including estimates of skipjack in the *faux-poisson* landed in Côte d'Ivoire by the EU-purse seiners) amounted to 212,668 t **(SKJ-Table 1**, **SKJ-Figure 2)**. This represents a considerable increase compared to the average catches of the previous five years (152,600 t). It is possible however, that the catches of a segment of the Ghanaian purse seine fleet, transshipped at sea on carriers before 2011, had escaped the collection process of fishery statistics. On the other hand, the preliminary results of the recent mission of experts carried out in Ghana under ICCAT suggest the existence of bias in the sampling protocol aimed at correcting the multi-species composition of catches reported in the logbooks.

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 2011 in the East Atlantic amounted to 173,338 t, that is, an increase of about 34% as compared to the average of 2006-2010 **(SKJ-Figure 3)**. A strong increase in the skipjack catches by European purse seiners is noted, probably due to the high selling price of this species. 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 have increased since 2006 and may have exceeded 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 studies conducted on board French purse seiners (estimated at 42 kg per ton of skipjack landed). Furthermore, the amount of small skipjack (average size 37 cm FL) landed in the local market of Abidjan in Côte d'Ivoire as *faux-poisson* has been 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. Catches in 2011 in the West Atlantic have been estimated at 39,000 t, which is close to the historic record of 40,000 t obtained in 1984. This very strong increase (57% compared to the average catches observed in recent years) is largely due to the good catches reported by Brazilian baitboats **(SKJ-Figure 6)**. As the fishing effort of this fleet has not increased, this increase could be due to an increase either due to the productivity or catchability. This corresponds to the increase in catches also observed in the East Atlantic by European purse seiners.

It is difficult to estimate effective fishing effort for skipjack tuna in the East Atlantic because this species is not always targeted and besides it is difficult to estimate fishing effort related to fishing under FADs and to quantify the assistance provided by the supply vessels. The Committee recognizes that the use of data series on the annual development of sale prices of tropical species by commercial category would allow identification of the years where skipjack was targeted by fishing fleets and recommends the ICCAT Secretariat to identify conditions for accessing the databases on this subject. 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 since 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 hypothesis of a 3% average annual increase in skipjack catchability to account for technological changes, an analysis has been conducted by fixing MSY and K at levels that agree with estimates made during previous stock assessments. This method considers an increase in catchability within a range of values 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 reached its maximum historical level in 2011 and 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, various 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 overexploited 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 absence of a larval index trend, limited to the Gulf of Mexico, seems to reinforce this hypothesis. However, 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 Committee 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. Effect of current regulations

There is currently no specific regulation in effect for skipjack tuna. Although the average of catches in recent years are below the estimates of MSY, the Committee is concerned about the high catches of skipjack reported in 2011 from the two coasts of the Atlantic and the potential under-reporting in recent years for the East stock.

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] and the establishment of a time/area closure of the surface fishery [Rec. 04-01], which aims at decreasing mortality due to juvenile bigeye tuna fishing, are regulatory measures whose effects were analyzed by the Species Group meeting.

Although aimed at a total closure, this measure which is much smaller in time (November) and area (0º-5ºN, 10ºW-20ºW) than the previous moratorium on FADs, has been considered less effective in reducing the catches of small bigeye taken by the surface fishery. For purposes of comparison, when the fishing effort of the EU purse seine fleet was at its maximum value (period 1994-1996, i.e., before the implementation of the first moratorium on FADs), 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).

The new Recommendation [Rec. 11-01] which replaces that relative to the complete closure of the surface fishery and establishes a new moratorium on FAD fishing in the area that extends from the coast to 10ºS and 5ºW latitude to 5ºE longitude during the months of January and February, will enter into force in 2013 and will most likely have an impact on the skipjack catches.

SKJ-5. Management recommendations

Although the Committee made 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.

The Committee noted that current yields are at or above the estimated MSY yields, meaning the stocks are now likely overfished.

ATLANTIC SKIPJACK TUNA SUMMARY

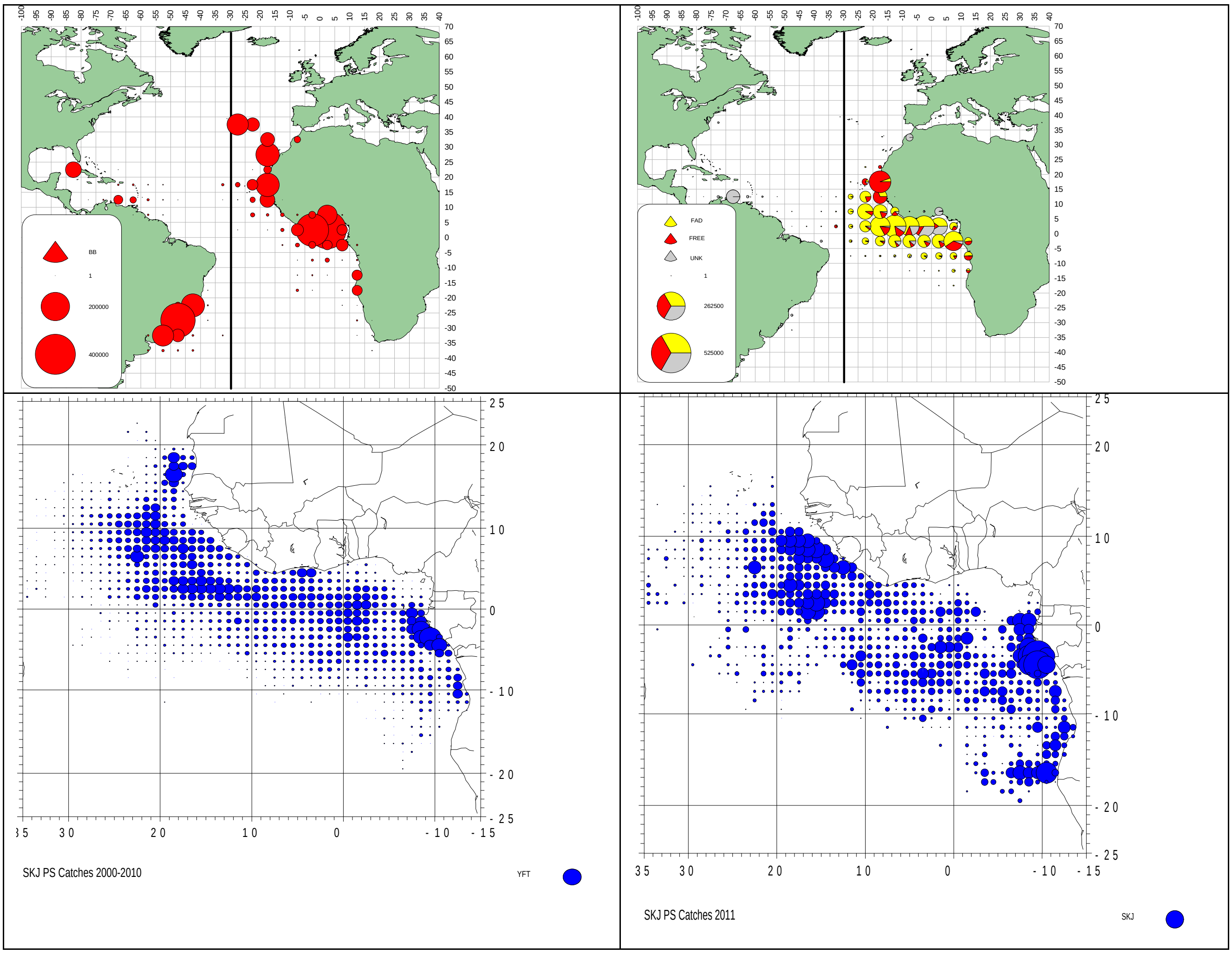
	East Atlantic	***West Atlantic***
Maximum Sustainable Yield (MSY)	Around 143,000-170,000 t	Around 30,000-36,000 t
Current (2011) Yield [1]	173,338 t	39,324 t
Current Replacement Yield	Somewhat below 173,338 t	Somewhat below 39,324 t
Relative Biomass (B_{2008}/B_{MSY})	Most likely>1	Most likely>1
Relative Fishing Mortality: (F_{2008}/F_{MSY})	Most likely<1	Most likely<1
Management measures in effect	Rec. 04-01 (effective 2005) [2] Rec. 11-01[3]	None

[1] Reports of catches for 2011 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.
[3] This new moratorium on FADs will enter info force in January 2013 and will replace Rec. 04-01.

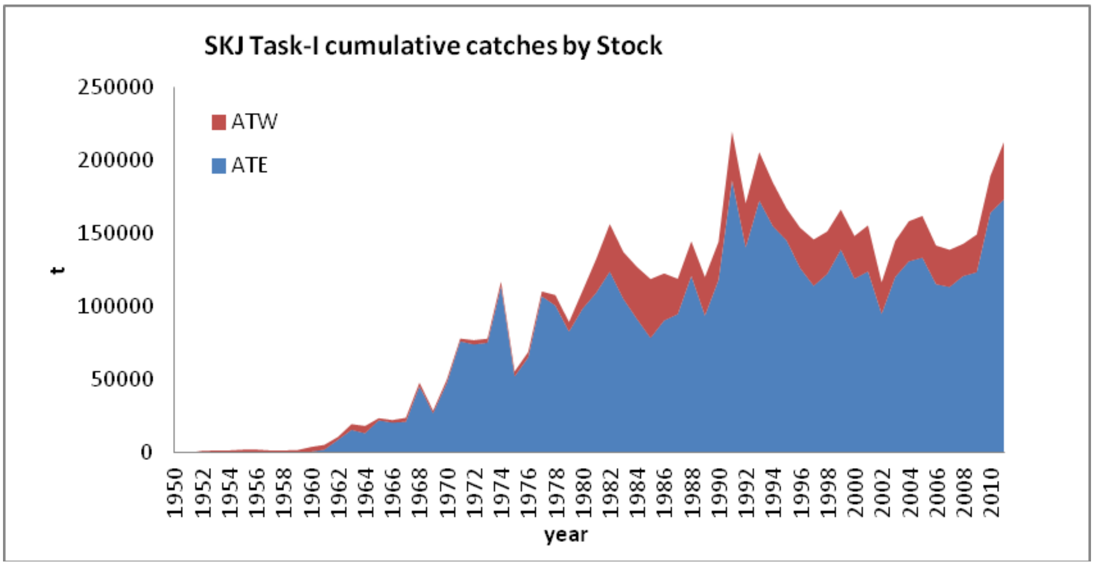
SKJ-Table 1. Estimated catches (t) of skipjack tuna (*Katsuwonus pelamis*) by area, gear and flag.

			1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
TOTAL			119229	144796	120419	144471	219733	170708	205685	185014	167381	154127	146082	151699	166488	148492	155767	116781	145293	158707	162240	141973	139127	143114	149446	189468	212668
	ATE		95052	121060	94037	118361	186330	140554	172462	155065	145479	126557	114367	122436	139079	119209	124204	95145	120412	131085	133596	115501	113580	121025	123669	164253	173338
	ATW		24164	23736	26382	26110	33404	30155	33221	29949	21860	27562	31712	29087	27356	29193	31486	21600	24749	27461	28517	26453	25443	22022	25771	25175	39324
	MED		13	0	0	0	0	0	2	0	43	9	4	176	53	90	77	37	132	161	127	20	104	67	5	40	6
Landings	ATE	Bait boat	38803	48015	41000	36922	41611	35660	31656	37817	33691	32047	37293	42045	37696	29974	46281	27591	29847	39539	43603	41175	29720	44106	33623	37157	31255
		Longline	6	4	9	0	5	3	2	10	3	7	47	85	42	48	53	56	66	47	71	201	405	172	58	42	30
		Other surf.	1027	1506	1643	1357	2067	1602	1062	501	445	501	304	923	417	2423	764	681	551	1085	2284	5159	3366	3745	6459	5731	1703
		Purse seine	55216	71535	51385	80082	142646	103288	139742	116737	111340	94002	76722	79383	100925	86763	77107	66817	89948	90414	87638	68966	80088	73002	83529	121323	140349
	ATW	Bait boat	18675	21057	23292	22246	23972	20852	19697	22645	17744	23741	26797	24724	23881	25641	25142	18737	21990	24082	26028	23749	22865	20617	22770	19923	29468
		Longline	6	9	25	23	33	29	20	16	34	19	12	21	58	22	60	349	95	206	207	286	52	49	20	13	31
		Other surf.	518	355	600	600	872	764	710	1577	2023	452	556	516	481	467	951	398	367	404	316	372	1317	455	950	1104	869
		Purse seine	4964	2315	2466	3241	8527	8509	12794	5712	2059	3349	4347	3826	2936	3063	5332	2116	2296	2769	1967	2045	1209	901	2032	4136	8957
	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	3	17	21	12	3	23	27	0	4	
		Other surf.	13	0	0	0	0	0	2	0	43	9	4	176	53	90	77	32	12	40	17	17	44	24	4	27	5
		Purse seine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	103	101	99	0	38	16	1	8	1
Discards	ATE	Purse seine	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
	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	80	30	85	69	66	41	13	7	3	15	52	2	32	14	14	14	14	10	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	510	331
		Benin	5	3	7	2	2	2	2	2	2	2	7	3	2	2	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	
		Cape Verde	2076	1456	971	806	1333	864	860	1007	1314	470	591	684	962	789	794	398	343	1097	7504	7930	6026	6010	5560	6032	7758
		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	4	0	0	0	0	0	0	0	0	0	0	0	0	
		Chinese Taipei	0	1	3	0	5	3	2	10	3	5	47	73	39	41	24	23	26	16	10	9	14	19	6	11	16
		Congo	8	8	11	12	9	9	10	7	7	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Cuba	81	206	331	86	0	0	7	0	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	7096	8444	8553	9932	10008	13370	5427	10092	8708	0	3042	1587	6436	9143	9179	11939
		Côte D'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	1173	259	292	143	559	1259	1565	1817	2328	2840	2840	2107
		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	33076	47643	35300	47834	79908	53319	63660	50538	51594	38538	38513	36008	44520	37226	30954	25456	44837	38725	28139	22206	23670	35105	36694	41186	56597
		EU.Estonia	0	0	0	0	102	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.France	17114	16504	15211	17099	33271	21890	33735	32779	25188	23107	17023	18382	20344	18183	16593	16615	19899	21879	14850	7034	4168	4439	7789	14741	13065
		EU.Germany	0	0	0	0	0	0	0	0	0	3	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	14	14	14	0	0	8	6	
		EU.Latvia	0	0	0	0	92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Lithuania	0	0	0	0	221	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Portugal	8420	14257	7725	3987	8059	7477	5651	7528	4996	8297	4399	4544	1810	1302	2167	2958	4315	8504	4735	11158	8995	6057	1084	12974	4143
		Gabon	0	0	0	0	0	0	1	11	51	26	0	59	76	21	101	0	0	0	0	0	0	0	0	0	
		Ghana	24347	26597	22751	24251	25052	18967	20225	21258	18607	19602	26336	34183	40216	28974	42489	30499	24597	25727	44671	30236	34572	37387	36064	53813	50363
		Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6389	4959	5546	6319	4036	2951	2829
		Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1224	1224	1010
		Japan	1982	3200	2243	2566	4792	2378	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1
		Korea Rep.	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	1028	428	295	1197	254	559	310	248	4981	675	4509	2481	848	1198	268	280	523	807	1893	3779	1570	1291	2575	2317	2147
		Mixed flags (FR+ES)	4663	4660	4125	5280	11101	12273	13750	9492	5862	5831	4905	5621	6845	9461	7137	2995	4959	5262	4666	5313	3275	3128	2969	4163	3300
		NEI (ETRO)	791	2994	2263	10869	11335	12409	20291	17418	16235	16211	6161	6748	8893	7127	8087	8550	9688	11137	2873	629	0	0	0	0	
		Namibia	0	0	0	0	0	0	0	2	15	0	1	0	0	0	8	0	0	0	0	0	0	0	71	2	2
		Norway	581	738	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	8312	8719	13027	12978	14853	5855	1300	572	1308	1559	281	342	0	7126	11490	13468	18821	8253	8518	9590	12509
		Rumania	0	0	59	142	349	73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Russian Federation	0	0	0	0	1175	1110	540	1471	1450	381	1146	2086	1426	374	0	0	0	0	0	392	1130	313	260	0	20
		S. Tomé e Príncipe	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	47	134	652	260	95	59	18	163	455	1963	1631	1506	1271	1053	733	1333	4874	3534	2278	3661	4573	2447	4823
		South Africa	88	157	96	17	15	7	6	4	4	1	6	2	1	7	1	1	2	2	1	0	0	4	4	2	6
		St. Vincent and Grenadir	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	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.	547	1822	1915	3635	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

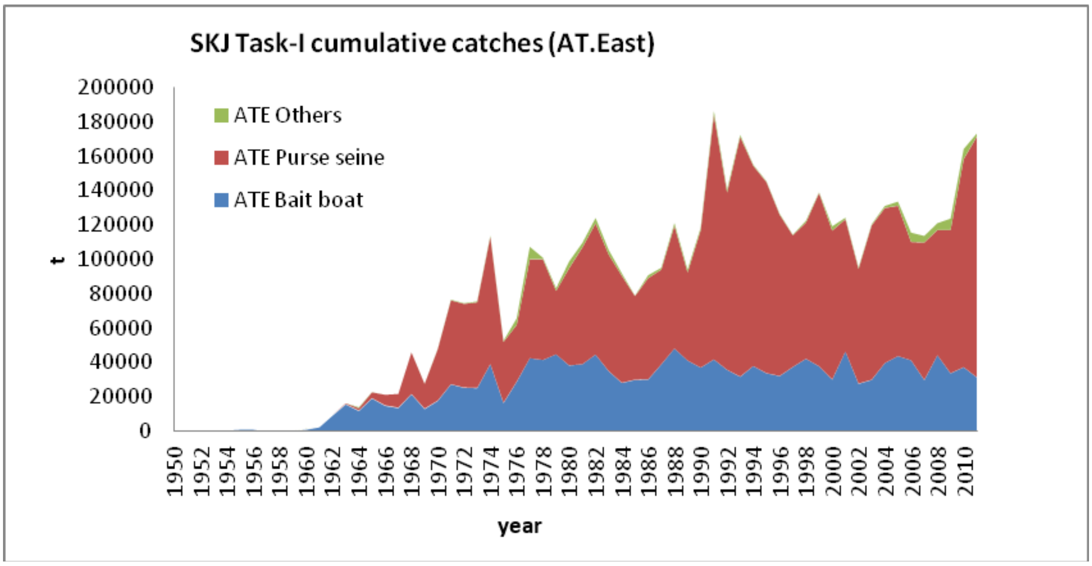
		UK.Sta Helena	139	158	397	171	24	16	65	55	115	86	294	298	13	64	205	63	63	63	63	88	110	45	15	25	371
		Venezuela	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	ATW	Argentina	90	7	111	106	272	123	50	1	0	1	0	2	0	1	0	0	0	30	0	0	0	0	0	0	
		Barbados	21	3	9	11	14	5	6	6	6	5	5	10	3	3	0	0	0	0	0	0	0	0	0	0	1
		Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2204	7099
		Brasil	16286	17316	20750	20130	20548	18535	17771	20588	16560	22528	26564	23789	23188	25164	24146	18338	20416	23037	26388	23270	24191	20846	23307	20590	30563
		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	2	7	19	0	32	26	9	7	2	10	1	2	1	0	1	16	14	27	28	29	2	8	0	2	**0**
		Colombia	0	0	0	0	0	0	2074	789	1583	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Cuba	1101	1631	1449	1443	1596	1638	1017	1268	886	1000	1000	651	651	651	0	0	624	545	514	536	0	0	0	0	
		Curaçao	40	40	40	40	40	40	45	40	35	30	30	30	30	30	0	0	0	0	0	0	0	0	0	0	
		Dominica	0	0	0	60	38	41	24	43	33	33	33	33	85	86	45	55	51	30	20	28	32	45	25	0	13
		Dominican Republic	62	63	117	110	156	135	143	257	146	146	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.España	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	4	9	0	0	23
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	3	3	5	21	11	0	6	0	8
		Grenada	5	22	11	23	25	30	25	11	12	11	15	23	23	23	15	14	16	21	22	15	26	20	0	0	
		Jamaica	0	0	0	0	0	0	0	0	0	62	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	1	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	0	
		Mexico	13	10	14	4	9	8	1	1	0	2	3	6	51	13	54	71	75	9	7	10	7	8	9	7	9
		NEI (ETRO)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	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	
		St. Vincent and Grenadir	0	17	28	29	27	20	66	56	53	37	42	57	37	68	97	357	92	251	251	355	90	83	54	46	50
		Sta. Lucia	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	1	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		U.S.A.	734	57	73	304	858	560	367	99	82	85	84	106	152	44	70	88	79	103	30	61	66	67	119	54	84
		UK.Bermuda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0
		Venezuela	5750	4509	3723	3813	8146	7834	11172	6697	2387	3574	3834	4114	2981	2890	6870	2554	3247	3270	1093	2008	921	757	2250	2119	1473
	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	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	22	0	0	0	0	0	0	0	8	2
		EU.Greece	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	102	99	99	0	0	0	0	0	
		EU.Italy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	29	34	17	0	0	0	0	0	
		Maroc	13	0	0	0	0	0	2	0	43	9	4	5	10	1	0	1	1	2	1	5	22	18	5	26	4
		Syria Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	36	0	0	
Discards	ATE	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	1
	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



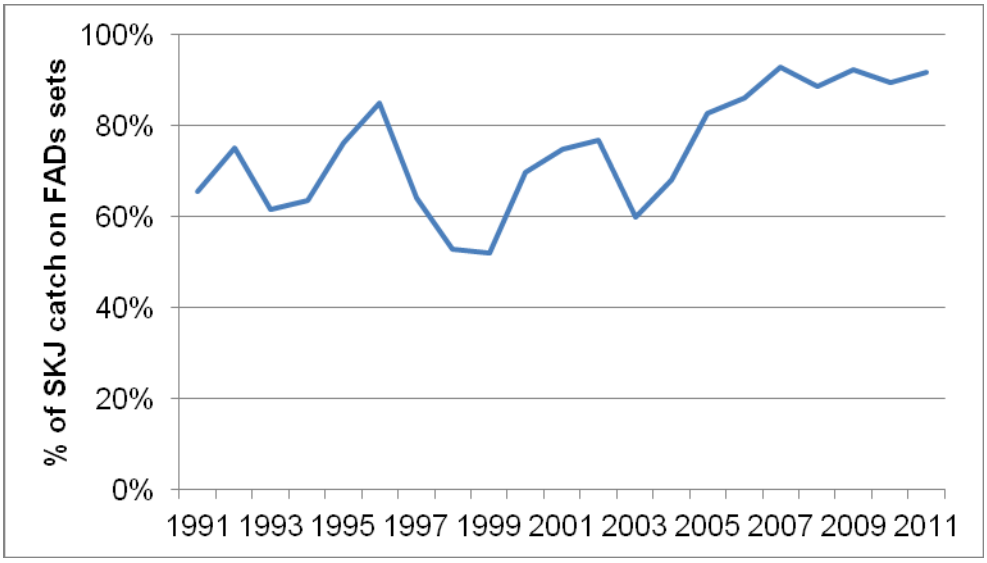
SKJ-Figure 1. (A) Distribution of skipjack catches in the Atlantic for baitboat between 1960 and 2009 (upper left panel) and for purse seiners by fishing mode (free schools vs. FADs) between 1991 and 2009 (upper right). (B) Skipjack catches made by European purse seiners (about 75% of the total catches) 2000 and 2010 (lower left panel) and showing the withdrawal from the Senegal zone due to non-renewal of the fishing agreements in 2006 and the recent expansion off Angola (lower right panel).



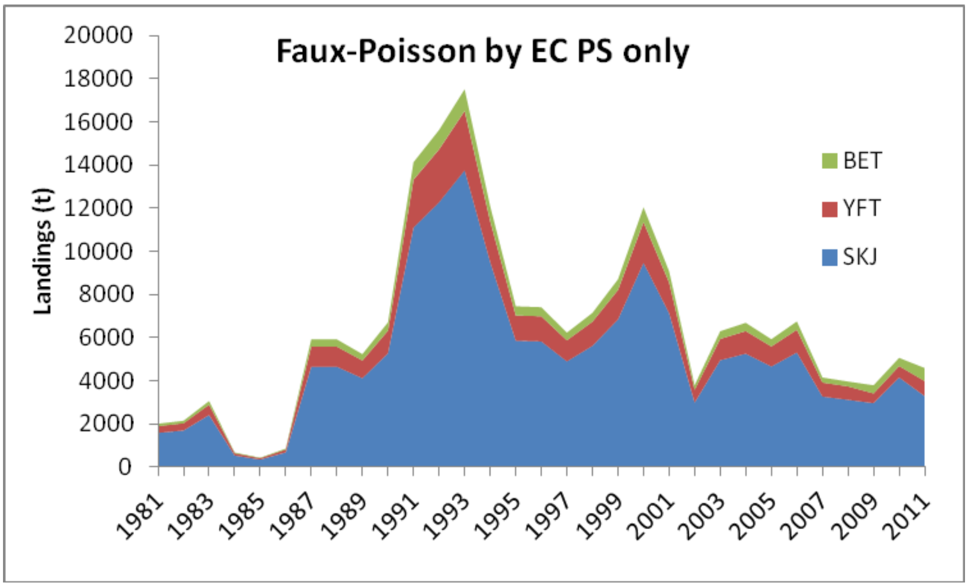
SKJ-Figure 2. Total catch (t) for skipjack tuna in the Atlantic Ocean and by stocks (East and West) between 1950 and 2011. Estimates of skipjack in the "*faux poissons*" landed in Côte d'Ivoire were included in the skipjack trade catches in the eastern Atlantic (only catches to 2006 were considered for the stock assessment). It is possible that skipjack catches taken in the eastern Atlantic in recent years were not reported or were under-estimated.



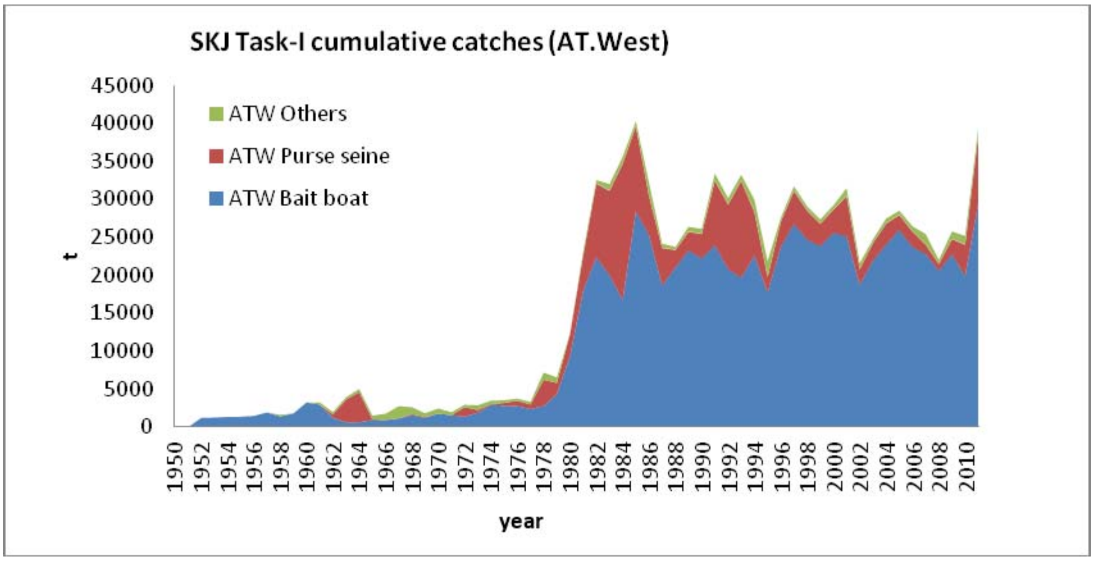
SKJ-Figure 3. Skipjack catches in the eastern Atlantic, by gear (1950-2011). It is possible that skipjack catches taken by purse seiners during recent years were not reported or were under-estimated.



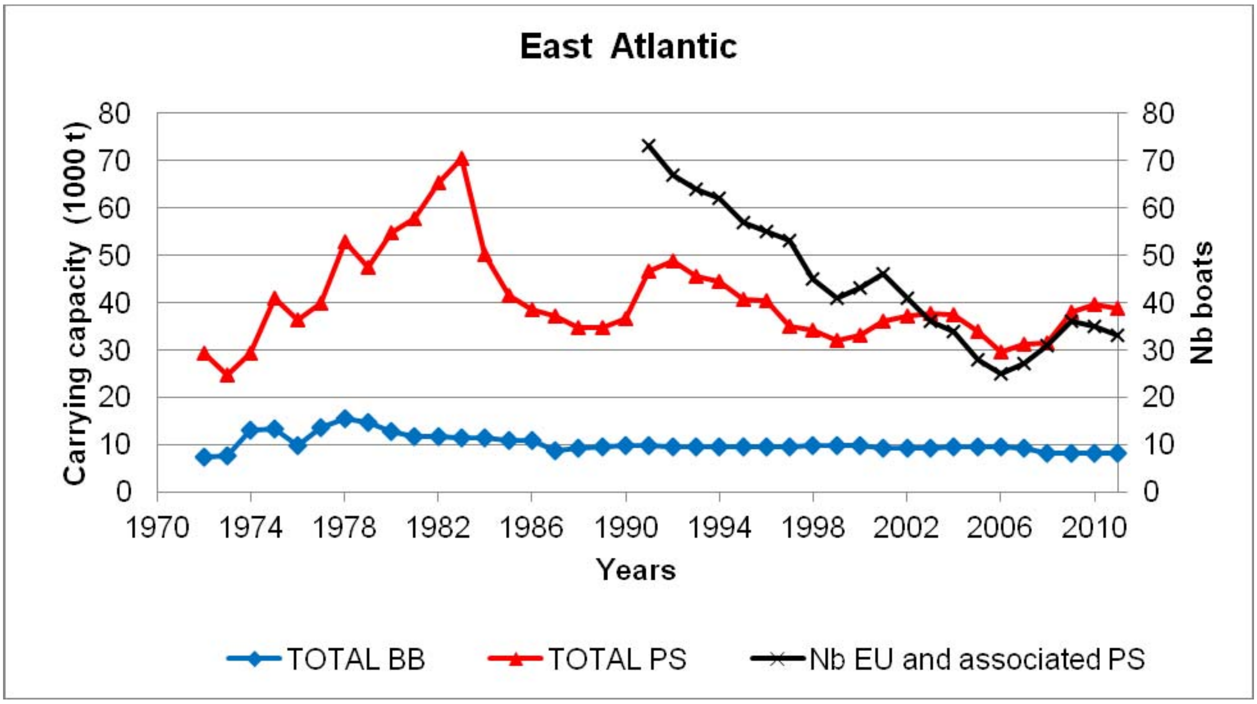
SKJ-Figure 4. Changes in the proportion of skipjack catches made by European purse seiners under FADs (1991-2011). The increase in the percentage of catches under FADs coincides with the shift from the Senegal area (due to not renewing the fishing agreements); area known for its seasonal fishing on free schools (see **Figure 1**).



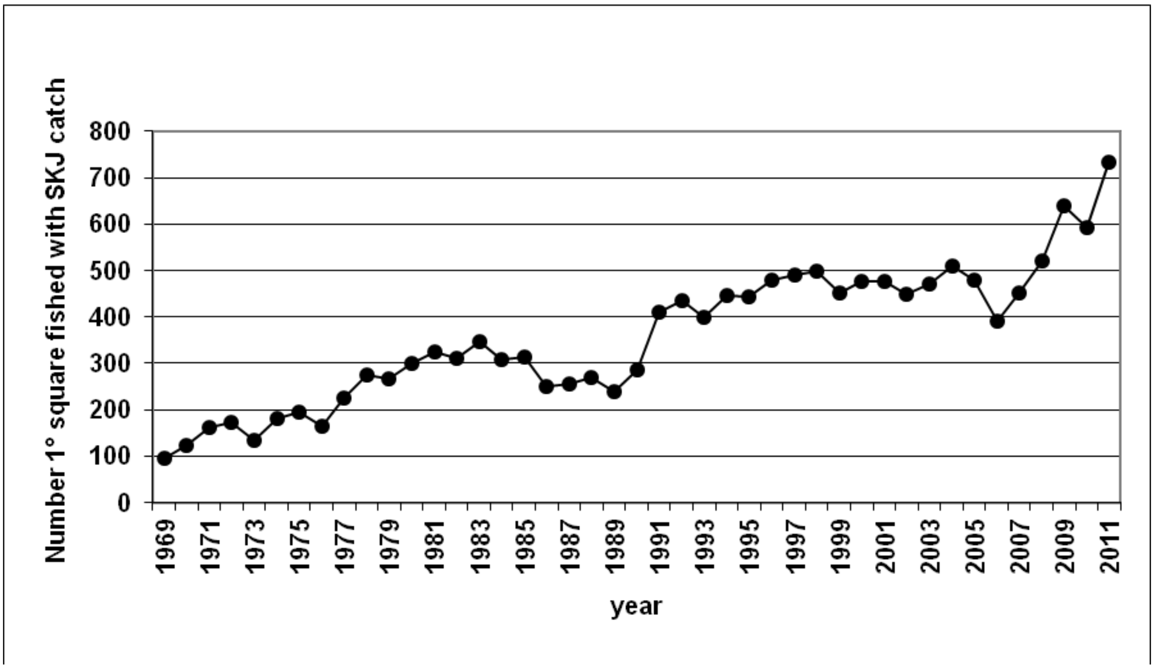
SKJ-Figure 5. Cumulative estimated landings of "*faux poissons*" (1981-2011) for the European or associated purse seiners for the three main species of tropical tunas in the local market of Abidjan (Côte d'Ivoire).



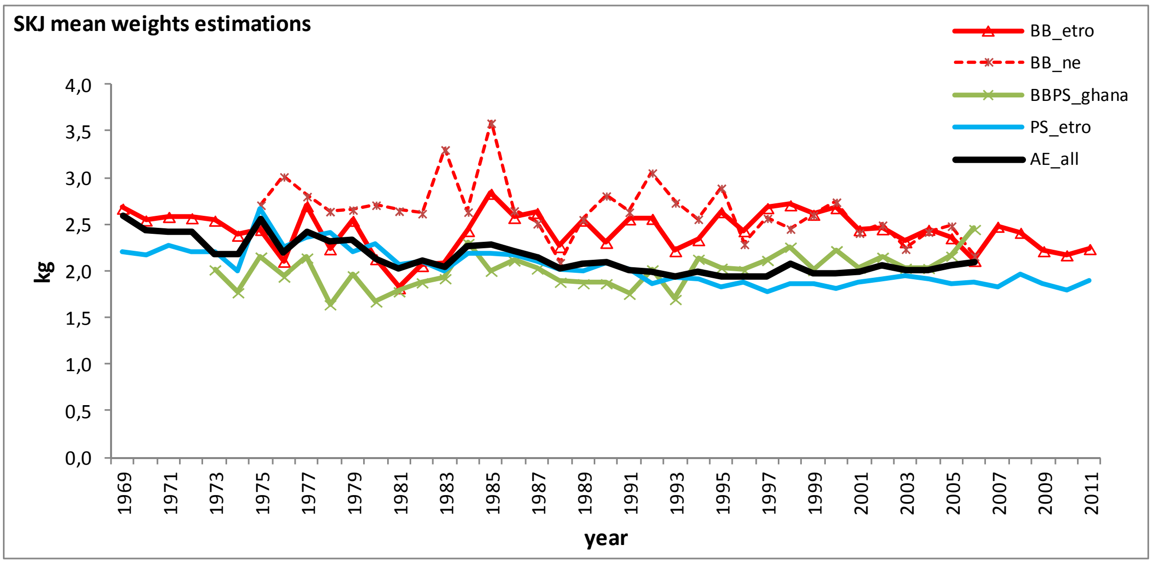
SKJ-Figure 6. Skipjack catches in the western Atlantic, by gear (1950-2011).



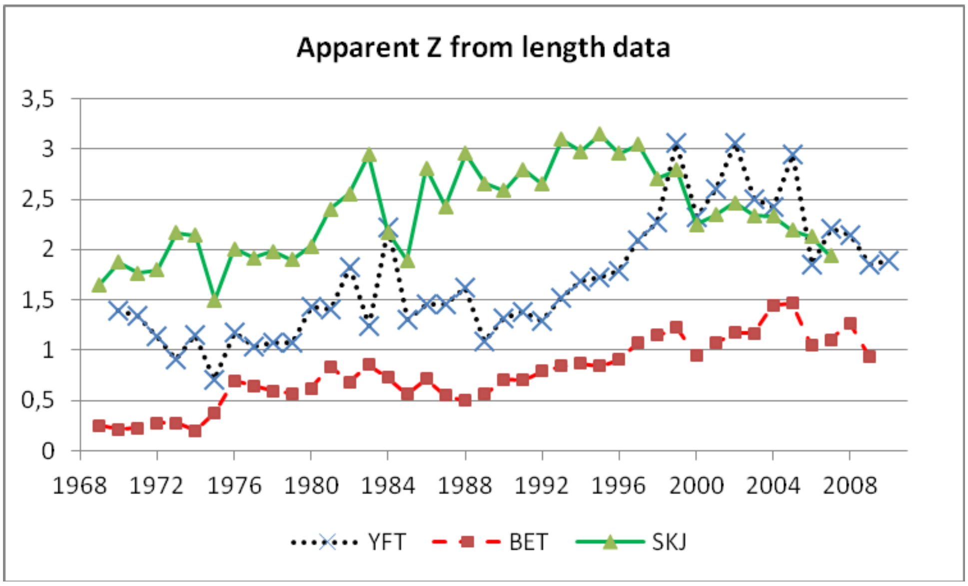
SKJ-Figure 7. Changes over time in the carrying capacity, corrected by time at sea, (left axis) for the overall purse seiners and baitboats operating in the eastern Atlantic (1971-2011) and in number of boats for the European purse seiners (right axis). It is possible that the carrying capacity for some segments of the purse seine fleet was underestimated during recent years.



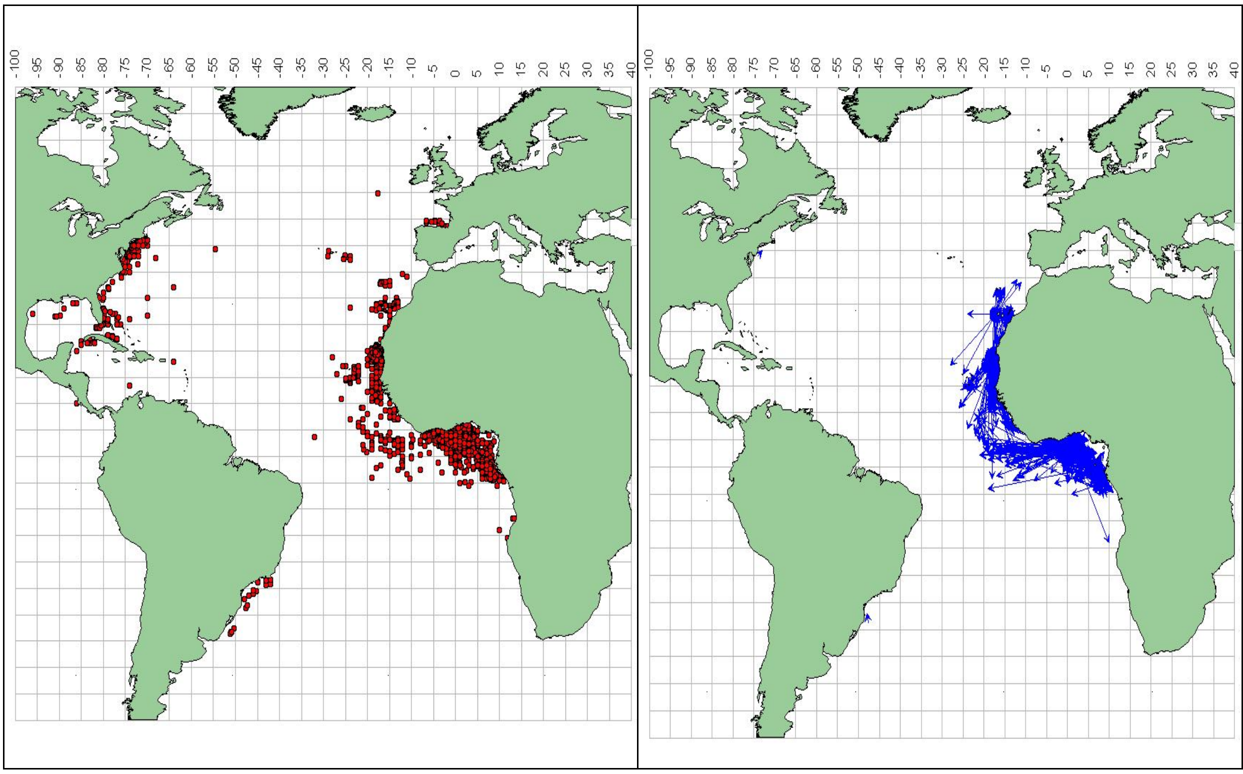
SKJ-Figure 8. Number of 1°x1° squares with catch of skipjack for the purse seiners operating in the eastern Atlantic (1969-2011). The increase observed in 1991 could be due to a modification of the species composition correction procedure of the catches implemented at this date (skipjack catches could 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.



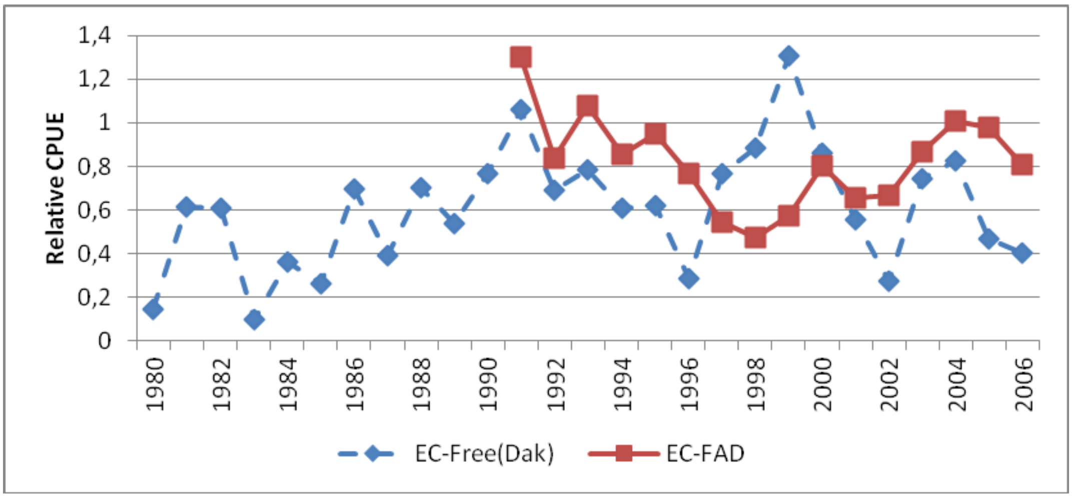
SKJ-Figure 9. Changes in time of the mean weight of the skipjack landed (non standardized) by major fisheries in the eastern Atlantic. Between 1969 and 2006, all series were estimated using the catch-at-size. From 2007 onwards (BB_etro and PS_etro fisheries) the mean weights were estimated with the reported catch-at-size of EU tropical fleets (EU-France and EU-Spain only).



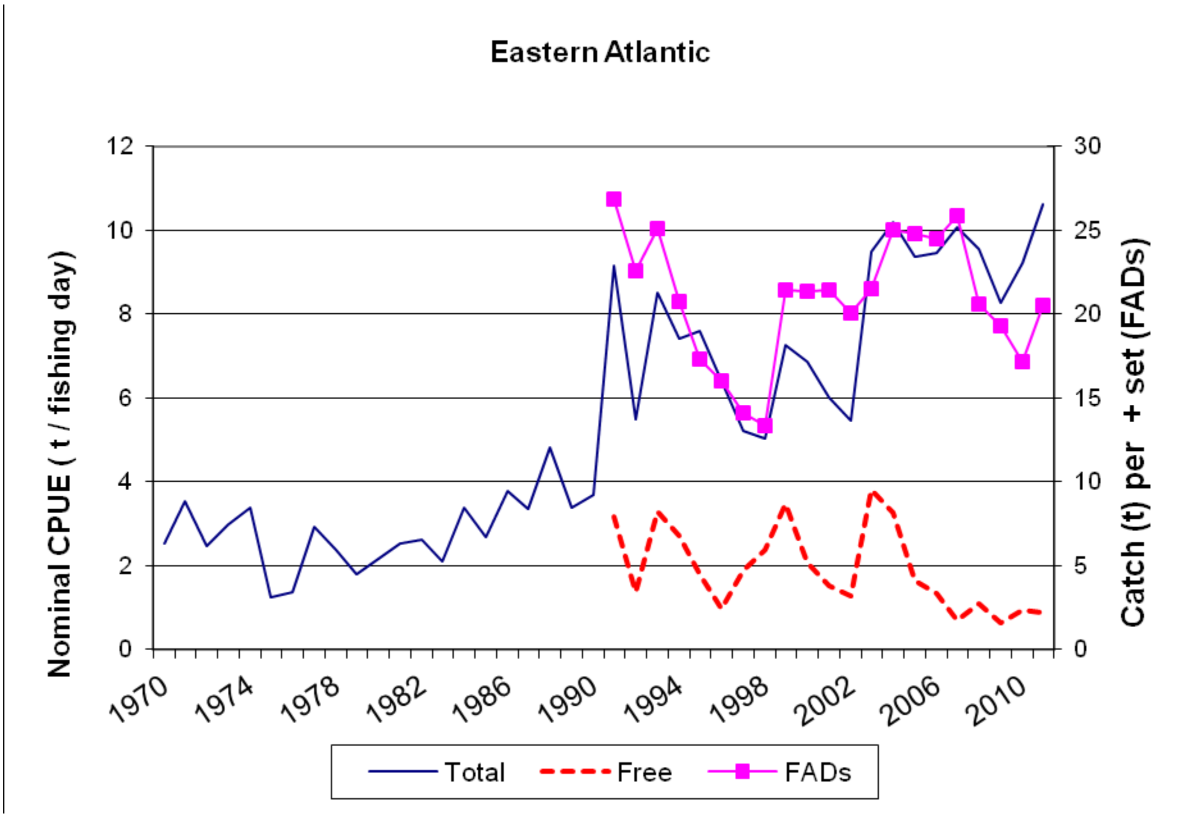
SKJ-Figure 10. Changes over time in the apparent total mortality *Z*, calculated based on Beverton and Holt's equation, for the three main tropical tuna species in the Atlantic Ocean. YFT = yellowfin, BET = bigeye, SKJ = eastern skipjack. The size at which the fish are fully recruited was fixed at 50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



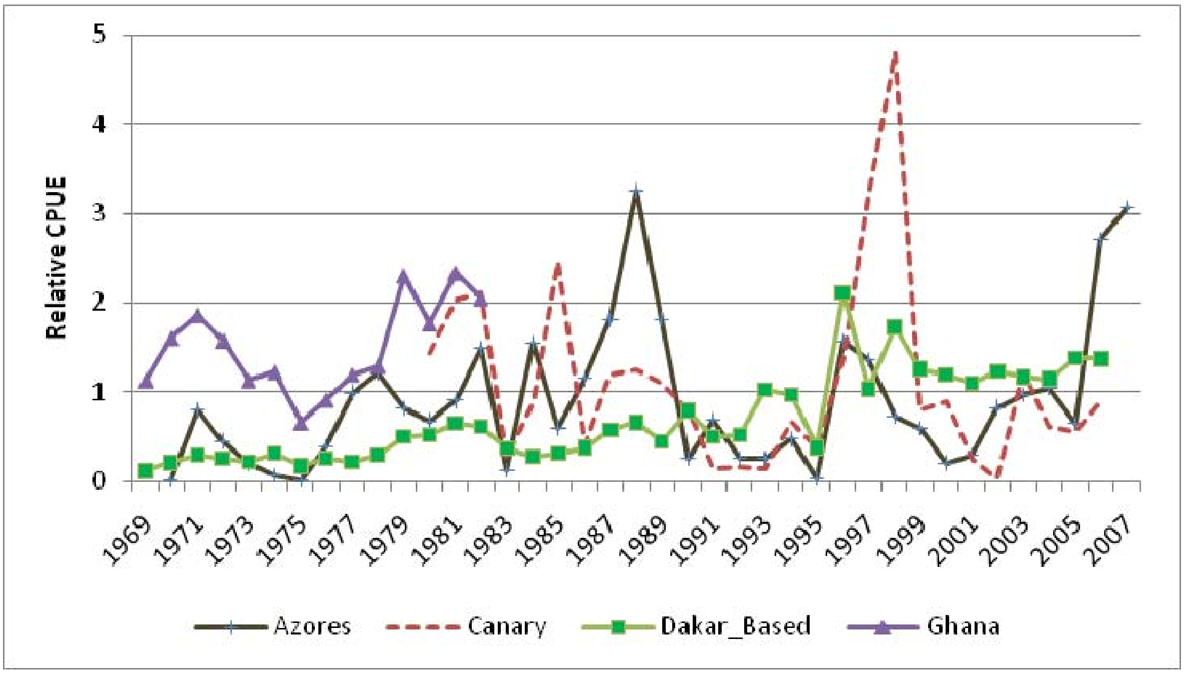
SKJ-Figure 11. Distribution of tagged and released SKJ (left panel) and apparent movements from geographic positions of recaptured fish (right panel).



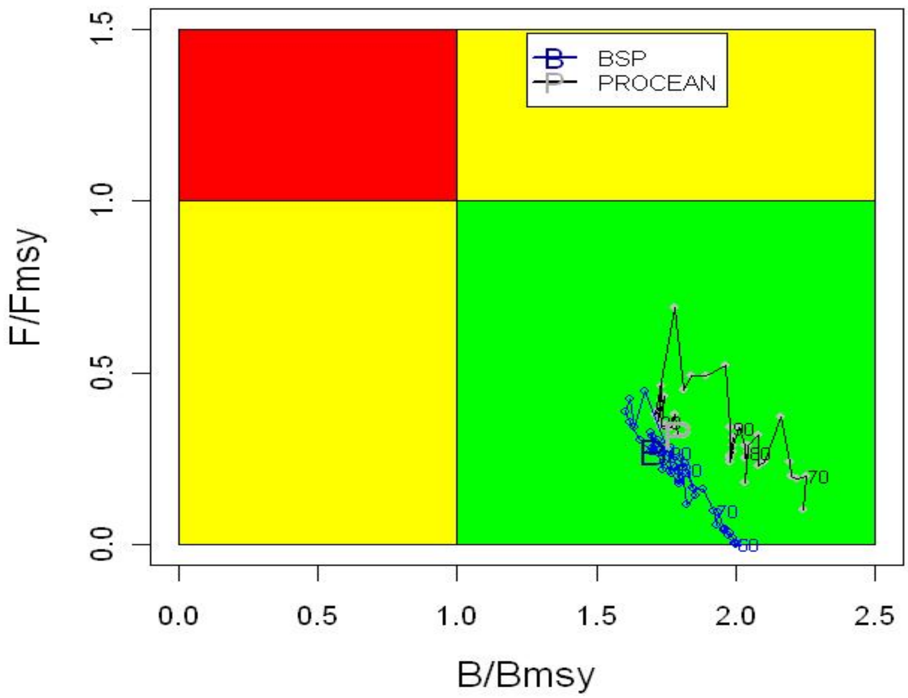
SKJ-Figure 12. Standardized skipjack CPUE for EU purse seiners in the eastern Atlantic Ocean. Free = free school off Senegal; FAD = schools associated with fish aggregating devices in the equatorial areas.



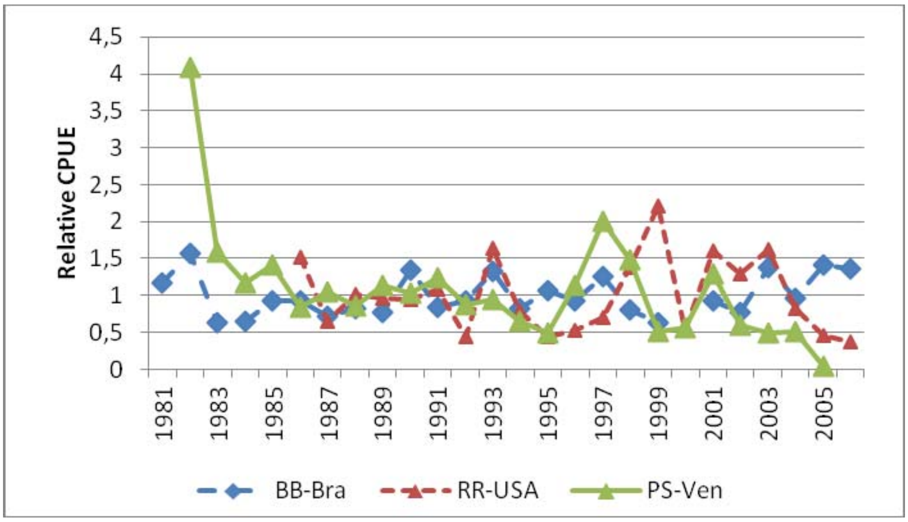
SKJ-Figure 13. Changes in nominal CPUE for the European purse seiners in the eastern Atlantic (1970-2011). Free = free schools (t/f. day) off Senegal; FADs = schools associated with fish aggregating devices (t /successful set) in the equatorial area.



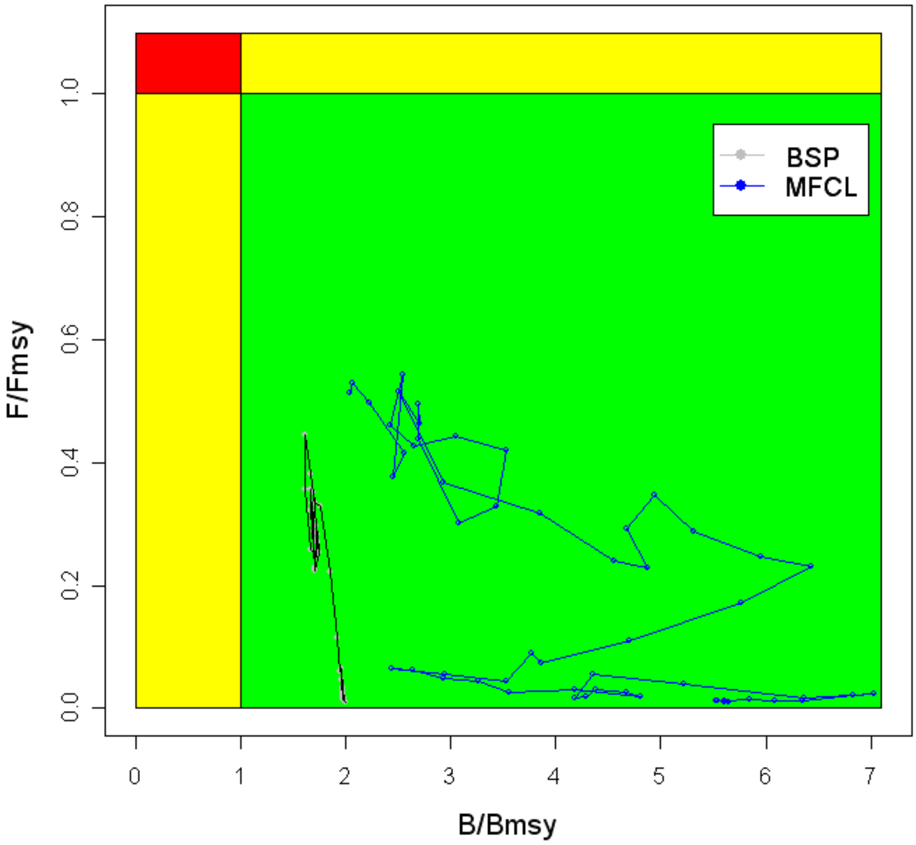
SKJ-Figure 14. Standardized CPUE for the main baitboat fleets operating in the eastern Atlantic Ocean: Azores, Canary islands (non standardized), Dakar and Ghana-based baitboats.



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. 2010c).

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 (Anon. 2012b).

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 some 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 in the Atlantic 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 fishery 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 2011 was 19,995 t, and the catch in the last three years has remained below 20,000 t, the lowest recorded in the time series since 1950.

During the last five years, the surface fisheries contributed to approximately 85% of the total catch **(ALB-Table 1)**. The reported catch in 2011 for EU-Spain was below the average of the last five years, while EU-Ireland reported catch was significantly higher than recent years. The reported catch for EU-France was similar to the average of the last five years.

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.

Longline catch contributed to approximately 15% of the total catch during the last five years. During the last decades, both Chinese Taipei and Japan have reduced their fishing effort directed to albacore. In the case of Japan, albacore is taken mainly as bycatch. Still, the catch reported in 2011 for these two fleets was similar to the average for the last five years. 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 2011 were 24,078 t, higher than the last five year average. The Chinese Taipei catch in 2011 was slightly above the last five year average. However, the Chinese Taipei catch in the last years has decreased compared to historical catches, 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. The 2011 catch for Brazil is much higher than catches in the recent past. However, albacore is only caught as by-catch in Brazilian tropical tuna-directed longline and baitboat fisheries. The significantly higher 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 2011, the estimated South African catch (mainly baitboat), was below the average of the last five years. On the contrary, the Namibian total reported catch was well above the last five years average. Japan takes albacore as by-catch using longline gear. However, catches during the last four years double those in the last few decades. This increase 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 2011, the reported landings were 4,660 t, similar to those in the last decade. (**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, with 69% of the catch during the last 10 years. In 2011 the Italian catch was slightly lower than the last five year average.

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 (**ALB-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 last 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 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, to the distinct catch levels projected, depending on the scenario. Projections showed that harvesting at the 2011 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. Effect of current regulations

North Atlantic

In 2011, the Commission established a TAC for 2012 and 2013 of 28,000 t [Rec. 11-04], 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 2007, the reported catches were below the recommended TACs **(ALB-Table 1)**.

South Atlantic

In 2011 the Commission established a new TAC of 24,000 t for 2012 and 2013 [Rec. 11-05]. The Committee noted that, since 2004, reported catches remained below this recommended TAC, except in 2006 and 2011 were reported catches were slightly above this value **(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 2012 and 2013 [Rec. 11-04].

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 2011 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 the current TAC (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 (2011) Yield	19,995 t	24,078 t	4,660 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 number of vessels to 1993-1995 average. [Rec. 11-04] TAC of 28,000 t for 2012 and 2013.	[Rec. 11-05]: TAC of 24,000 t for 2012 and 2013	None

[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}.

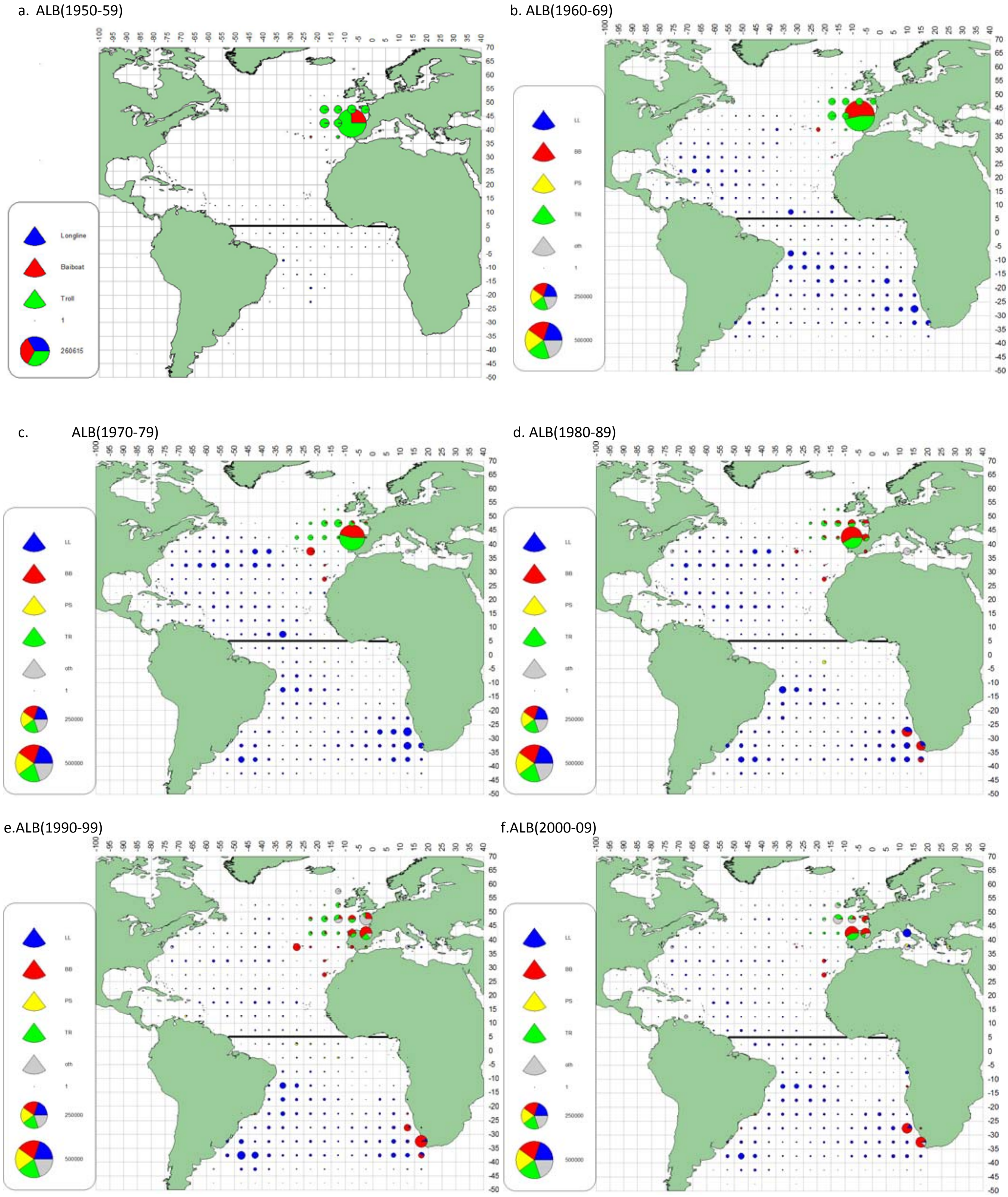
ALB-Table 1. Estimated catches (t) of albacore (*Thunnus alalunga*) by area, gear and flag.

			1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
TOTAL			82741	67295	63342	67491	56326	69615	73086	71812	67517	60379	59585	59039	67058	70088	69915	60094	61462	53378	57728	67389	48827	42310	42235	40637	48733
	ATN		38115	33059	32071	36881	27931	30851	38135	35163	38377	28803	29023	25746	34551	33124	26253	22741	25567	25960	35318	36989	21991	20483	15381	19647	19995
	ATS		40630	30173	27212	28714	26016	36562	32813	35300	27552	28426	28022	30595	27656	31387	38796	31746	28002	22543	18881	24453	20269	18857	22833	18866	24078
	MED		3996	4063	4060	1896	2379	2202	2138	1349	1587	3150	2541	2698	4851	5577	4866	5608	7893	4874	3529	5947	6566	2970	4021	2124	4660
Landings	ATN	Bait boat	18756	15933	15374	18624	8968	12436	15646	11967	16411	11338	9821	7562	8780	11072	6103	6638	7840	8128	10458	14273	8496	7931	4994	6026	5530
		Longline	7296	3013	2239	2683	5315	3152	7093	7309	4859	4641	4051	4035	6710	7321	7372	6180	7699	6917	6911	5223	3237	2647	2625	4026	3620
		Other surf.	343	994	1652	3865	3999	5173	7279	7506	3555	3337	4378	6846	6817	5971	2828	422	551	697	624	625	525	274	427	324	411
		Purse seine	1	97	12	1	222	139	229	292	278	263	26	91	56	191	264	118	211	348	99	188	198	70	84	99	5
		Trawl	262	1693	2240	1033	469	2603	1779	2131	3049	2571	2877	1318	5343	3547	5374	5376	3846	2369	7001	6385	3429	4321	2811	2026	6852
		Troll	11457	11329	10554	10675	8959	7348	6109	5959	10226	6652	7870	5894	6845	5023	4312	4007	5419	7501	10224	10296	6105	5239	4440	7146	3576
	ATS	Bait boat	8181	7696	7393	5981	3454	6490	7379	8947	7091	6960	8110	10353	6709	6873	10355	9712	6973	7475	5084	5876	3374	4346	9777	5271	7206
		Longline	30964	21894	19407	21590	22008	27162	23947	24806	20040	21000	19547	19799	20640	24398	28039	21671	20626	14735	12977	17740	15087	13218	12695	13358	16450
		Other surf.	537	398	411	1139	137	393	39	483	10	209	127	0	73	58	377	323	82	299	288	395	1762	1219	211	122	270
		Purse seine	948	185	0	4	416	2517	1448	1064	412	257	117	434	183	58	25	39	309	16	533	441	45	75	150	114	153
		Trawl	0	0	0	0	0	0	0	0	0	0	120	9	52	0	0	0	12	18	0	0	0	0	0	0	
	MED	Bait boat	0	0	0	83	499	171	231	81	163	205	0	33	96	88	77	29	0	0	0	0	0	0	0	0	
		Longline	164	168	165	624	524	442	410	350	87	391	348	194	417	2800	2597	3706	4248	2345	2012	3010	4119	2695	1580	1719	2356
		Other surf.	3782	3879	3879	1098	1198	1533	879	766	1031	2435	1991	2426	4265	2689	2193	1755	3166	2176	1200	134	1401	250	2414	404	2245
		Purse seine	50	16	16	91	110	6	559	23	0	0	0	0	0	0	0	1	478	353	317	2803	1046	24	25	0	34
		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	0	0	0	0	48	50	59	129	306	119	202	45	73	0	0	117	0	0	0	0	0	0	1	1	
Discards	ATS	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
	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	0	25
Landings	ATN	Barbados	0	0	0	0	0	0	0	0	0	0	1	1	1	0	2	5	8	10	13	9	7	7	4	6	4
		Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	26	39	416	351
		Brasil	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	21	47	22	6	5	1	9	32	12	24	31	23	38	122	51	113	56	27	52	27	25	33	11	14	28
		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	5
		China P.R.	0	0	0	0	0	0	0	14	8	20	0	0	21	16	57	196	155	32	112	202	59	24	27	142	101
		Chinese Taipei	6636	2117	1294	3005	4318	2209	6300	6409	3977	3905	3330	3098	5785	5299	4399	4330	4557	4278	2540	2357	1297	1107	863	1587	1367
		Cuba	15	4	1	2	0	0	0	0	0	0	0	0	0	0	0	1	322	435	424	527	0	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	25	53	
		Dominican Republic	0	0	0	0	0	0	0	0	0	0	323	121	73	95	0	0	0	0	0	0	0	0	0	0	
		EU.España	28206	26738	25424	25792	17233	18175	18380	16998	20197	16324	17295	13285	15363	16000	9177	8952	12530	15379	20447	24538	14582	12725	9617	12989	8357
		EU.France	1921	2805	4050	3625	4123	6924	6293	5934	5304	4694	4618	3711	6888	5718	6006	4345	3456	2448	7266	6585	3179	3009	1122	1298	3348
		EU.Ireland	0	0	0	40	60	451	1946	2534	918	874	1913	3750	4858	3464	2093	1100	755	175	306	521	596	1517	1997	788	3597
		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	6
		EU.Portugal	433	184	169	3185	709	1638	3385	974	6470	1634	395	91	324	278	1175	1953	553	513	556	119	184	614	108	202	1046
		EU.United Kingdom	0	0	0	0	0	59	499	613	196	49	33	117	343	15	0	0	0	0	6	19	30	50	67	118	57
		FR.St Pierre et Miquelon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	7	2	0	3	0	0	0	**0**
		Grenada	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	494	723	764	737	691	466	485	505	386	466	414	446	425	688	1126	711	680	893	1336	781	288	402	288	525	494
		Korea Rep.	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	55	81	120	178	98	96	99	130	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	
		NEI (Flag related)	0	0	0	0	11	19	13	10	8	11	3	8	12	0	0	0	0	0	0	0	0	0	0	0	
		Panama	44	0	0	0	0	29	60	117	73	11	5	0	0	0	0	0	0	0	0	96	298	113	51	154	**0**
		Philippines	0	0	0	0	0	0	0	0	0	0	0	151	4	0	0	0	0	0	9	0	8	19	54	22	9
		Sierra Leone	0	0	10	0	0	0	0	0	0	0	0	0	0	0	91	0	0	0	0	0	0	0	0	0	
		St. Vincent and Grenadines	0	0	0	0	0	0	2	0	0	0	0	0	1	704	1370	300	1555	89	802	76	263	130	135	177	329
		Sta. Lucia	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	4	0	247	0	0	0	0	2	1	1	2	11	9	12	12	9	12	18	32	17	17	

		U.S.A.	301	288	243	357	479	438	509	741	545	472	577	829	315	406	322	480	444	646	488	400	532	257	189	315	449
		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	0	0	0	0	0	0	0	0	0	0	1	0	2	2	2	0	0	1	1	0	0	0	0	0	1
		Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	414	507	235	95	20	140	187	196
		Venezuela	26	137	41	94	302	193	246	282	279	315	75	107	91	299	348	162	346	457	175	321	375	222	398	288	247
	ATS	Argentina	469	344	354	151	60	306	0	2	0	0	120	9	52	0	0	0	12	18	0	0	0	0	0	0	
		Belize	0	0	0	0	0	0	0	0	2	0	0	0	8	2	0	0	0	0	0	54	32	31	213	303	365
		Brasil	395	421	435	514	1113	2710	3613	1227	923	819	652	3418	1872	4411	6862	3228	2647	522	556	361	535	487	202	271	1269
		Cambodia	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	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	5	0	
		China P.R.	0	0	0	0	0	0	0	0	0	0	0	0	39	89	26	30	26	112	95	100	35	25	89	97	80
		Chinese Taipei	28790	20746	18386	21369	19883	23063	19400	22573	18351	18956	18165	16106	17377	17221	15833	17321	17351	13288	10730	12293	13146	9966	8678	10975	13032
		Cuba	10	2	1	2	17	5	3	0	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	9	192	0	2	0	0	0	0	0	0	0	0	21	4	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	47	43	
		EU.España	807	185	0	0	280	1943	783	831	457	184	256	193	1027	288	573	836	376	81	285	367	758	933	1061	266	313
		EU.France	100	0	0	0	50	449	564	129	82	190	38	40	13	23	11	18	63	16	478	347	12	50	60	109	53
		EU.Portugal	899	1153	557	732	81	184	483	1185	655	494	256	124	232	486	41	433	415	9	43	8	13	49	254	84	44
		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	1	0	
		Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0	0	0	0	
		Honduras	0	0	0	0	0	29	0	0	2	0	7	1	6	0	0	0	0	0	0	0	0	0	0	0	
		Japan	357	405	450	587	654	583	467	651	389	435	424	418	601	554	341	231	322	509	312	316	238	1370	921	973	1194
		Korea Rep.	383	180	54	19	31	5	20	3	3	18	4	7	14	18	1	0	5	37	42	66	56	88	374	39	130
		Maroc	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	4	8	122	68	55	63	41	5	27	0	0	10	14	53	0	15	46	15	0	0	0	
		NEI (Flag related)	0	0	0	0	149	262	146	123	102	169	47	42	38	0	0	0	0	0	0	0	0	0	0	0	
		Namibia	0	0	0	0	0	0	0	1111	950	982	1199	1429	1162	2418	3419	2962	3152	3328	2344	5100	1196	1958	4936	1320	3791
		Panama	924	0	0	0	240	482	318	458	228	380	53	60	14	0	0	0	0	0	17	0	87	5	0	1	**0**
		Philippines	0	0	0	0	0	0	0	0	0	0	0	5	4	0	0	0	0	0	52	0	13	79	45	73	87
		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	7275	6636	6890	5280	3410	6360	6881	6931	5214	5634	6708	8412	5101	3610	7236	6507	3469	4502	3198	3735	3797	3468	5043	4147	3380
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	2116	4292	44	0	0	0	65	160	71	51	31	94
		U.S.A.	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	
		UK.Sta Helena	2	1	1	1	5	28	38	5	82	47	18	1	1	58	12	2	0	0	0	62	46	94	81	3	120
		Uruguay	178	100	83	55	34	31	28	16	49	75	56	110	90	90	135	111	108	120	32	93	34	53	685	24	37
		Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	684	1400	96	131	64	104	85
	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	2	7
		EU.Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	12	30	255	425	507	712	209	223	206	222
		EU.España	3	3	0	84	548	227	298	218	475	429	380	126	284	152	200	209	1	138	189	382	516	238	204	277	343
		EU.France	60	31	31	121	140	11	64	23	3	0	5	5	0	0	0	1	0	0	0	0	2	1	0	1	2
		EU.Greece	500	500	500	500	500	500	1	1	0	952	741	1152	2005	1786	1840	1352	950	773	623	402	448	191	116	125	165
		EU.Italy	3433	3529	3529	1191	1191	1464	1275	1107	1109	1769	1414	1414	2561	3630	2826	4032	6912	3671	2248	4584	4017	2104	2724	1109	2494
		EU.Malta	0	0	0	0	0	0	0	0	0	0	1	1	1	4	0	2	0	10	15	0	1	5	1	2	5
		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	
		Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	
		Maroc	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	500	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	19	14	0	0	
		Turkey	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27	30	73	852	208	631	402	1396
		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	
Discards	ATS	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	0
	MED	EU.Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25

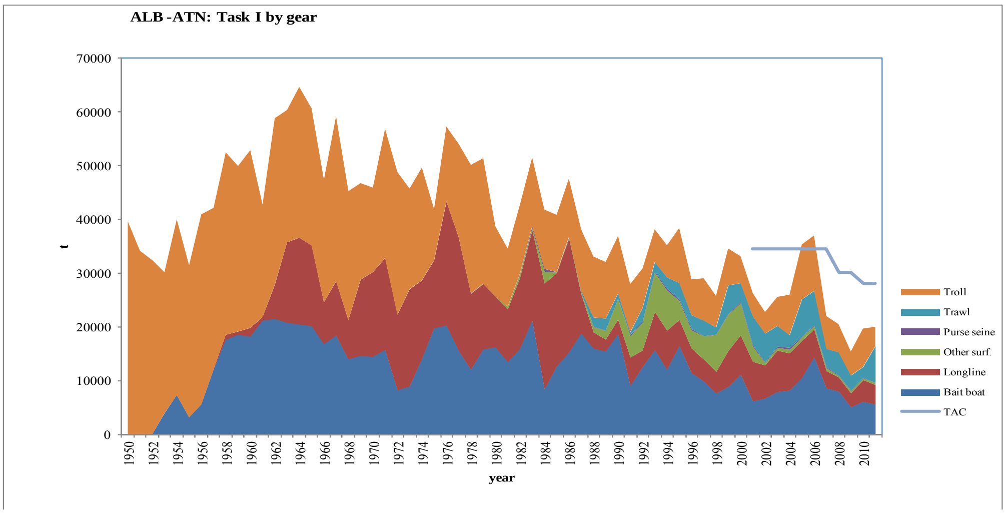
ALB-Table 2. South Atlantic albacore estimated probabilities (in %) that the South Atlantic albacore stock is above B_{MSY} and below F_{MSY} in a specific year for various TAC levels, based on the results of the 2011 assessment.

	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

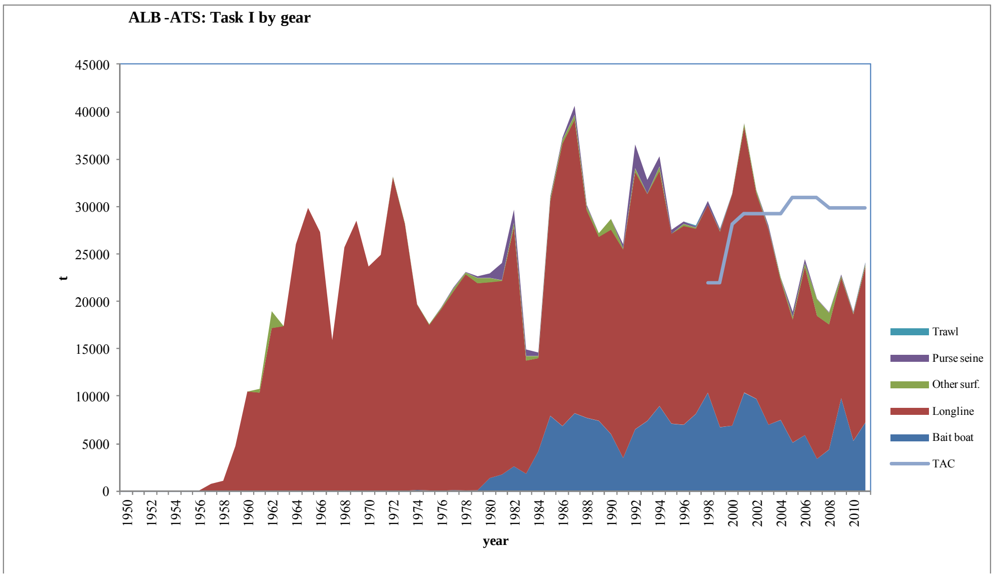


ALB-Figure 1. Geographic distribution of albacore accumulated catch by major gears and decade (1950-2009). Baitboat and troll catches are aggregated by 5ºx5º degrees in the Bay of Biscay thus the spatial representation of catch is concentrated on this area. (See Figures 2a,b and c for total catch values 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.

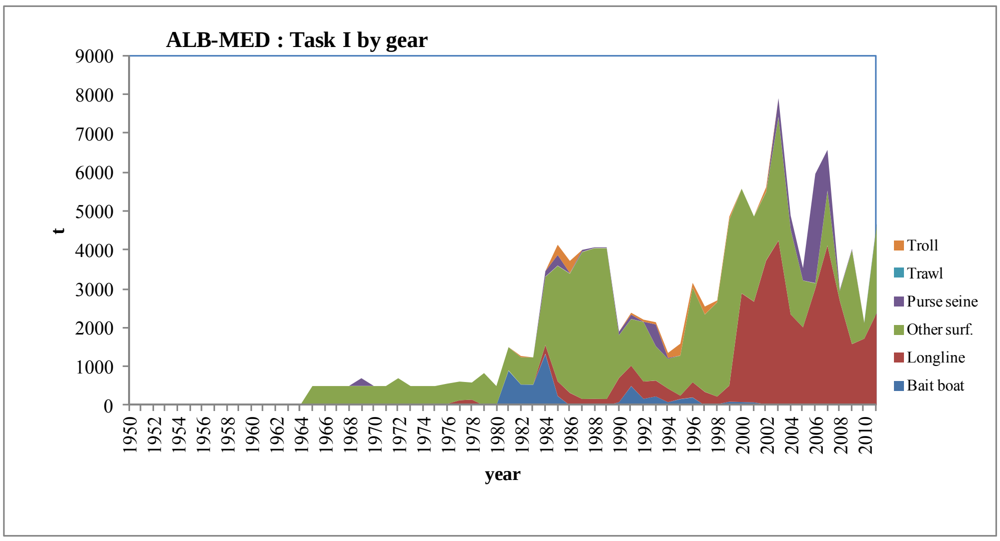
a)



b)

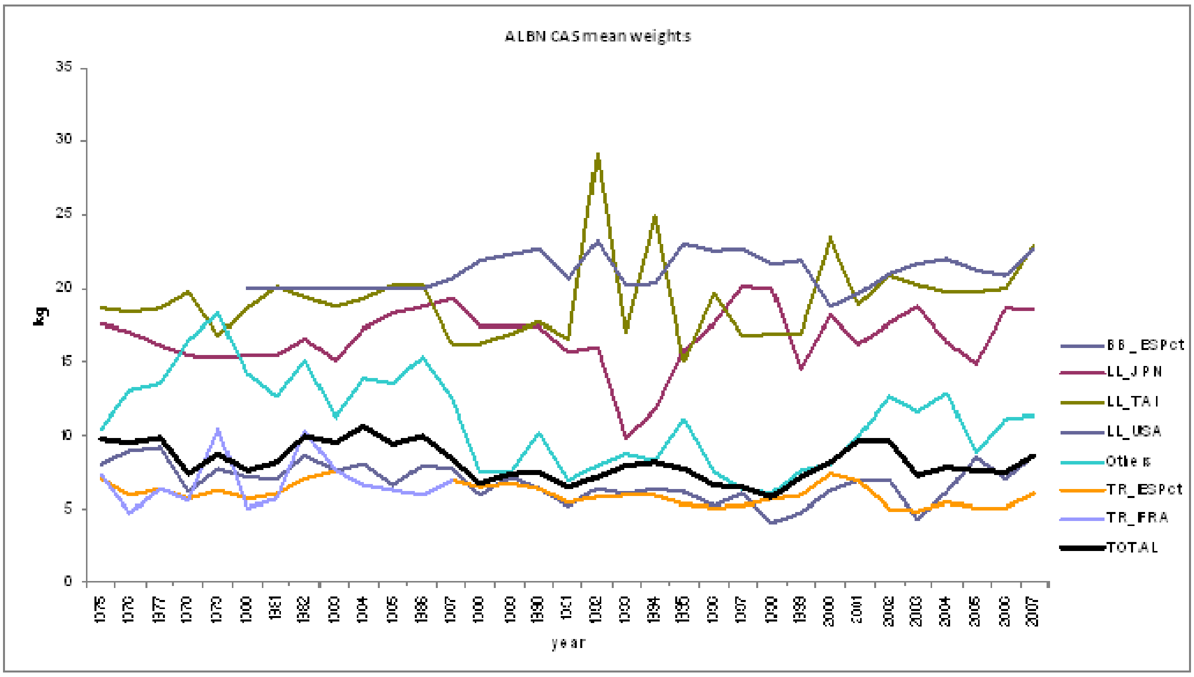


c)

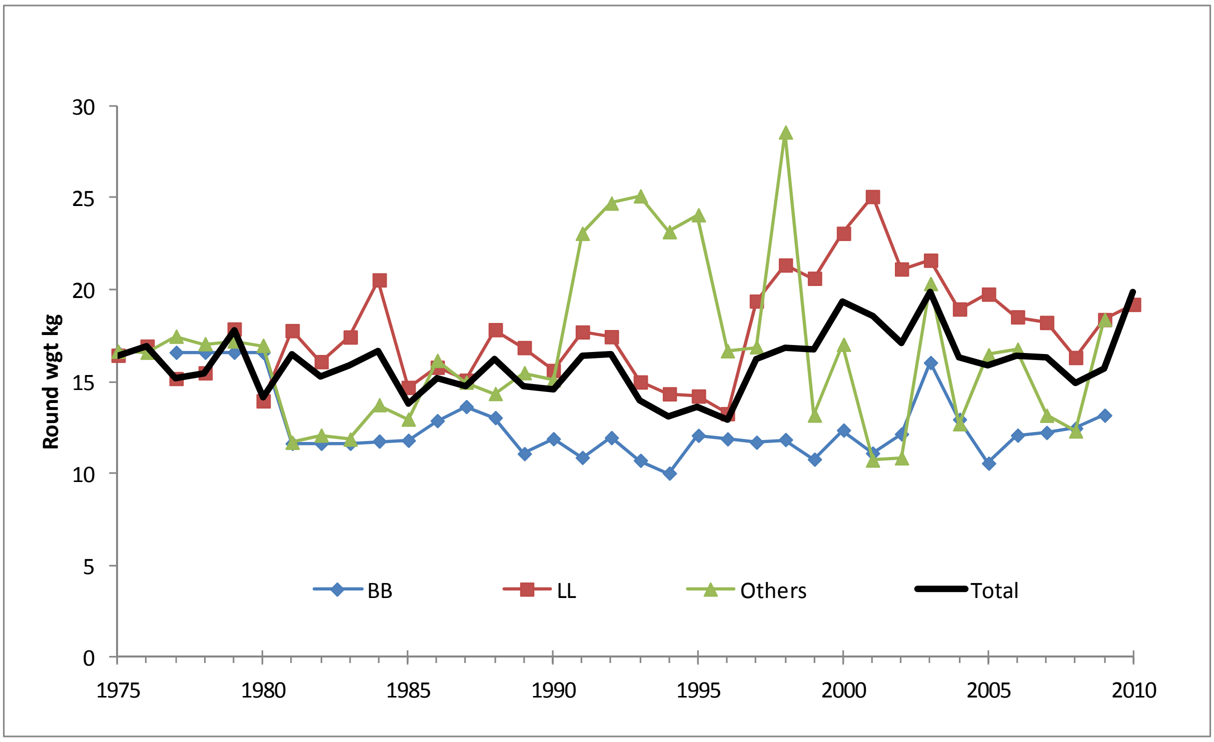


ALB-Figure 2a, b, c. Total albacore catches reported to ICCAT (Task I) by gear for the northern, southern Atlantic stocks including TAC, and the Mediterranean stock.

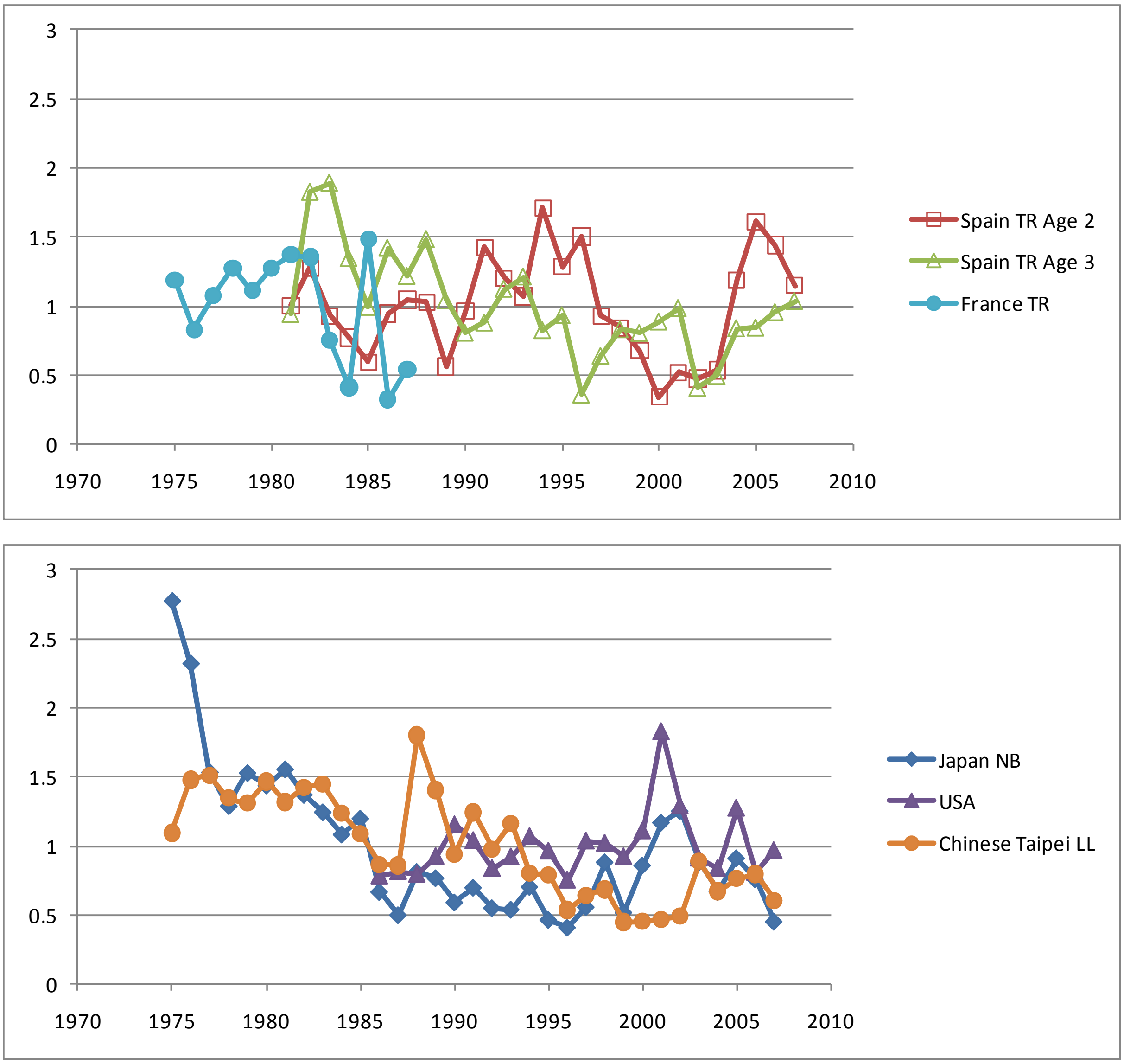
a)



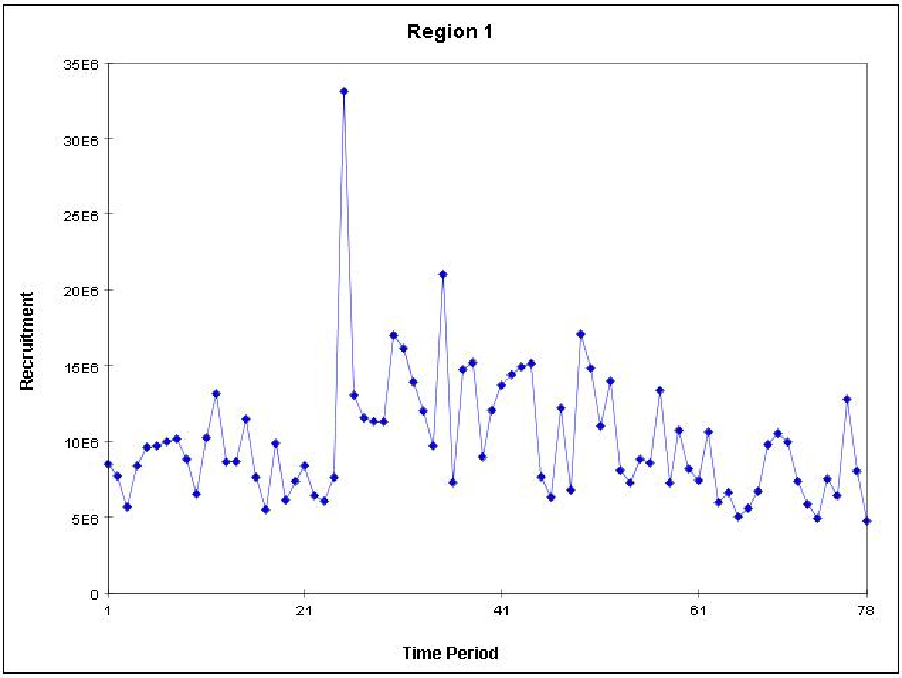
b)

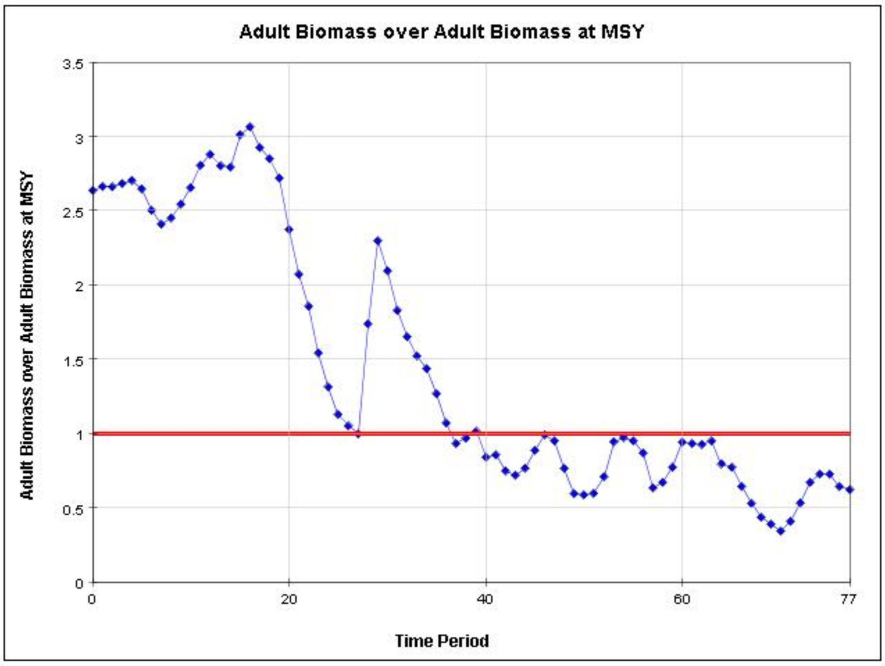


ALB-Figure 3a, b. North Atlantic and South Atlantic albacore. Mean weight trend by surface and longline fisheries in North Atlantic (a) and South Atlantic (b) stocks.

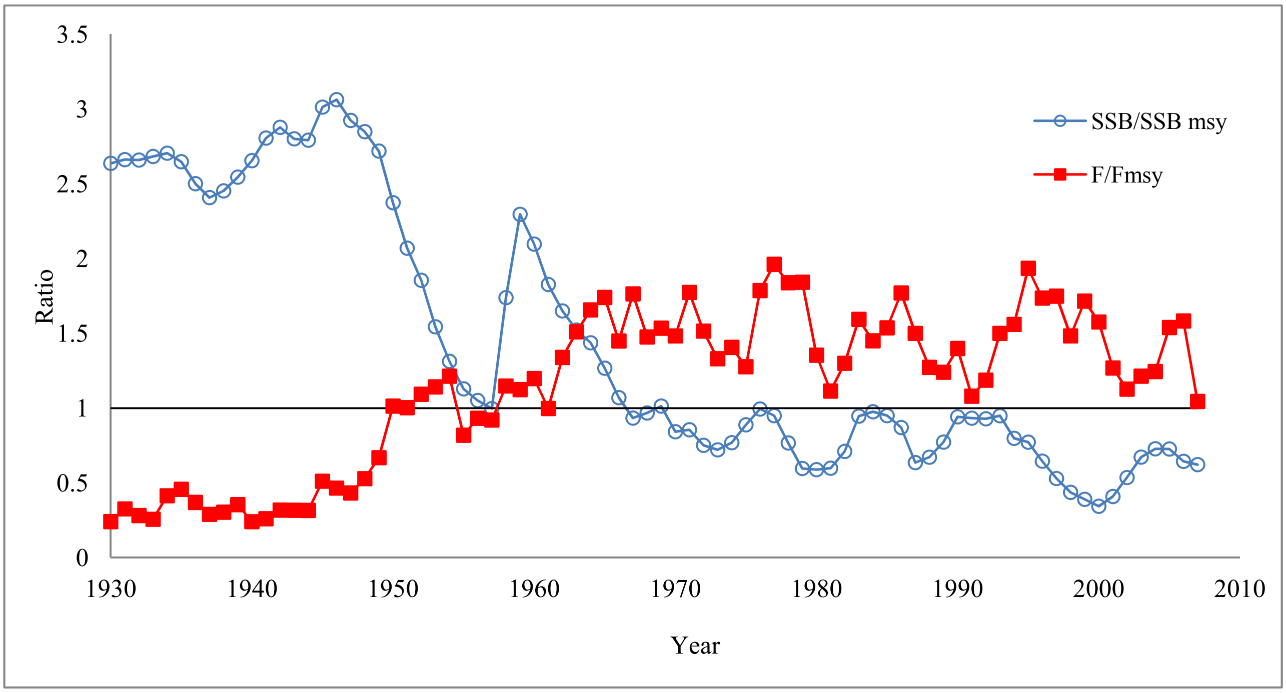


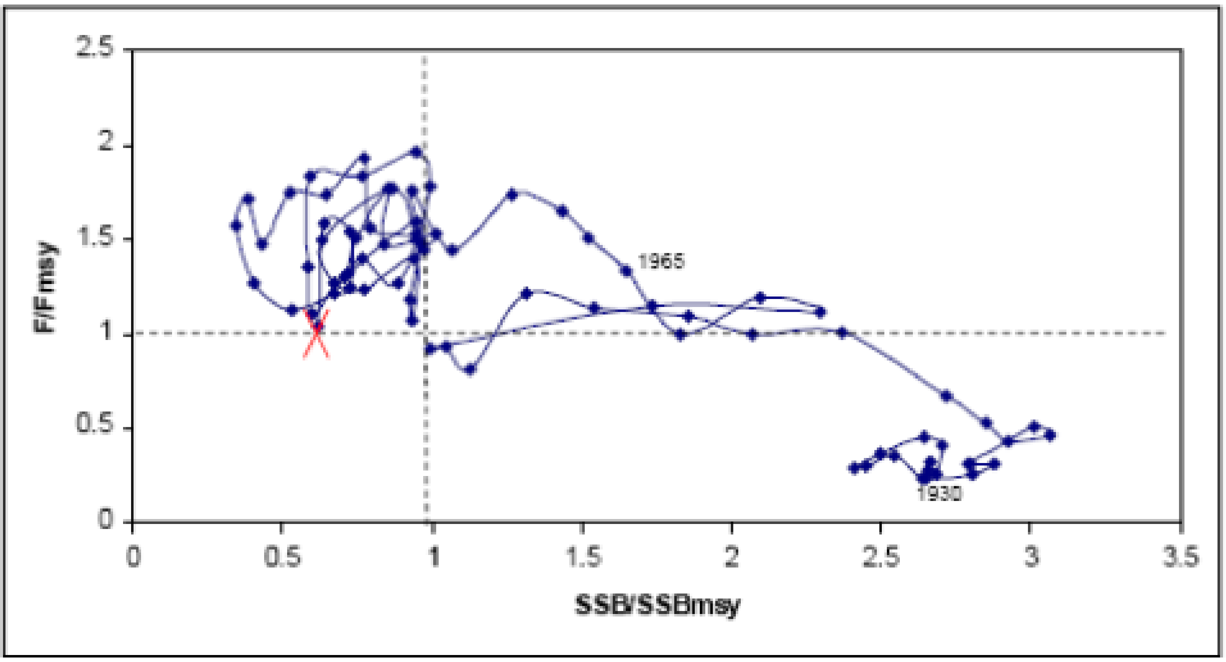
ALB-Figure 4. Standardized catch rate indices used in the 2009 northern albacore stock assessment from the surface fisheries (upper panel), which take mostly juvenile fish, and from the longline fisheries (lower panel), which take mostly adult fish.



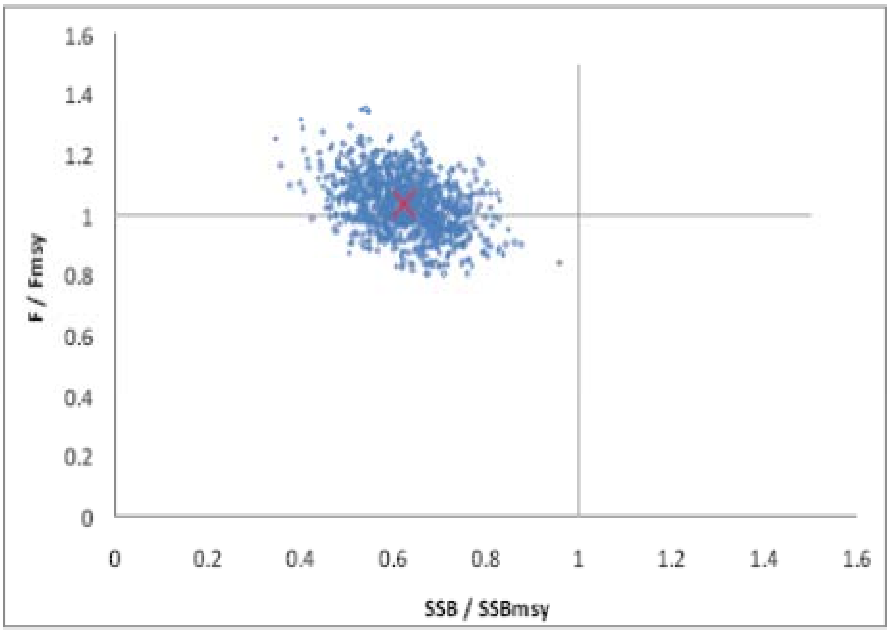


ALB-Figure 5. Estimates of northern Atlantic albacore recruitment (age 1) and spawning stock size from 1930-2007 from Multifan-CL model assessment. Uncertainty in the estimates has not been characterized, but the uncertainty in recent recruitment levels is considered to be higher than in the past.

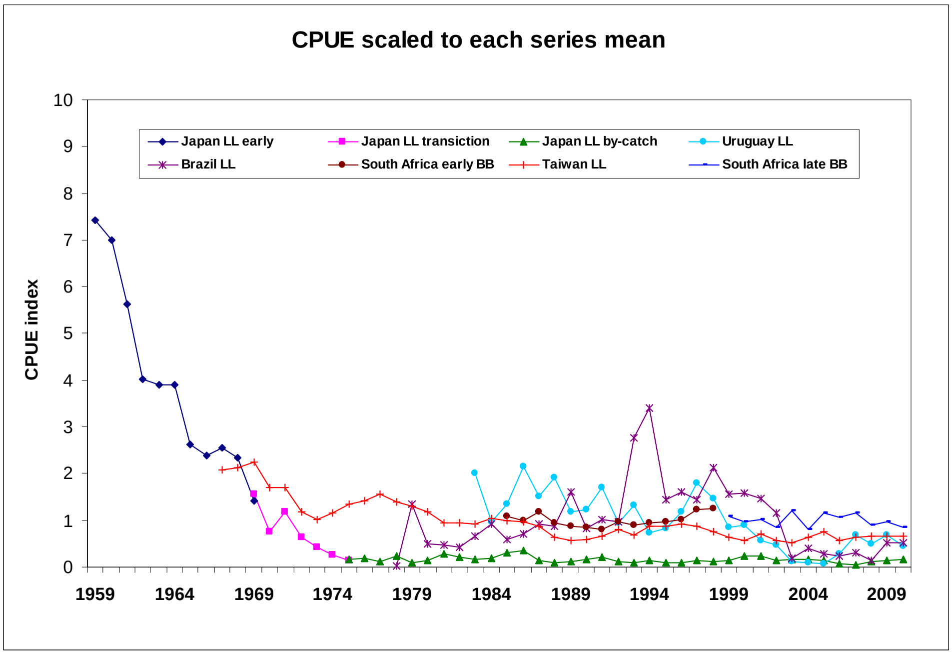




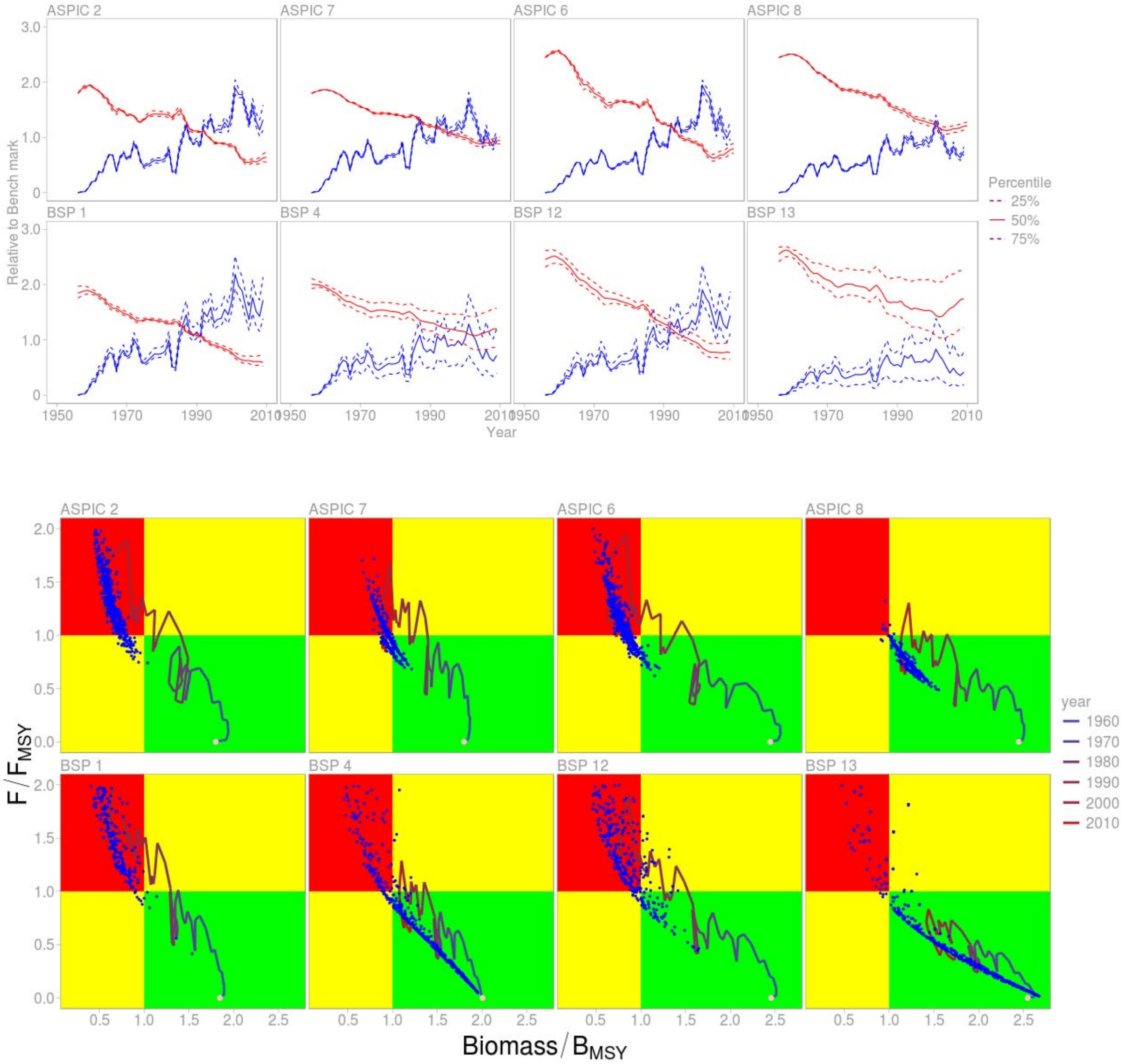
ALB-Figure 6. Stock status of northern albacore, estimated with Multifan-CL. Top: Relative biomass (SSB/SSB_{MSY}) and relative fishing mortality (F/F_{MSY}) trajectories over time. Bottom: joint trajectories of SSB/SSB_{MSY} and F/F_{MSY}. The red X cross in the lower panel represents the stock status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



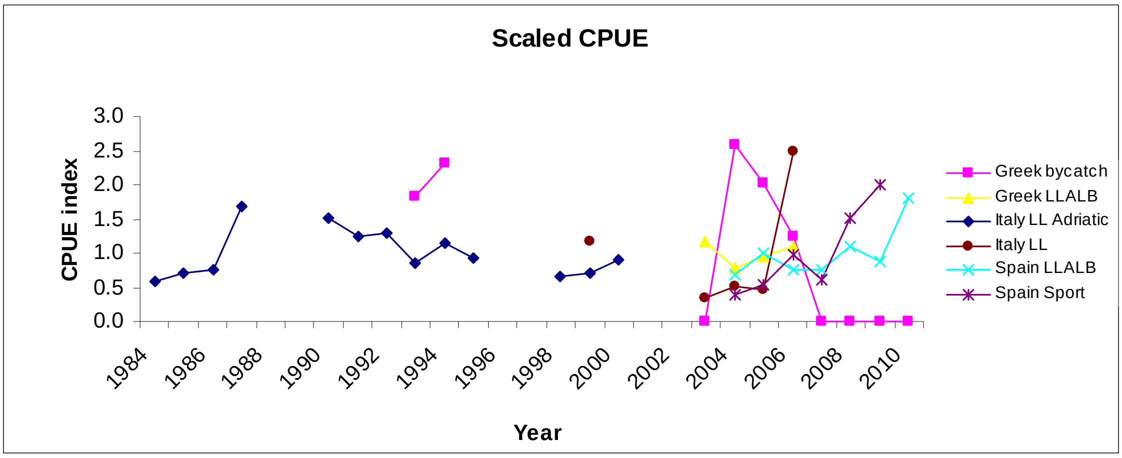
ALB-Figure 7. Uncertainty in current stock status for northern albacore, as estimated from the Multifan base case model. The X represents the current (2007) estimates of fishing mortality and spawning biomass ratios, and the scatter of points depicts uncertainty in that estimate.



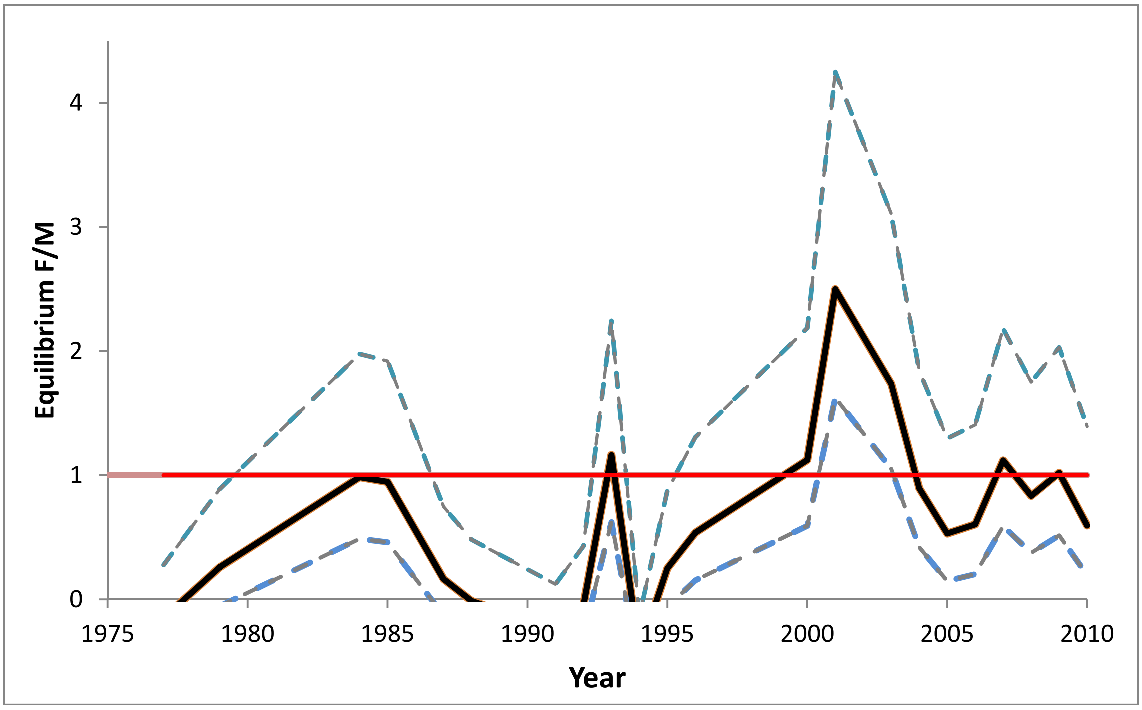
ALB-Figure 8. Standardized catch rates indices used in the 2011 southern albacore stock assessment from the longline fisheries, which take mostly mature fish, and from the surface fisheries (South African baitboat), which take mostly juvenile fish.



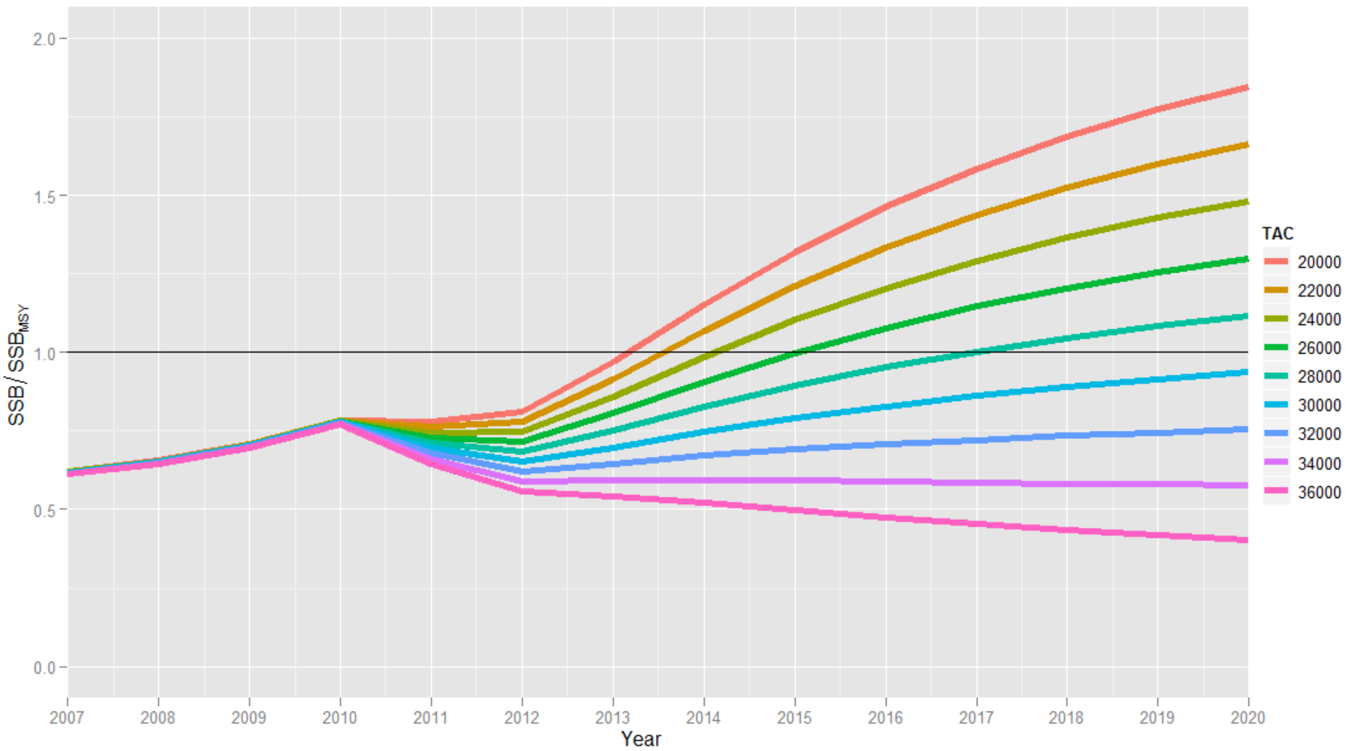
ALB-Figure 9. South Atlantic albacore. Upper panel: Median biomass and fishing mortality rates relative to MSY levels, with 50% credibility intervals, from the 4 base case Bayesian Surplus Production (BSP) models and the point estimate biomass and 50% credibility intervals for the 4 base case ASPIC Production 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).



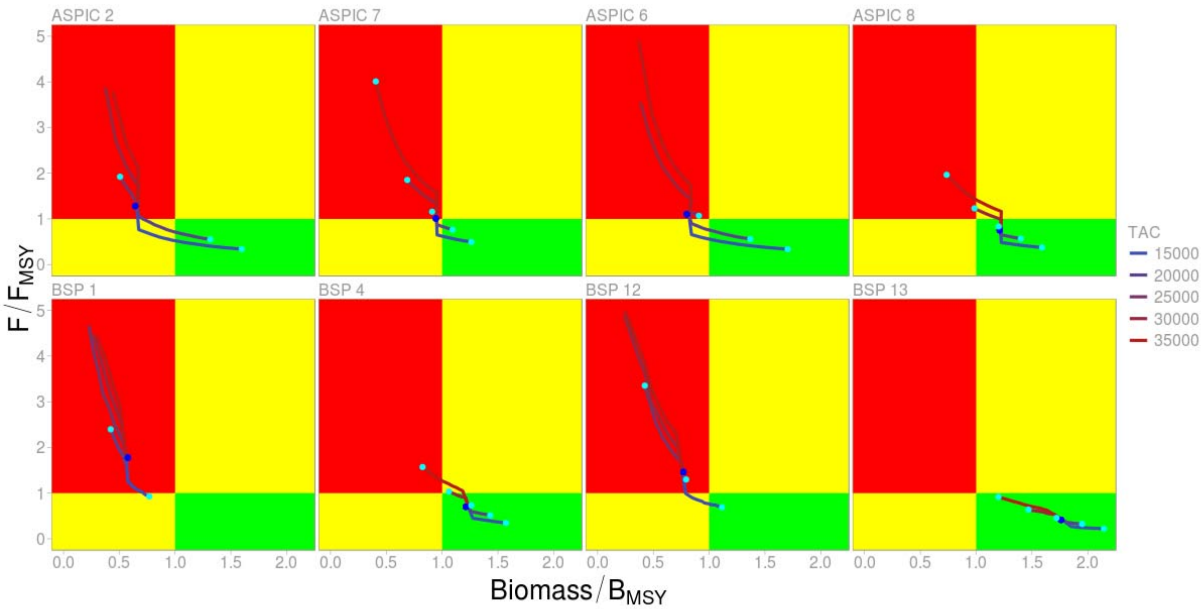
ALB-Figure 10. Set of standardized and nominal CPUEs used in the assessment of the Mediterranean albacore stock. The "Greek by-catch" indicates the probability of albacore by-catch in the swordfish fishery, practically null in some years. This series is the only one that is not included in the base case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

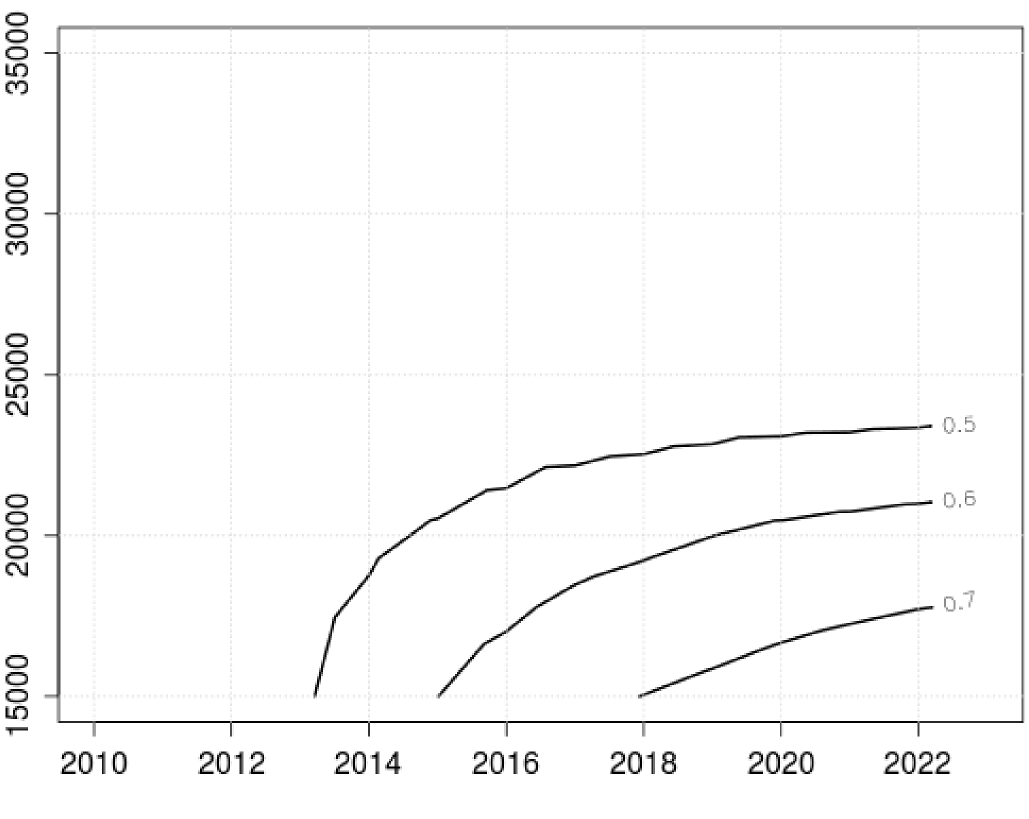


ALB-Figure 11. Mediterranean albacore. Estimates of equilibrium fishing mortality rate relative to M (as a proxy for $F_{MSY)}$ based on length-converted catch curve analysis. The central solid line represents an M assumption of 0.3 with patterns resulting from an assumed M of 0.4 (lower dashed) and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



ALB-Figure 12. 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

In 2012, the SCRS conducted an update of the 2010 assessment of Atlantic bluefin tuna (Anon. 2011f). In this update, the available data included catch, effort and size statistics through 2011. As previously discussed, there are considerable data limitations for the eastern stock up to 2007. While catch data reporting for the eastern and Mediterranean fisheries has substantially improved since 2008 and some historical statistical data have been recovered, none-the-less, 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 SCRS strongly recommends the continuation of enhanced data collection program and the replacement of current assessment methods with appropriate approaches that take unquantified uncertainties into account.

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 system or acoustic coupled with video system have been presented at the SCRS since 2010. The results are encouraging and could already provide catch composition of greater precision than this of current Mediterranean fleets Task II data. The SCRS strongly encourages the CPCs to make the stereoscopic camera systems or any alternative technique that would provide equivalent precision to recover size information from farms operational for the coming year.

The Atlantic-wide Research Program for 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, particularly with respect to obtain fisheries-independent indices of stock size, 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 2012, the SCRS also reviewed new information on the biology, spatial dynamics, catch statistics and fisheries catch rates. The SCRS also discussed progress made by the GBYP and other research program about the aerial survey, tagging, data mining, biological sampling, stock mixing and new modeling approaches. The new information is summarized in SCRS/2012/139.

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. 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, the SCRS assumes that eastern Atlantic and Mediterranean bluefin tuna mature at approximately 25 kg (age 4) and western Atlantic bluefin tuna at approximately 145 kg (age 9). Recent information received by the SCRS indicated that some individuals caught in the West Atlantic as small as 47 kg (age 5) were mature. 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 Committee received new information on stock structure derived from otolith microchemistry, but the potential conclusions were still limited by sample size considerations. It is anticipated that with the expanded biological sample collections now being undertaken by CPCs and through the GBYP, more information on stock structure will be forthcoming in coming years. One current study that had more complete information examined natal origin of bluefin tuna caught in Bay of Biscay in 2009 to 2011, and concluded that a large fraction (95-100%) of the catch originated in the Mediterranean. The Committee also considered the evidence of the recent strong 2003 year class in both the eastern and western fisheries. In the west, otolith microchemistry results suggest that the natal origin of the 2003 year-class in recent U.S. catches is about equal proportions of eastern and western individuals. It is unclear, however, how strong the western 2003 year-class is, because of recent changes in location of Japanese fishing and stock mixing.

Substantial progress has been achieved by the GBYP “Biological Sampling and Analysis” program in relation to stock structure (genetics and microconstituents) and direct age estimations.

Important electronic and conventional tagging contributions from national programs, NGOs, industry and the GBYP were presented, and these ongoing efforts are expected to provide significant insight into bluefin tuna stock structure, mixing and migrations in the Convention area.

The Committee recognized that there have been important recent contributions to the understanding of bluefin tuna biology and ecology that should have significant impacts on the assessment (and possibly on the management) of the resource. The new information includes conversion factors, maturity, growth, migrations and stock structure. This new information needs to be evaluated in detail, prior to incorporation in the current stock assessment models. To accomplish this objective, the Committee suggested convening an intersessional meeting on bluefin tuna biology and ecology in 2013.

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 **(BFTE-Figure 1)**. Both the increase and the subsequent decrease in declared production occurred mainly for the Mediterranean **(BFTE-Figure 1)**. Since 2008, there was a significant decrease in the reported catch following more restrictive TACs. Declared catch was, at the time of the meeting, 23,849 t, 19,751 t, 11,328 t and 9,779 t for the East Atlantic and Mediterranean, of which 16,205 t, 13,066 t, 6,949 t and 5,790 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 a major cause of stock decline. 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 the 2010 ICCAT Data Preparatory Meeting on Bluefin Tuna) (Anon. 2011c). 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. The Committee discussed extensively catch estimates based on trade statistics and concluded that these studies could substantially improve size data and could be used to corroborate reported total catch. However, the methodology developed for the back-calculation needs to be improved and should further integrate information from the BCDs

(Bluefin Catch Document) before to be used by the SCRS (see Bluefin Tuna 2012 Detailed Report) (SCRS/2012/015).

Available indicators from the Bay of Biscay baitboat fisheries (small and medium fish) shows a general increasing trend over the whole time period, with more variable values after the mid 80's, with two peaks in the 90s and one in the mid-2000s (**BFTE-Figure 2**). This CPUE index covers the longest period (1952-2011), during which changes in selectivity took place, especially during the most recent periods because of changes in management regulations.

Indicators from Moroccan and Spanish traps targeting large fish (spawners) showed large fluctuations, with period of high catch rates, as in the early 1980s, late 1990s and late 2000s and periods of lower catch rates, as in the mid-1990s and mid-2000s (**BFTE-Figure 2**).

Indicators from Japanese longliners targeting large fish (spawners) in the East Atlantic (South of 40ºN) and the Mediterranean Sea displayed a recent increase after a general decline since the mid-1970s (**BFTE-Figure 2**). However, this index has not been updated since 2009 because this fleet did not operate in the Mediterranean and rarely in the East Atlantic (South of 40ºN) in recent years. Indicators from Japanese longliners targeting medium to large fish in the northeast Atlantic were available since 1990 and showed an increasing trend in the last 3 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 40ºN) and Mediterranean Sea were strongly reduced. The spatial coverage of the Japanese longliners has strongly contracted in recent years, in response to a lower number of boats and management regulations. This may affect the ability of this index to track changes in bluefin tuna abundance.

All CPUE indices displayed positive trends in recent years. Fisheries-independent information from the aerial surveys performed on the juveniles fish in the northwestern Mediterranean Sea provide similar indications, showing a four-fold increase in juveniles abundance in 2009-2011 compared to 2000-2003. However, this index has a restricted spatial coverage (i.e., the northwestern Mediterranean Sea).

The SCRS recognized that the recent regulatory measures affect significantly the CPUE values (e.g., Spanish baitboat, Moroccan and Spanish traps and Japanese longline indices) through the change of operational pattern, length of the fishing season and target sizes. Recent tendency in the indicators are likely a reflection of positive outcomes from recent management measures. The Committee found it difficult to derive any clearer conclusion without more precise scientific information about the catch composition, effort and spatial distribution of the main Mediterranean fisheries. Fisheries-independent indicators (e.g., aerial and larval surveys) and a large-scale tagging program are needed to provide more reliable stock status indicators.

BFTE-3. State of the stock

In spite of recent improvements in the data quantity and quality for the past few years, there remain important data limitations for the 2012 updated assessment of the stock. These included poor temporal and spatial coverage for detailed size and catch-effort statistics for several fisheries, especially in the Mediterranean. Substantial under-reporting of total catches was also evident between 1998 and 2007. Nevertheless, the Committee updated the 2010 stock assessment as requested by the Commission, applying the same methodologies and hypotheses adopted by the Committee in 2010. 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 so far 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 tuna. This process will require at least three years to complete in terms of robustness testing of the methodologies envisioned.

The updated assessment results indicated that the spawning stock biomass (SSB) peaked over 300,000 tonnes in the late 1950s and early 1970s and then declined to about 150,000 tonnes until the mid-2000s. In the most recent period, the SSB showed clear signs of increase in all the runs that have been investigated by the Committee (see Bluefin Tuna Detailed Report, **BFTE-Figure 3)**. However, the magnitude and the speed of the SSB increase vary considerably among the runs and remain, therefore, highly uncertain. Trends in fishing mortality (F) for the younger ages (ages 2-5) displayed a continuous increase until recent years. Since 2008, F at ages 2-5 decreased sharply to reach the lowest historical values. For oldest fish (ages 10+), F had been decreasing during the first 2 decades and then rapidly increased since the 1980s and finally declined since the late 2000s (**BFTE-Figure 3**). These recent trends in F are consistent with those obtained during the 2010 stock assessment. For the 1995-2007 years, Fs for older fish are also consistent with a shift in targeting towards larger individuals destined for fattening and/or farming. Recent recruitment levels remain uncertain due to limited information about incoming year class strength and uncertainties in the indicators used to track recruitment. The low recent catches of fish less than the minimum size also cause problem in this respect.

Estimates of current stock status relative to MSY benchmarks are highly sensitive to the selectivity pattern (and thus to some technical assumptions in the VPA) and, for the biomass reference point, to the hypotheses about the recruitment levels. Nonetheless, the perception of the stock status derived from the 2012 updated assessment has improved in comparison to previous assessments, as F for both younger and older fish have declined during the recent years. All the runs investigated by the Committee also showed a clear increase of the SSB, but both the speed and magnitude of this upward trend remain highly uncertain, as these strongly depend on model specifications (see detailed report, section 6). F_{2011} appears to clearly be below the reference target $F_{0.1}$ (a reference point used as a proxy for F_{MSY} that is more robust to uncertainties than F_{MAX}) in both catch scenarios: $F_{2011}/F_{0.1}$= 0.7 and 0.36 for the reported and inflated catch scenarios, respectively. If F_{2011} would be consistent with the Convention Objectives, current SSB remained most likely to be under the level expected at $F_{0.1}$: $SSB_{2011}/SSB_{0.1}$= 0.63 and 0.76 for reported and inflated catch scenario when considering medium recruitment. In the reported catch scenario, the median of the SSB is about 37% (high recruitment scenario) to 89% (low recruitment scenario) of the biomass that is expected under a $F_{0.1}$ strategy. In the inflated catch scenario, the median SSB ranges from 37% (high recruitment) to 116% (low recruitment, the only scenario for which current biomass would be above target reference biomass level, **BFTE-Figure 4 and 5)**.

BFTE- 4. Outlook

In 2012, the Committee performed a set of projections using similar technical specifications as in 2010, *i.e.* using three mean recruitment levels and two catch scenarios (reported and inflated) and the current selectivity patterns (computed as the geometric means over the 2009-2011 partial Fs, see SCRS/2012/186 for more details). According to the 2012 VPA results and above specifications, F would remain below $F_{0.1}$ in the 10 coming years with at least 60% of probabilities for all catch levels investigated, 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, with at least 60% of probabilities, is slightly more restrictive (**BFTE-Tables 1 and 2**).

Projections are known to be impaired by various sources of uncertainties that have not yet been fully quantified. Although the situation has improved regarding recent catch, there are still uncertainties about the speed and magnitude of the SSB increase (see the slope of **BFTE-Figure 3**), population structure, migratory rates, key modeling parameters for bluefin tuna productivity and the level of IUU catch (although the Committee believed that the level of IUU has strongly decreased since 2008). These uncertainties are not taken into account in the Kobe matrices. Acknowledging these limitations, the 2012 updated stock assessment confirmed 2010 findings, according to which the rebuilding of eastern bluefin tuna at $SSB_{F0.1}$ level with a probability of at least 60% could be achieved by 2022 with catch close to current TAC (12,900 t) or 2010 TAC (13,500 t, **BFTE-Table 3**). Current estimates indicate that the rebuilding could even be achieved before 2022, or slightly higher TAC may achieve the recovery by 2022. However, as the speed and magnitude of the rebuilding of the SSB remains highly uncertain, this outcome needs to be confirmed by future data and analyses.

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 and 2012 TAC were 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 fishing capacity, 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 (23,849 t), 2009 (19,751 t), 2010 (11,328 t) and 2011 (9,779 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 (**BFT-Table 1, BFTE-Figure 1**). Although care is needed when considering estimates of catch using capacity measures, the Group'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 current capacity 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 five 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 significant increase in the annual mean-weight in the catch-at-size since 2007 (**BFTE-Figure 6**). Additionally, higher abundance or higher concentration of small bluefin tuna in the north-western Mediterranean detected from aerial surveys could also reflect positive outcomes from increase minimum size regulation. Rec. [06.05] also resulted in improved yield-per-recruit levels in comparison to the early 2000s as well as to a greater recruitment to the spawning stock biomass due to higher survival of juvenile fish.

BFTE-6. Management Recommendations

In [Rec. 09-06, 10-04] the Commission established a total allowable catch for eastern Atlantic and Mediterranean bluefin tuna at 13,500 t and 12,900 t in 2010, 2011 and 2012, respectively. 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.

The Kobe matrices are presented in **Tables BFTE 1** to **3** indicating the probabilities of $F<F_{MSY}$, $SSB>SSB_{MSY}$ and $F<F_{MSY}$ and $SSB>SSB_{MSY}$ for quotas from 0 to 30,000 t for 2013 through 2022. Shading corresponds to the probabilities of being in the ranges of 50-59%, 60- 69%, 70-79%, 80-89% and greater or equal to 90%.

The implementation of recent regulations through [Recs. 10-04, 09-06, and previous recommendations] has clearly resulted in reductions in catch and fishing mortality rates. All CPUE indices showed increasing tendencies in most recent years. The Committee notes that maintaining catches at the current TAC (12,900 t) or at the 2010 TAC (13,500 t) under the current management scheme 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. A period of stabilization in the main management regulations of the rebuilding plan would allow the SCRS to better estimate the magnitude and speed of recent trends in F and SSB in the coming years.

EAST ATLANTIC AND MEDITERRANEAN BLUEFIN TUNA SUMMARY

	Reported catch	Inflated catch
Current reported yield (2011)	9,779 t	
Short-term sustainable yield according to Rec.[09-06]	13,500 t or less	
Maximum Sustainable Yield[1]		
Low recruitment scenario (1970s)	21,500 t	23,370 t
Medium recruitment scenario (1950-2006)	30,700 t	35,900 t
High recruitment scenario (1990s)	52,900 t	74,900 t
$F_{0.1}$ [2,3]	0.10 yr^{-1}	0.083 yr^{-1}
$F_{2011}/F_{0.1}$	0.70	0.36
$SSB_{F0.1}$		
Low recruitment scenario (1970s)	318,500 t	342,500 t
Medium recruitment scenario (1950-2006)	452,500 t	524,100 t
High recruitment scenario (1990s)	774,700 t	1,087,000 t
$SSB_{2011}/SSB_{F0.1}$		
Low recruitment scenario (1970s)	0.89	1.16
Medium recruitment scenario (1950-2006)	0.63	0.76
High recruitment scenario (1990s)	0.37	0.37
TAC (2009 - 2012)	19,500 t - 13,500 t - 12,900 t - 12, 900 t	

[1] Approximated as the average of the potential long-term yield that is expected at a $F_{0.1}$ strategy. The levels of these yields have been computed using the 2012 selectivity pattern and can substantially change according to different selectivity patterns.

[2] The Committee decided, on the basis of current published literature, to adopt $F_{0.1}$ as the proxy for F_{MSY}. $F_{0.1}$ has been indeed shown to be more robust to uncertainty about the true dynamics of the stock and observation errors than F_{MAX}. Values are given for both reported and inflated catch scenarios, respectively. $F_{0.1}$ have been also computed using the 2012 selectivity pattern and can thus substantially change according to different selectivity patterns

[3] The recruitment levels do not impact $F_{0.1}$.

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

			1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
TOTAL			20723	27016	23819	26027	29350	34131	36636	48853	49714	53320	49489	42375	35228	36541	37390	37089	33469	33505	37602	32501	36154	25849	21730	13186	11765
BFT-E			18220	24118	21061	23247	26429	31849	34268	46740	47291	50807	47155	39718	32456	33766	34605	33770	31163	31381	35845	30689	34516	23849	19751	11328	9779
	ATE		4456	6951	5433	6040	6556	7619	9367	6930	9650	12663	13539	11376	9628	10528	10086	10347	7362	7410	9036	7535	8037	7645	6684	4379	3989
	MED		13764	17167	15628	17207	19872	24230	24901	39810	37640	38144	33616	28342	22828	23238	24519	23424	23801	23971	26810	23154	26479	16205	13066	6949	5790
BFT-W			2503	2898	2759	2780	2921	2282	2368	2113	2423	2514	2334	2657	2772	2775	2784	3319	2306	2125	1756	1811	1638	2000	1980	1857	1986
Landings	ATE	Bait boat	1821	1936	1971	1693	1445	1141	3447	1980	2601	4985	3521	2550	1492	1822	2275	2567	1371	1790	2018	1116	2032	1794	1260	725	567
		Longline	924	1169	962	1496	3197	3817	2717	2176	4392	4788	4534	4300	4020	3736	3303	2896	2750	2074	2713	2448	1706	2491	1960	1194	1157
		Other surf.	668	1221	1020	562	347	834	1548	932	1047	646	511	621	498	703	712	701	560	402	1014	1047	502	187	298	143	36
		Purse seine	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)	3	1	2	1	0	0	0	0	0	0	162	28	33	126	61	63	109	87	11	4	10	6	2	25	92
		Traps	1040	2624	1478	2234	1522	1365	1631	1630	1152	1921	3982	3185	2859	2996	3585	3235	2082	1978	2408	2588	3788	3166	3164	2292	2137
	MED	Bait boat	0	0	0	25	148	158	48	0	206	5	4	11	4	0	0	1	9	17	5	0	0	0	0	0	
		Longline	799	1227	1121	1026	2869	2599	2342	7048	8475	8171	5672	2749	2463	3317	3750	2614	2476	2564	3101	2202	2656	2254	1213	1058	869
		Other surf.	2762	2870	3289	1212	1401	1894	1607	3218	1043	1197	1037	1880	2976	1067	1096	990	2536	1106	480	301	699	1022	169	275	223
		Purse seine	8857	11198	9450	11250	13245	17807	19297	26083	23588	26021	24178	21291	14910	16195	17174	17656	17167	18785	22475	20020	22952	12641	11395	4984	4293
		Sport (HL+RR)	433	838	457	1552	738	951	1237	2257	3556	2149	2340	1336	1622	1921	1321	1647	1392	1340	634	503	78	137	146	351	226
		Traps	913	1034	1311	2142	1471	821	370	1204	772	601	385	1074	852	739	1177	515	221	159	115	129	95	152	144	281	165
	ATW	Longline	1138	1373	698	739	895	674	696	539	466	547	382	764	914	858	610	730	186	644	425	565	420	606	366	529	743
		Other surf.	156	425	755	536	578	509	406	307	384	432	293	342	281	284	202	108	140	97	89	85	63	82	121	107	148
		Purse seine	367	383	385	384	237	300	295	301	249	245	250	249	248	275	196	208	265	32	178	4	28	0	11	0	
		Sport (HL+RR)	726	601	786	1004	1083	586	854	804	1114	1029	1181	1108	1124	1120	1649	2035	1398	1139	924	1005	1023	1130	1251	1009	887
		Traps	17	14	1	2	0	1	29	79	72	90	59	68	44	16	16	28	84	32	8	3	4	23	23	39	26
Discards	MED	Purse seine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
	ATW	Longline	99	102	119	115	128	211	88	83	138	167	155	123	160	222	105	211	232	181	131	149	100	159	207	174	181
		Other surf.	0	0	14	0	0	0	0	0	0	4	0	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	14	3	0	0	6	0	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	85	103	80	68	39	19	41	24	42	72	119	42	38	36
		Chinese Taipei	20	0	109	0	0	0	6	20	8	61	226	350	222	144	304	158	0	0	10	4	0	0	0	0	**0**
		EU.Denmark	0	1	0	0	0	0	37	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		EU.España	2479	4567	3565	3557	2272	2319	5078	3137	3819	6174	6201	3800	3360	3474	3633	4089	2138	2801	3102	2033	3276	2938	2409	1550	1488
		EU.France	533	724	460	510	565	894	1099	336	725	563	269	613	588	542	629	755	648	561	818	1218	629	253	366	228	135
		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	**0**
		EU.Ireland	0	0	0	0	0	0	0	0	0	0	14	21	52	22	8	15	3	1	1	2	1	1	1	2	4
		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	163	48	3	27	117	38	25	240	35	199	712	323	411	441	404	186	61	27	79	97	29	36	53	58	180
		EU.Sweden	0	0	0	0	1	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	1	0	1	1	12	0	0	0	0	0	0	0	0	0	1	0	
		Faroe Islands	0	0	0	0	0	0	0	0	0	0	0	67	104	118	0	0	0	0	0	0	0	0	0	0	
		Guinée Conakry	0	0	0	0	0	0	0	330	0	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	2	27	0	0	1	0	0	0	0	0	0	0	0	2
		Japan	900	1169	838	1464	2981	3350	2484	2075	3971	3341	2905	3195	2690	2895	2425	2536	2695	2015	2598	1896	1612	2351	1904	1155	1089
		Korea Rep.	0	0	0	0	0	0	0	4	205	92	203	0	0	6	1	0	0	3	0	1	0	0	0	0	
		Libya	0	0	0	0	0	312	0	0	0	576	477	511	450	487	0	0	0	0	0	47	0	0	0	0	**0**
		Maroc	356	437	451	408	531	562	415	720	678	1035	2068	2341	1591	2228	2497	2565	1797	1961	2405	2196	2418	1947	1909	1348	1055
		NEI (ETRO)	0	5	6	74	4	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	85	144	223	68	189	71	208	66	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	5	0	0	0	0	0	0	0	0	0	0	0	**0**
		Panama	4	0	0	0	0	0	0	1	19	550	255	0	13	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	0	2	0	0	0	0	0	0	0	0	
		Sierra Leone	0	0	0	0	0	0	0	0	0	0	0	0	0	93	118	0	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	Albania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	
		Algerie	420	677	820	782	800	1104	1097	1560	156	156	157	1947	2142	2330	2012	1710	1586	1208	1530	1038	1511	1311	0	0	
		China P.R.	0	0	0	0	0	0	0	97	137	93	49	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Chinese Taipei	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	1418	1076	1058	1410	1220	1360	1105	906	970	930	903	977	1139	828	1017	1022	825	834	619	389	371
		EU.Cyprus	10	10	10	10	10	10	14	10	10	10	10	21	31	61	85	91	79	105	149	110	1	132	2	3	10
		EU.España	1178	1428	1645	1822	1392	2165	2018	2741	4607	2588	2209	2000	2003	2772	2234	2215	2512	2353	2758	2689	2414	2465	1769	1056	942
		EU.France	4330	5780	4434	4713	4620	7376	6995	11843	9604	9171	8235	7122	6156	6794	6167	5832	5859	6471	8638	7663	10157	2670	3087	1754	805
		EU.Greece	156	159	182	201	175	447	439	886	1004	874	1217	286	248	622	361	438	422	389	318	255	285	350	373	224	172
		EU.Italy	4607	4201	4317	4110	3783	5005	5328	6882	7062	10006	9548	4059	3279	3845	4377	4628	4973	4686	4841	4695	4621	2234	2735	1053	1783
		EU.Malta	36	24	29	81	105	80	251	572	587	399	393	407	447	376	219	240	255	264	346	263	334	296	263	136	142
		EU.Portugal	0	0	0	0	278	320	183	428	446	274	37	54	76	61	64	0	2	0	0	11	0	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	50	0	0	**0**
		Israel	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Japan	280	258	127	172	85	123	793	536	813	765	185	361	381	136	152	390	316	638	378	556	466	80	18	0	**0**
		Korea Rep.	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	84	328	370	425	635	1422	1540	812	552	820	745	1063	1941	638	752	1300	1091	1280	1358	1318	1082	645	**0**
		Maroc	116	140	295	1149	925	205	79	1092	1035	586	535	687	636	695	511	421	760	819	92	190	641	531	369	205	182
		NEI (Flag related)	0	0	0	0	0	0	0	427	639	171	1066	825	140	17	0	0	0	0	0	0	0	0	0	0	
		NEI (MED)	183	633	757	360	1799	1398	0	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	773	211	0	101	1030	1995	109	571	508	610	709	0	0	0	0	0	0	
		Panama	72	67	0	74	287	484	467	1499	1498	2850	236	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Serbia & Montenegro	0	0	0	0	0	0	0	0	2	4	0	0	0	4	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	50	41	0	34	
		Tunisie	456	624	661	406	1366	1195	2132	2773	1897	2393	2200	1745	2352	2184	2493	2528	791	2376	3249	2545	2622	2679	1932	1042	852
		Turkey	972	1343	1707	2059	2459	2817	3084	3466	4220	4616	5093	5899	1200	1070	2100	2300	3300	1075	990	806	918	879	665	409	519
		Yugoslavia Fed.	648	1523	560	940	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	ATW	Argentina	2	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Brasil	2	0	2	1	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0	
		Canada	83	393	619	438	485	443	459	392	576	597	503	595	576	549	524	604	557	537	600	733	491	575	530	505	474
		Chinese Taipei	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	74	11	19	27	19	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	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	1	0	0	3	1	10	5	0	4	3	2	8	0
		Japan	960	1109	468	550	688	512	581	427	387	436	322	691	365	492	506	575	57	470	265	376	277	492	162	353	578
		Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	52	0	0	0	0	
		Mexico	0	0	0	0	0	0	0	4	0	19	2	8	14	29	10	12	22	9	10	14	7	7	10	14	14
		NEI (ETRO)	0	0	30	24	23	17	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	0	0	0	0	2	0	0	429	270	49	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	0	0	0	0	0	0	0	0	0	0	0	
		Sta. Lucia	1	3	2	14	14	14	2	43	9	3	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	0	0	0	0	0	0	0	0	0	0	0	
		U.S.A.	1352	1289	1483	1636	1582	1085	1237	1163	1311	1285	1334	1235	1213	1212	1583	1840	1426	899	717	468	758	764	1068	803	738
		UK.Bermuda	0	0	0	0	0	0	0	0	0	1	2	2	1	1	1	1	0	0	0	0	0	0	0	0	0
		Uruguay	0	2	0	0	1	0	1	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
Discards	MED	Albania	0	0	0	0	0	0	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0	0	0	0	0	4
		Turkey	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
	ATW	Canada	0	0	14	0	0	0	0	0	0	0	6	16	11	46	13	37	14	15	0	2	0	1	3	25	36
		Japan	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		U.S.A.	99	102	119	115	128	211	88	83	138	171	155	110	149	176	98	174	218	167	131	147	100	158	204	150	145

BFTE-Table 1. The probabilities of F<F_{MSY} for quotas from 0 to 30,000 t for 2013 through 2022. Shading corresponds to the probabilities of being in the ranges of 50-59%, 60-69%, 70-79%, 80-89% and greater or equal to 90%.

Kobe II Strategy matrix, *P(F≤F_{MSY})*

TAC	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
0	100	100	100	100	100	100	100	100	100	100
2000	100	100	100	100	100	100	100	100	100	100
4000	100	100	100	100	100	100	100	100	100	100
6000	100	100	100	100	100	100	100	100	100	100
8000	100	100	100	100	100	100	100	100	100	100
10000	100	100	100	100	100	100	100	100	100	100
12000	100	100	100	100	100	100	100	100	100	100
12900	100	100	100	100	100	100	100	100	100	100
13500	100	100	100	100	100	100	100	100	100	100
14000	100	100	100	100	100	100	100	100	100	100
16000	99	100	100	100	100	100	100	100	100	100
18000	97	98	99	99	100	100	100	100	100	100
20000	93	95	97	97	98	98	98	99	99	99
22000	86	89	92	93	94	94	94	95	95	95
24000	77	81	85	86	88	89	89	90	90	90
26000	68	73	78	80	81	82	83	83	84	84
28000	59	65	70	73	74	76	76	77	77	78
30000	51	57	62	66	68	70	70	71	71	71

BFTE-Table 2. The probabilities of SSB >SSB_{MSY} for quotas from 0 to 30,000 t for 2013 through 2022. Shading corresponds to the probabilities of being in the ranges of 50-59%, 60-69%, 70-79%, 80-89% and greater or equal to 90%.

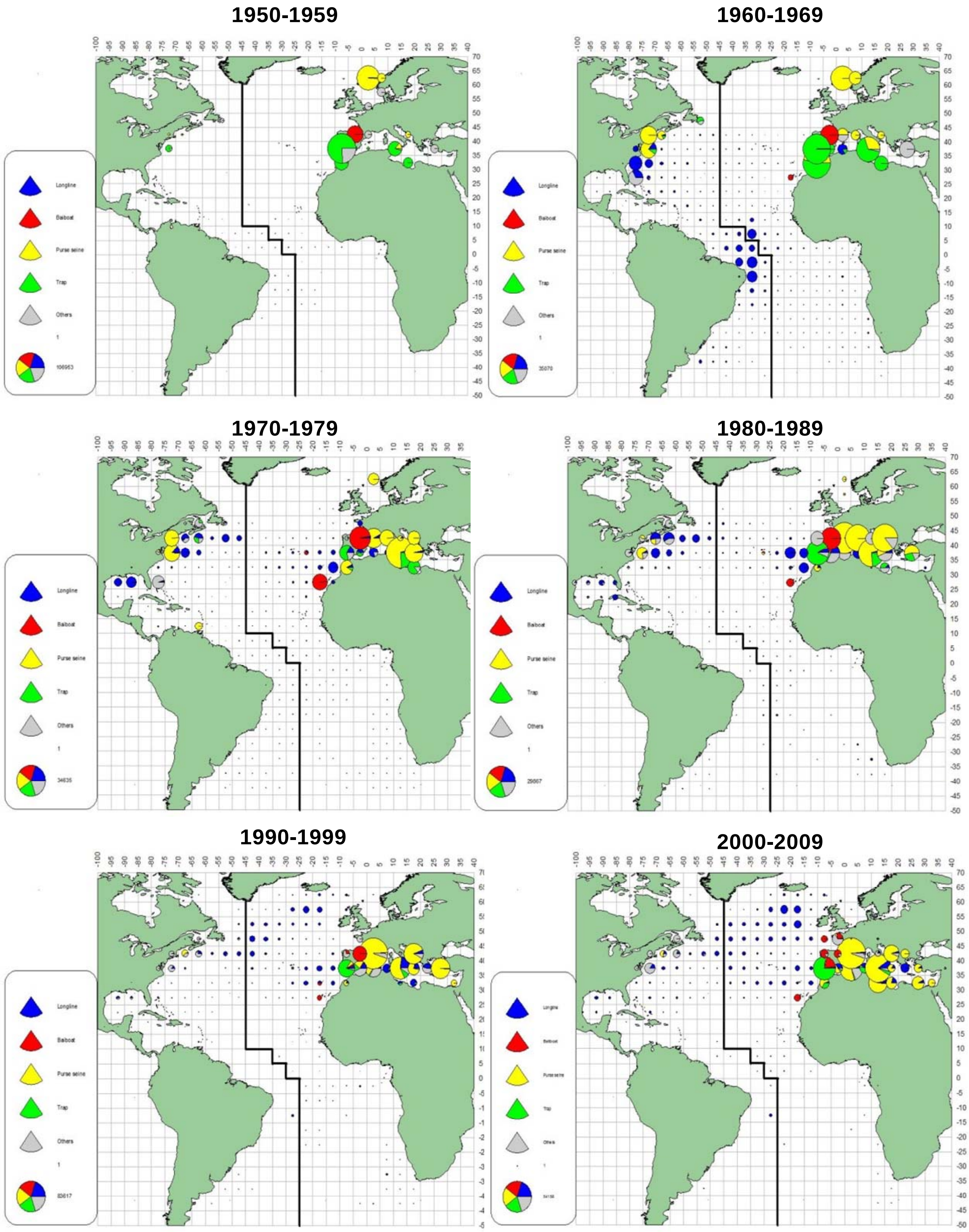
Kobe II Strategy matrix, *P(SSB≥SSB_{MSY})*

TAC	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
0	36	46	54	63	72	82	92	97	100	100
2000	36	45	54	62	70	81	90	97	99	100
4000	36	45	53	61	69	79	89	96	99	100
6000	36	44	52	59	67	77	87	94	98	100
8000	36	43	51	58	66	75	85	92	97	99
10000	35	43	50	56	64	73	83	91	96	99
12000	35	42	48	55	63	70	80	88	95	98
12900	35	42	48	55	62	69	79	87	93	98
13500	35	42	48	54	61	69	78	87	93	97
14000	35	42	47	54	60	68	77	86	92	97
16000	35	41	46	52	58	66	74	83	90	94
18000	34	40	45	51	56	63	71	79	86	92
20000	34	39	44	49	54	60	68	75	83	88
22000	34	39	43	47	52	57	63	71	77	83
24000	34	38	42	46	50	55	60	67	73	78
26000	34	37	41	44	48	52	57	62	67	73
28000	33	36	40	43	45	49	53	58	63	66
30000	33	36	38	41	43	46	50	54	58	62

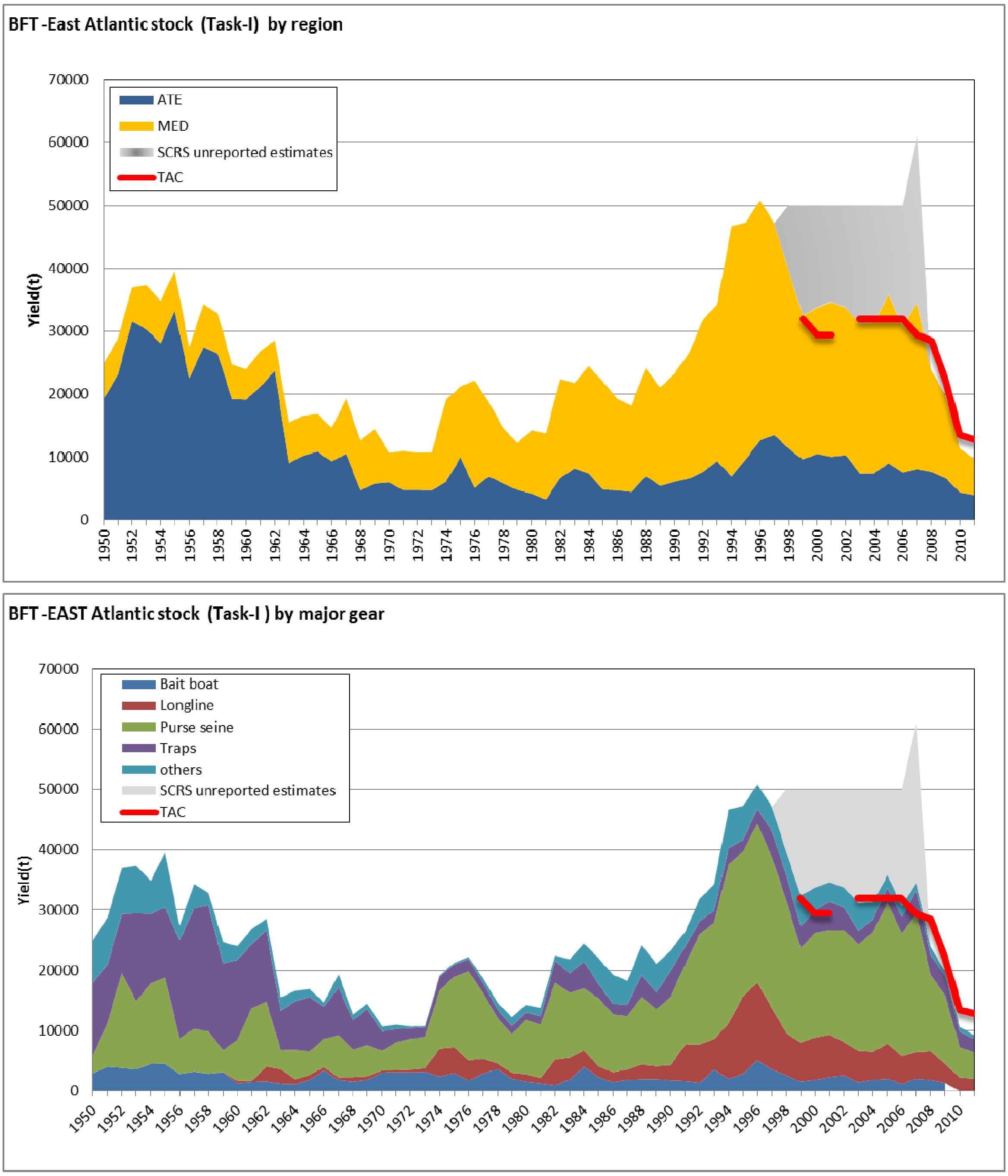
BFTE-Table 3. The probabilities of $F<F_{MSY}$ and SSB $>SSB_{MSY}$ for quotas from 0 to 30000 t for 2013 through 2022. Shading corresponds to the probabilities of being in the ranges of 50-59%, 60-69%, 70-79%, 80-89% and greater or equal to 90%.

Kobe II Strategy matrix, $P(F\leq F_{MSY})$ and $P(SSB\geq SSB_{MSY})$

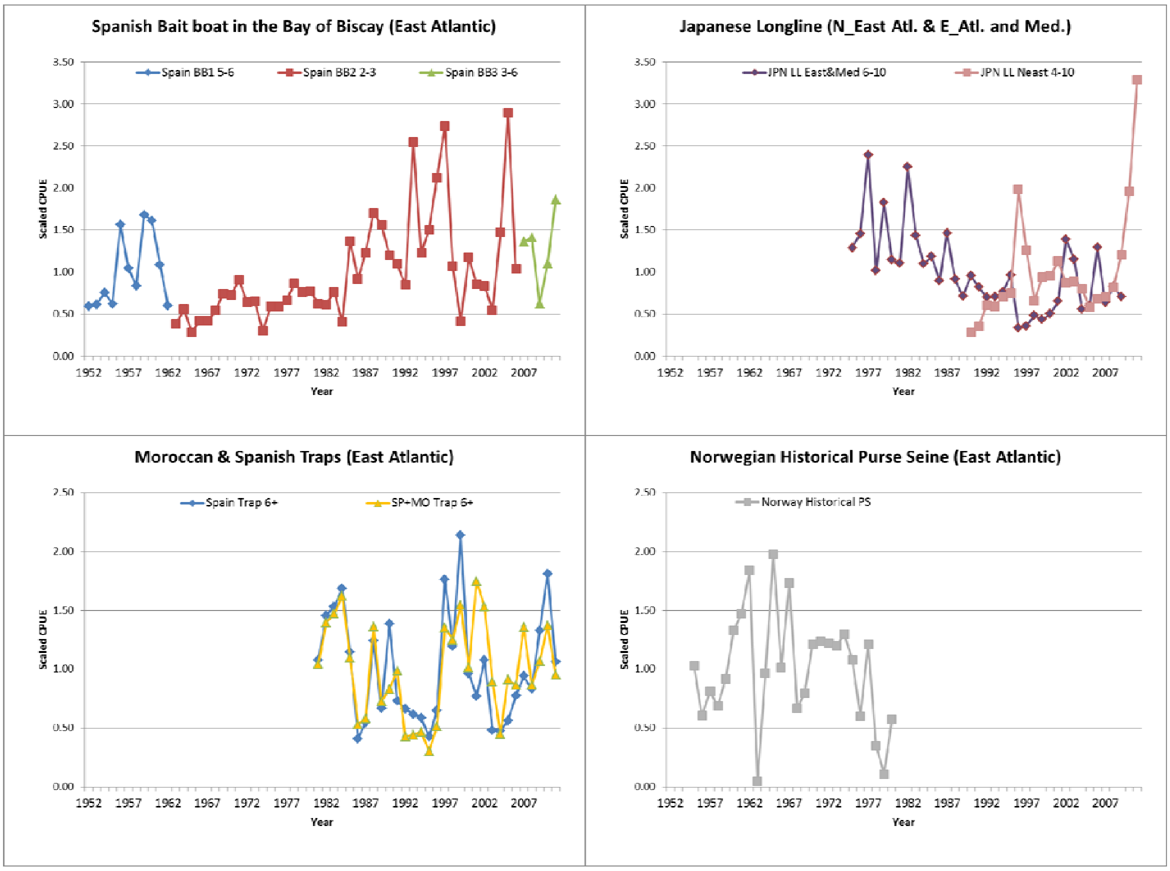
TAC	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
0	36	46	54	63	72	82	92	97	100	100
2000	36	45	54	62	70	81	90	97	99	100
4000	36	45	53	61	69	79	89	96	99	100
6000	36	44	52	59	67	77	87	94	98	100
8000	36	43	51	58	66	75	85	92	97	99
10000	35	43	50	56	64	73	83	91	96	99
12000	35	42	48	55	63	70	80	88	95	98
12900	35	42	48	55	62	69	79	87	93	98
13500	35	42	48	54	61	69	78	87	93	97
14000	35	42	47	54	60	68	77	86	92	97
16000	35	41	46	52	58	66	74	83	90	94
18000	34	40	45	51	56	63	71	79	86	92
20000	34	39	44	49	54	60	68	75	83	88
22000	33	37	42	46	51	56	63	70	76	83
24000	30	34	38	41	46	51	56	63	69	74
26000	28	31	34	37	41	45	50	57	62	67
28000	25	27	31	34	38	41	46	51	56	60
30000	23	25	28	31	34	38	41	46	50	54



BFT-Figure 1. Geographic distribution of bluefin tuna catches per 5x5 degrees and per main gears from 1950 to 2009.

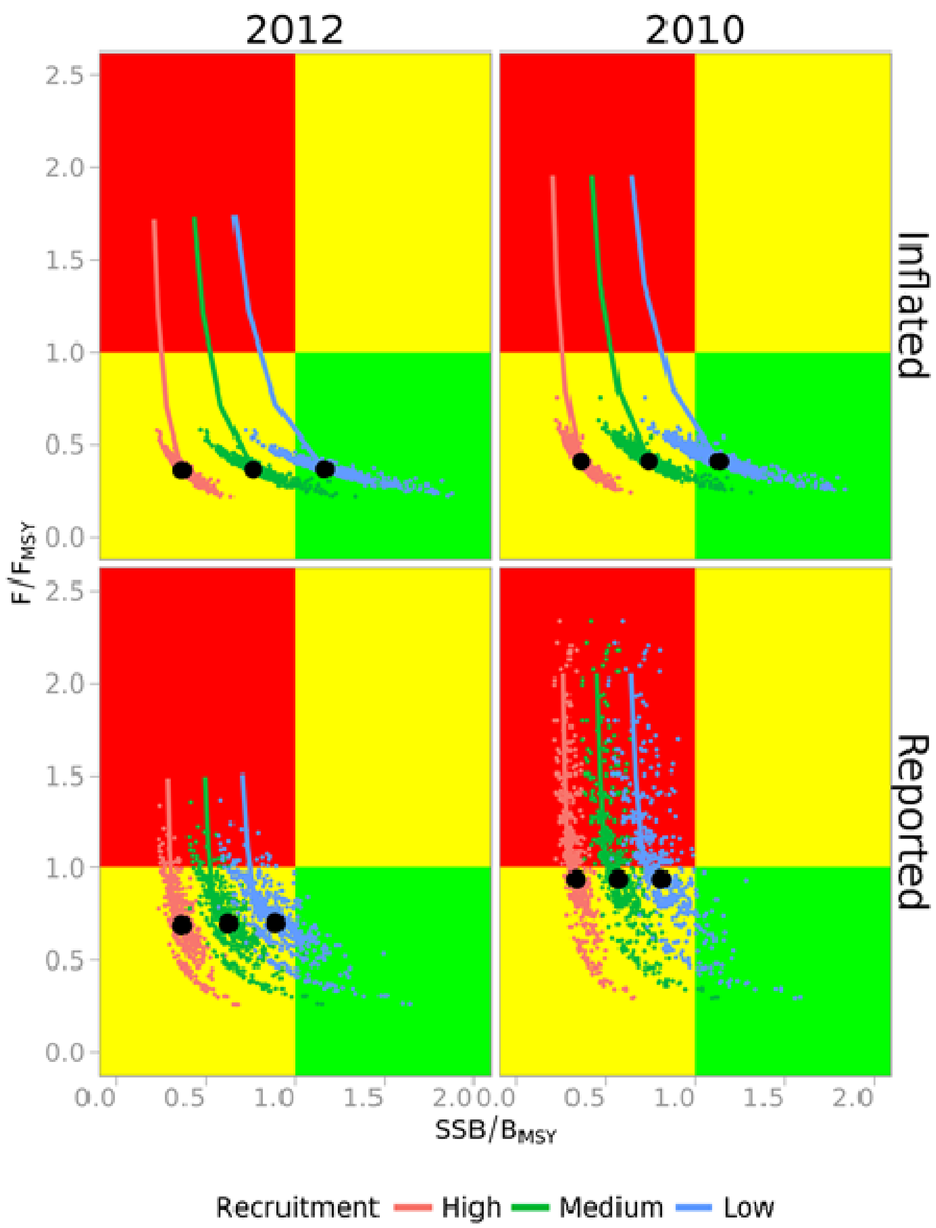


BFTE-Figure 1. Reported catch for the East Atlantic and Mediterranean from Task I data from 1950 to 2011 split by main geographic areas (top panel) and by gears (bottom panel) together with unreported catch estimated by the SCRS (using fishing capacity information and mean catch rates over the last decade) from 1998 to 2007 (the SCRS did not detect unreported catch using fishing capacity information since 2008) and TAC levels since 1998.

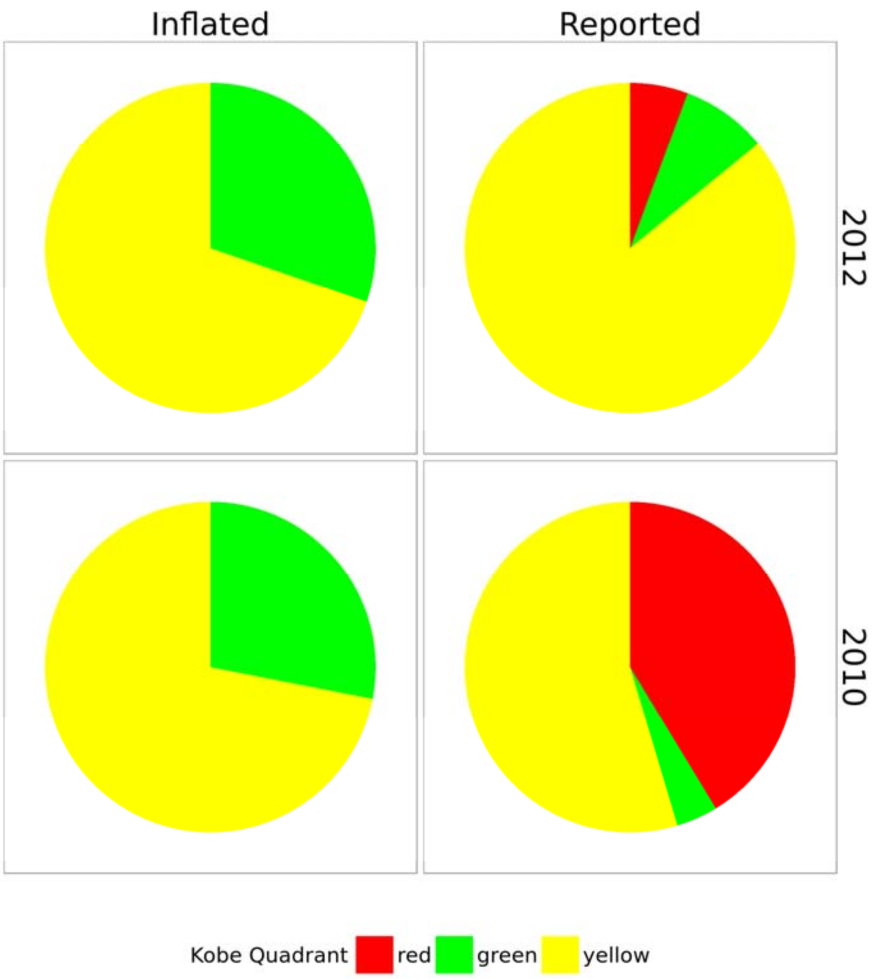


BFTE-Figure 2. Plots of the CPUE time series fishery indicators for the East Atlantic and Mediterranean bluefin tuna stock used in the 2012 stock assessment. All CPUE series are standardized series except the nominal Norway PS index. The Spanish BB series (top left panel) was split in three series to account for changes in selectivity patterns.

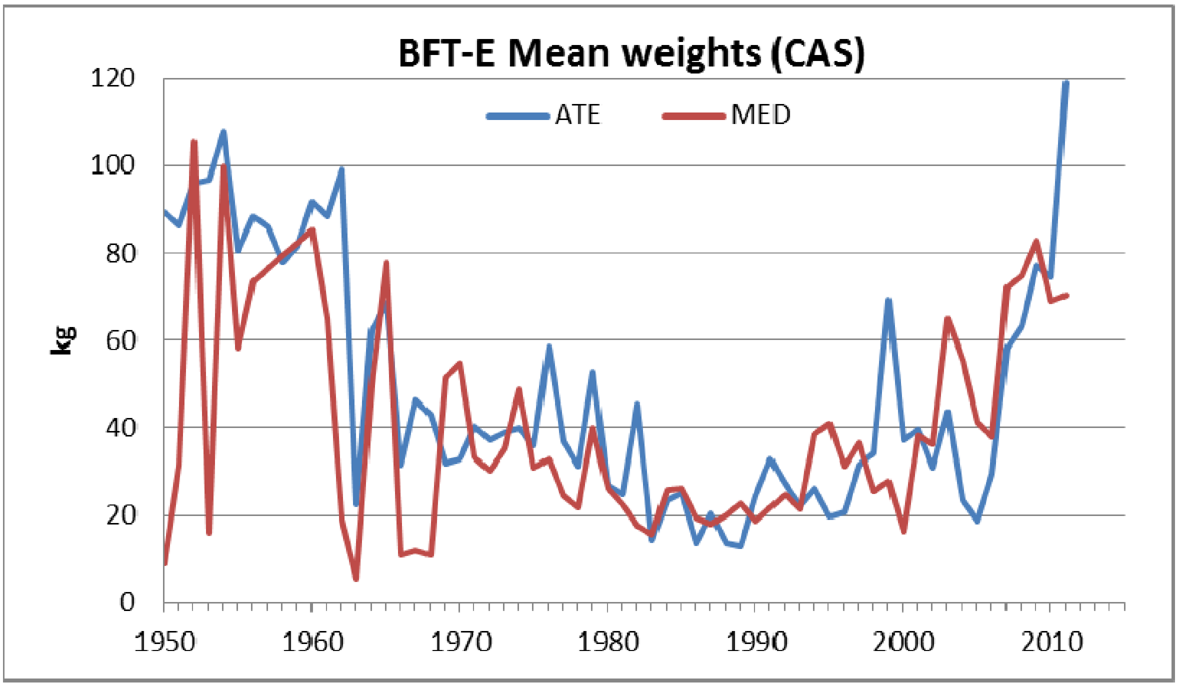
BFTE-Figure 3. Fishing mortality (for ages 2 to 5 and 10+), spawning stock biomass (in kg) and recruitment (in number of fish) estimates from VPA continuity run. Blue line: reported catch; red line: inflated (from 1998 to 2007) catch.



BFTE-Figure 4. Stock status from 2008 to the terminal year (2011) estimated from VPA continuity run with reported and inflated catch (upper and lower panels) and considering low, medium and high recruitment levels (blue, green and red lines). Blue, green and red dots represent the distribution of the terminal year obtained through bootstrapping for the corresponding three recruitment levels. Left panel (2012): 2011 SSB and F relative to reference points calculated during the 2012 stock assessment. Right panel (2010): 2011 SSB and F relative to the reference points that have calculated during the 2010 stock assessment.



BFTE-Figure 5. Pie chart showing the proportion of the VPA continuity run results for the terminal year (2011) that are within the green quadrant of the Kobe plot chart (not overfished, no overfishing), the yellow quadrant (overfished or overfishing), and the red quadrant (overfished and overfishing). Split by catch scenario (reported and inflated) and benchmark (estimated in 2010 and estimated in 2012).



BFTE-Figure 6. Plots of the annual mean weight from the catch-at-size data per main area (ATE: East Atlantic and MED: Mediterranean) from 1950 to 2011.

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 (that started in 1962) and the U.S. purse seine fishery for juvenile fish **(BFT-Table 1, BFTW-Figure 1)**. 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 2011 was 1,986 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 2011 Canadian catch (including dead discards) was 510 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 2011 were 578 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 2011 the U.S. catches totaled 884t and were below the quota partly owing to a reduction in dead discards and fishing effort in the Gulf of Mexico.

The indices of abundance used in the 2010 assessment were updated through 2011 **(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 and 2011. 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 and showed a small decrease in 2011. The catch rates of the Japanese longline fishery north of 30^{o}N fluctuated significantly since 2007, showing considerably high values for 2007, 2009, and 2011 fishing years. These high indices might be related to the abundance of relatively small-sized bluefin (135-150cm, 50-60kg). The catch rates from the U.S. Gulf of Mexico longline fishery showed a gradual increasing trend from 1996 to 2008 and a slight decrease afterwards. The catch rates in the Gulf of St. Lawrence have increased rapidly since 2004 and the catch rates in 2011 were the highest in the time series considered in the assessment. The catch rates in southwest Nova Scotia have continued to follow an increasing trend since 2000. The Gulf of Mexico larval survey (the only fishery independent indicator) continues to fluctuate around the low levels observed since the 1980s.

BFTW-3. State of the stock

The SCRS cautions that the conclusions of this 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. 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. Mixing models will be further investigated prior to the next assessment. 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. Many of these deficiencies are being addressed by current research programs.

The assessment used to provide management advice in 2010 was updated this year with data collected through 2011. The estimated trends are consistent with the previous analysis in that spawning stock biomass (SSB) declined steadily from 1970 to 1992 and has since fluctuated between 25% and 36% of the 1970 level (**BFTW-Figure 4**). In recent years, however, there appears to have been a gradual increase in SSB from 27% in 2003 to an estimated 36% in 2011. Since 1998, when the rebuilding plan was adopted, the SSB has increased by 19%. 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 previous 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 previous assessment estimated that the 2003 year-class was the largest since 1974, but the current assessment estimates two somewhat smaller year classes (2002 and 2003) instead. The Committee continues to believe the 2003 year class was large based on the progression of size classes through various fisheries; and the estimate of two adjacent but smaller year classes is likely an artifact of the lack of direct observations of the age of fish in the catch and recent regulations in the United States that limited the take of fish in that size range. In 2012, the 2003 year class has started to contribute to the spawning biomass.

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 (2008-2010) is 61% of F_{MSY} and B_{2011} is about 140% of B_{MSY} (**BFTW-Figure 5, BFTW-Figure 6**). Estimates of stock status are more pessimistic if a high recruitment scenario is considered (F =160% of F_{MSY}, B =19% of B_{MSY}).

BFTW-4. Outlook

A medium-term outlook evaluation of changes in spawning stock size and yield over the remaining rebuilding period under various management options was conducted. Future recruitment was assumed to fluctuate under two scenarios: (i) average levels observed for 1976-2008 (87,000 fish, the low recruitment potential scenario) and (ii) levels that increase as the stock rebuilds (MSY level of 280,000 fish, the high recruitment potential scenario). The Committee has no strong evidence to favor either scenario over the other and notes that both are plausible (but not extreme) lower and upper bounds on rebuilding potential.

The outlook for bluefin tuna in the West Atlantic is similar to that from the 2010 assessment (**BFTW-Figure 7, BFTW-Tables 1-3**). 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. Constant catches of 2,000 t would result in 2019 SSB nearly equal to that in 2012. If the high recruitment scenario is correct, then the western stock will not rebuild by 2019 even with no catch, although catches of 1,200 t or less are predicted to have a 60% chance to immediately end overfishing and initiate rebuilding.

The Committee notes 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. Effect of current regulations

The Committee previously noted that Recommendation 08-04, which was implemented in 2009, was 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 in 2011. Nevertheless, the available fishery indicators **(BFTW-Figure 3)** as well as the current assessment suggest the spawning biomass of western bluefin tuna continues to increase.

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, 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 current (2012) assessment indicates similar historical trends in abundance as in previous assessments. The strong 2003 year class has contributed to stock productivity such that total 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 1970s and a “low recruitment scenario” in which future recruitment is expected to remain near present levels. The results of this assessment have shown that long term implications of future biomass are different between the two hypotheses and the issue of distinguishing between them remains unresolved.

Probabilities of achieving B_{MSY} within the Commission rebuilding period were projected for alternative catch levels **(BFTW-Table 1)**. 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 (1,750 t) should allow the biomass to continue to increase. Larger catches in excess of 2,000 t will prevent the possibility of the 2003 year class elevating the productivity potential of the stock in the future. The Commission may wish to protect the 2003 year class to enhance its contribution to the spawning biomass. Maintaining catch at current levels (1,750 t) is expected to allow the spawning biomass to increase, which may help resolve the issue of low and high recruitment potential. For example, should the high recruitment hypothesis be correct, allowing substantial increases in spawning biomass should lead to higher recruitment.

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 considerable 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 (2011) Catch (including discards)	1,986	
Assumed recruitment	Low potential	High potential
Maximum Sustainable Yield (MSY)	2,634 (2,452-2,834)[1]	6,472 (5,736-7,500)[1]
B_{MSY}	12,943 (12,717-13,268)[1]	93,621 (77,288-116,679)
B_{2011}/B_{MSY}	1.4 (1.14-1.72)[1]	0.19 (0.13-0.29)[1]
F_{MSY}	0.17 (0.14-0.19)[1]	0.064 (0.056-0.074)[1]
$F_{0.1}$	0.11 (0.10-.12)[1]	0.11 (0.10-.12)[1]
$F_{2008\text{-}2010}/F_{MSY}$[2]	0.61 (0.49-0.74)[1]	1.57(1.24-1.95)[1]
$F_{2008\text{-}2010}/F_{0.1}$	0.92 (0.77-1.12)[1]	0.92 (0.77-1.12)[1]
Stock status	Overfished: NO	Overfished: YES
	Overfishing: NO	Overfishing: YES
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] $F_{2008\text{-}2010}$ refers to the geometric mean of the estimates for 2008-2010 (a proxy for recent F levels).

BFTW-Table 1. Kobe II matrices (updated during the 2012 stock assessment) giving the probability that the spawning stock biomass will exceed the level that will produce MSY ($B>B_{MSY}$, not overfished) in any given year for various constant catch levels under the low recruitment, high recruitment, and combined scenarios. The current TAC of 1,750 t [Rec. 10-03] is indicated in bold.

Low Recruitment

TAC	2012	2013	2014	2015	2016	2017	2018	2019
0	98%	98%	99%	100%	100%	100%	100%	100%
1600	98%	97%	96%	96%	96%	97%	99%	99%
1750	98%	97%	94%	96%	94%	97%	97%	98%
1900	98%	97%	94%	95%	93%	95%	96%	97%
2100	98%	97%	94%	94%	91%	92%	93%	94%
2300	98%	96%	93%	93%	87%	87%	90%	89%
2500	98%	96%	92%	92%	84%	84%	84%	84%
2600	98%	96%	91%	90%	82%	82%	80%	80%
2700	98%	96%	91%	89%	80%	78%	77%	76%
2800	98%	96%	90%	88%	78%	76%	75%	72%
2900	98%	96%	90%	87%	77%	73%	70%	67%
3000	98%	96%	89%	85%	74%	70%	67%	62%
3100	98%	96%	87%	83%	70%	68%	61%	56%
3200	98%	95%	87%	82%	67%	63%	57%	52%
3300	98%	95%	86%	81%	66%	58%	53%	47%

High Recruitment

TAC (t)	2012	2013	2014	2015	2016	2017	2018	2019
0	0%	0%	0%	0%	0%	0%	0%	0%
500	0%	0%	0%	0%	0%	0%	0%	0%
1000	0%	0%	0%	0%	0%	0%	0%	0%
1500	0%	0%	0%	0%	0%	0%	0%	0%
1750	0%	0%	0%	0%	0%	0%	0%	0%
2000	0%	0%	0%	0%	0%	0%	0%	0%

Combined

TAC (t)	2012	2013	2014	2015	2016	2017	2018	2019
0	49%	49%	49%	50%	50%	50%	50%	50%
100	49%	49%	49%	50%	50%	50%	50%	50%
200	49%	49%	49%	50%	50%	50%	50%	50%
300	49%	49%	49%	50%	50%	50%	50%	50%
400	49%	49%	49%	50%	50%	50%	50%	50%
500	49%	49%	49%	50%	50%	50%	50%	50%
600	49%	49%	49%	50%	50%	50%	50%	50%
700	49%	49%	49%	50%	50%	50%	50%	50%
800	49%	49%	49%	50%	50%	50%	50%	50%
900	49%	49%	48%	50%	50%	50%	50%	50%
1000	49%	49%	48%	49%	50%	50%	50%	50%
1100	49%	48%	48%	49%	49%	50%	50%	50%
1200	49%	48%	48%	49%	49%	50%	50%	50%
1300	49%	48%	48%	49%	49%	50%	50%	50%
1750	49%	48%	47%	48%	47%	48%	49%	49%
1800	49%	48%	47%	48%	47%	48%	48%	49%
1900	49%	48%	47%	48%	47%	48%	48%	49%
2000	49%	48%	47%	47%	46%	47%	47%	48%
2500	49%	48%	46%	46%	42%	42%	42%	42%

BFTW-Table 2. Kobe II matrices (updated during the 2012 stock assessment) giving the probability that the fishing mortality rate (F) will be less than the level that will produce MSY ($F<F_{MSY}$, no overfishing) in any given year for various constant catch levels under the low recruitment, high recruitment, and combined scenarios. The current TAC of 1,750 t [Rec. 10-03] is indicated in bold.

Low Recruitment

TAC (t)	2012	2013	2014	2015	2016	2017	2018	2019
0	100%	100%	100%	100%	100%	100%	100%	100%
1600	100%	100%	100%	100%	100%	100%	100%	100%
1750	100%	100%	100%	100%	100%	100%	100%	100%
1900	100%	99%	100%	100%	100%	100%	100%	100%
2100	100%	99%	99%	98%	98%	99%	99%	99%
2300	100%	96%	96%	95%	94%	96%	95%	95%
2500	100%	91%	90%	86%	85%	87%	86%	84%
2600	100%	87%	85%	82%	81%	81%	81%	79%
2700	100%	83%	81%	76%	74%	75%	72%	70%
2800	100%	79%	76%	69%	67%	68%	65%	61%
2900	100%	74%	70%	62%	58%	59%	56%	53%
3000	100%	67%	63%	53%	51%	51%	48%	45%
3100	100%	60%	55%	46%	43%	44%	40%	35%
3200	100%	52%	48%	39%	36%	36%	31%	28%
3300	100%	45%	42%	33%	29%	29%	26%	23%

High Recruitment

TAC (t)	2012	2013	2014	2015	2016	2017	2018	2019
0	8%	100%	100%	100%	100%	100%	100%	100%
700	8%	100%	100%	100%	100%	100%	100%	100%
800	8%	99%	99%	100%	100%	100%	100%	100%
900	8%	95%	97%	98%	99%	100%	100%	100%
1000	8%	89%	92%	94%	97%	98%	99%	100%
1100	8%	80%	85%	87%	90%	95%	97%	98%
1200	8%	67%	75%	78%	83%	88%	91%	93%
1300	8%	52%	62%	66%	72%	81%	83%	86%
1400	8%	39%	48%	52%	60%	70%	74%	79%
1500	8%	30%	38%	41%	47%	57%	64%	68%
1600	8%	19%	28%	30%	38%	46%	53%	57%
1700	8%	13%	18%	21%	28%	37%	42%	46%
1750	8%	12%	15%	17%	23%	32%	38%	42%
1900	8%	6%	9%	10%	12%	20%	24%	28%
2100	8%	2%	3%	4%	5%	9%	11%	13%
2300	8%	1%	2%	2%	3%	3%	5%	6%

Combined

TAC (t)	2012	2013	2014	2015	2016	2017	2018	2019
0	54%	100%	100%	100%	100%	100%	100%	100%
900	54%	98%	99%	99%	100%	100%	100%	100%
1000	54%	95%	96%	97%	98%	99%	100%	100%
1100	54%	90%	93%	93%	95%	98%	98%	99%
1200	54%	83%	88%	89%	91%	94%	96%	97%
1300	54%	76%	81%	83%	86%	90%	92%	93%
1400	54%	70%	74%	76%	80%	85%	87%	90%
1500	54%	65%	69%	71%	73%	79%	82%	84%
1600	54%	59%	64%	65%	69%	73%	77%	78%
1700	54%	57%	59%	60%	64%	69%	71%	73%
1750	54%	56%	57%	59%	61%	66%	69%	71%
1800	54%	54%	56%	57%	60%	64%	66%	68%
1900	54%	53%	54%	55%	56%	60%	62%	64%
2000	54%	51%	52%	53%	54%	56%	59%	60%
2100	54%	50%	51%	51%	52%	54%	55%	56%
2200	54%	50%	50%	50%	50%	52%	53%	53%
2300	54%	49%	49%	48%	49%	50%	50%	51%
2400	54%	47%	47%	46%	46%	48%	47%	47%
2500	54%	46%	45%	44%	43%	45%	44%	43%

BFTW-Table 3. Kobe II matrices (updated during the 2012 stock assessment) giving the joint probability that the fishing mortality rate will be less than the level that will produce MSY ($F<F_{MSY}$) and the spawning stock biomass (SSB) will exceed the level that will produce MSY ($B>B_{MSY}$) in any given year for various constant catch levels under the low recruitment, high recruitment, and combined scenarios. The current TAC of 1,750 t [Rec. 10-03] is indicated in bold.

Low Recruitment

TAC	2012	2013	2014	2015	2016	2017	2018	2019
0	98%	99%	100%	100%	100%	100%	100%	100%
1600	98%	97%	96%	96%	96%	97%	99%	99%
1750	98%	97%	94%	96%	94%	97%	97%	98%
1900	98%	97%	94%	95%	93%	95%	96%	97%
2100	98%	97%	94%	94%	91%	92%	93%	94%
2300	98%	95%	93%	92%	87%	87%	90%	89%
2500	98%	91%	89%	85%	83%	83%	84%	83%
2600	98%	87%	85%	82%	79%	80%	79%	77%
2700	98%	83%	81%	76%	74%	74%	72%	70%
2800	98%	79%	76%	69%	67%	68%	65%	61%
2900	98%	74%	70%	62%	58%	59%	56%	53%
3000	98%	67%	63%	53%	51%	51%	48%	45%
3100	98%	60%	55%	46%	43%	44%	40%	35%
3200	98%	52%	48%	39%	36%	36%	31%	28%
3300	98%	45%	42%	33%	29%	29%	26%	23%

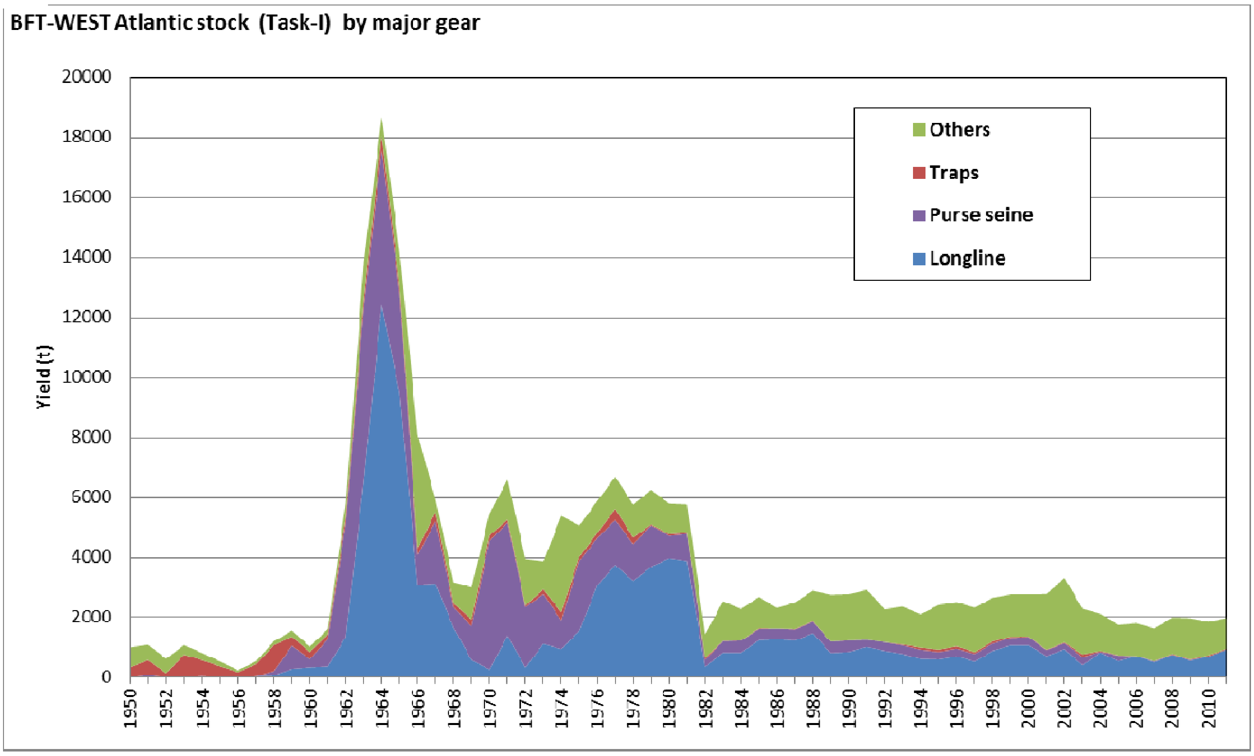
High Recruitment

TAC (t)	2012	2013	2014	2015	2016	2017	2018	2019
0	0%	0%	0%	0%	0%	0%	0%	0%
500	0%	0%	0%	0%	0%	0%	0%	0%
1000	0%	0%	0%	0%	0%	0%	0%	0%
1500	0%	0%	0%	0%	0%	0%	0%	0%
1750	0%	0%	0%	0%	0%	0%	0%	0%
2000	0%	0%	0%	0%	0%	0%	0%	0%

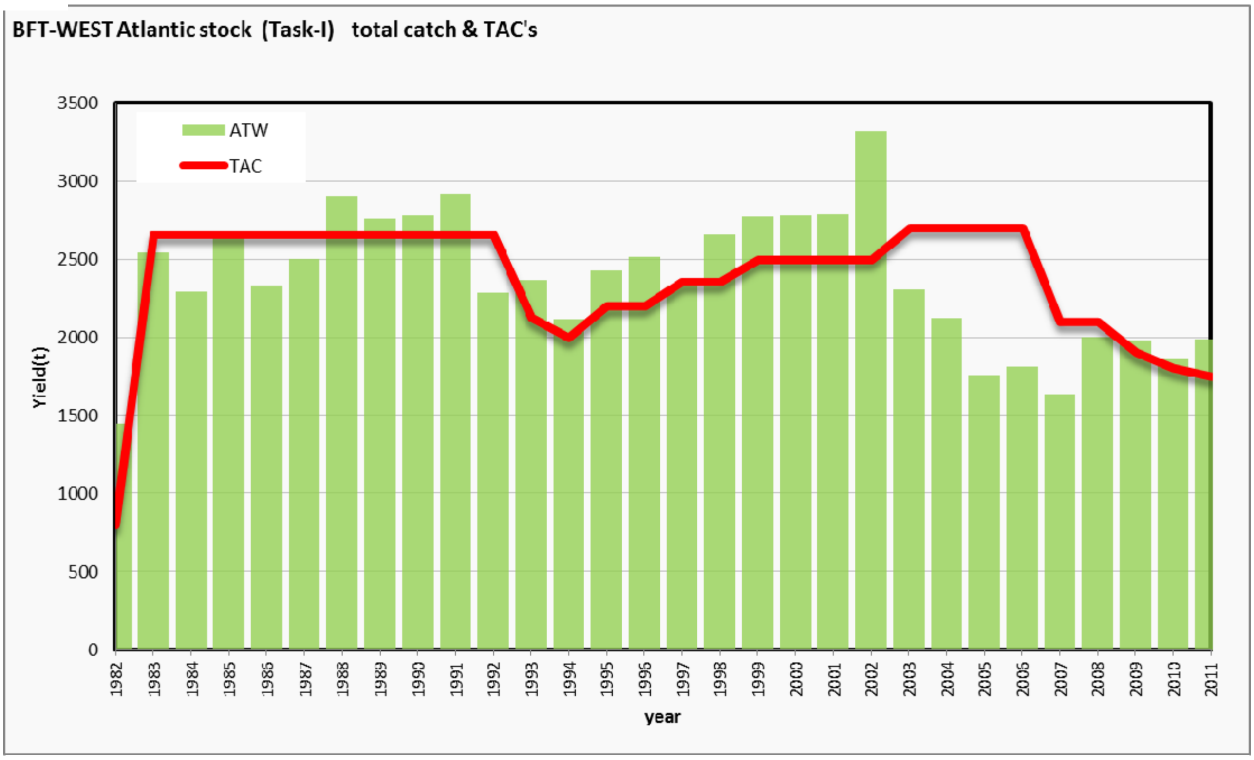
Combined

TAC (t)	2012	2013	2014	2015	2016	2017	2018	2019
0	49%	49%	49%	50%	50%	50%	50%	50%
100	49%	49%	49%	50%	50%	50%	50%	50%
200	49%	49%	49%	50%	50%	50%	50%	50%
300	49%	49%	49%	50%	50%	50%	50%	50%
400	49%	49%	49%	50%	50%	50%	50%	50%
500	49%	49%	49%	50%	50%	50%	50%	50%
600	49%	49%	49%	50%	50%	50%	50%	50%
700	49%	49%	49%	50%	50%	50%	50%	50%
800	49%	49%	49%	50%	50%	50%	50%	50%
900	49%	49%	48%	50%	50%	50%	50%	50%
1000	49%	49%	48%	49%	50%	50%	50%	50%
1100	49%	48%	48%	49%	49%	50%	50%	50%
1200	49%	48%	48%	49%	49%	50%	50%	50%
1300	49%	48%	48%	49%	49%	50%	50%	50%
1750	49%	48%	47%	48%	47%	48%	49%	49%
1800	49%	48%	47%	48%	47%	48%	48%	49%
1900	49%	48%	47%	48%	47%	48%	48%	49%
2000	49%	48%	47%	47%	46%	47%	47%	48%
2500	49%	46%	44%	43%	41%	42%	42%	41%

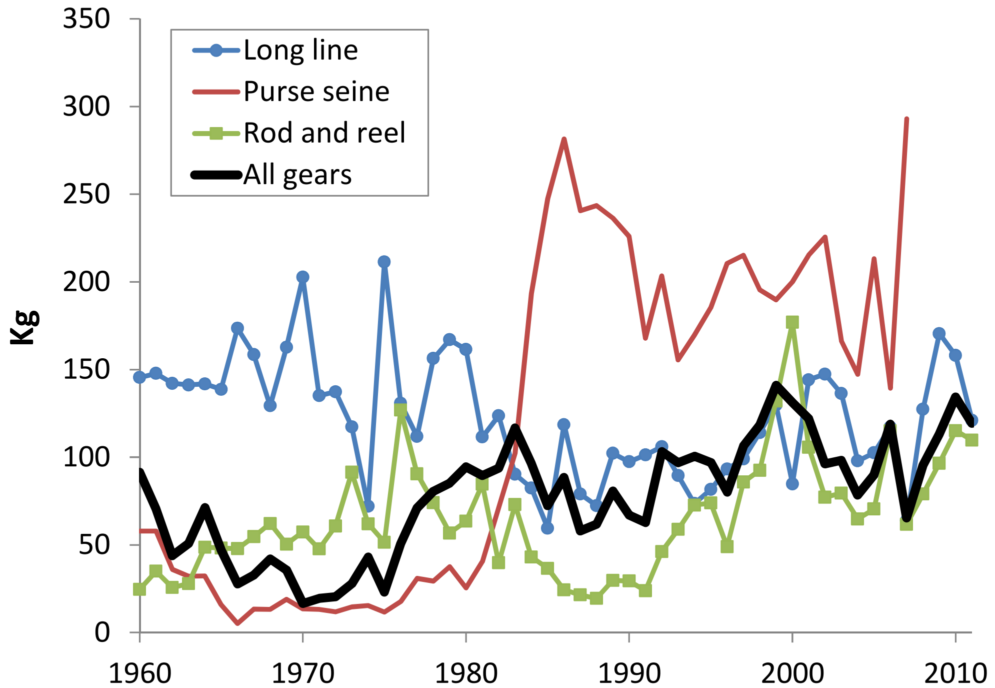
(a)



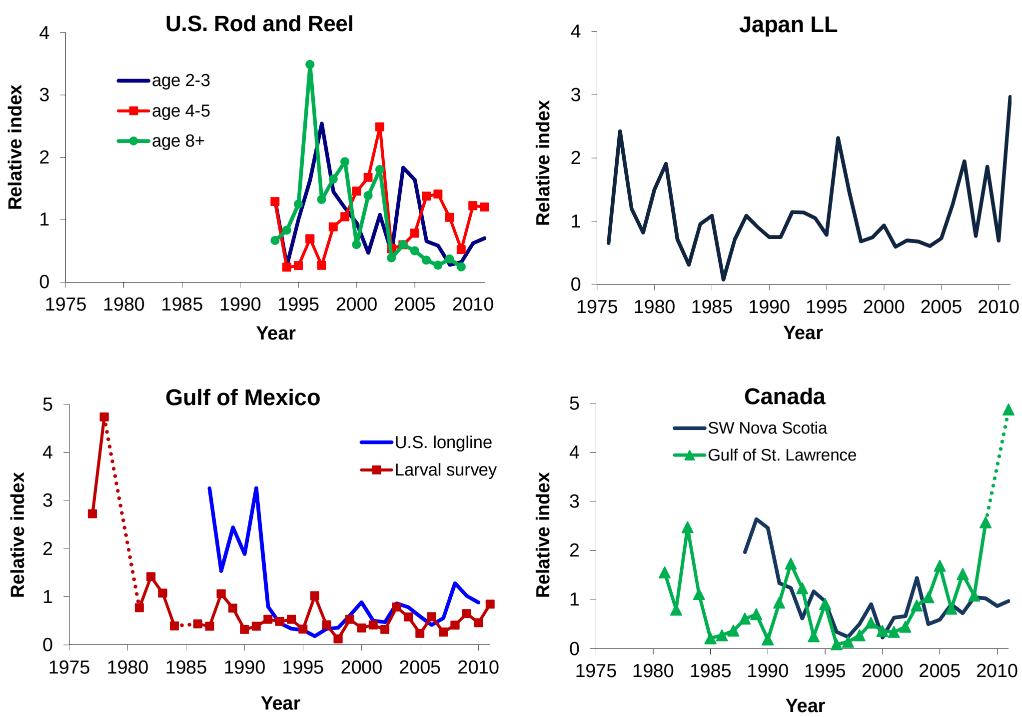
(b)



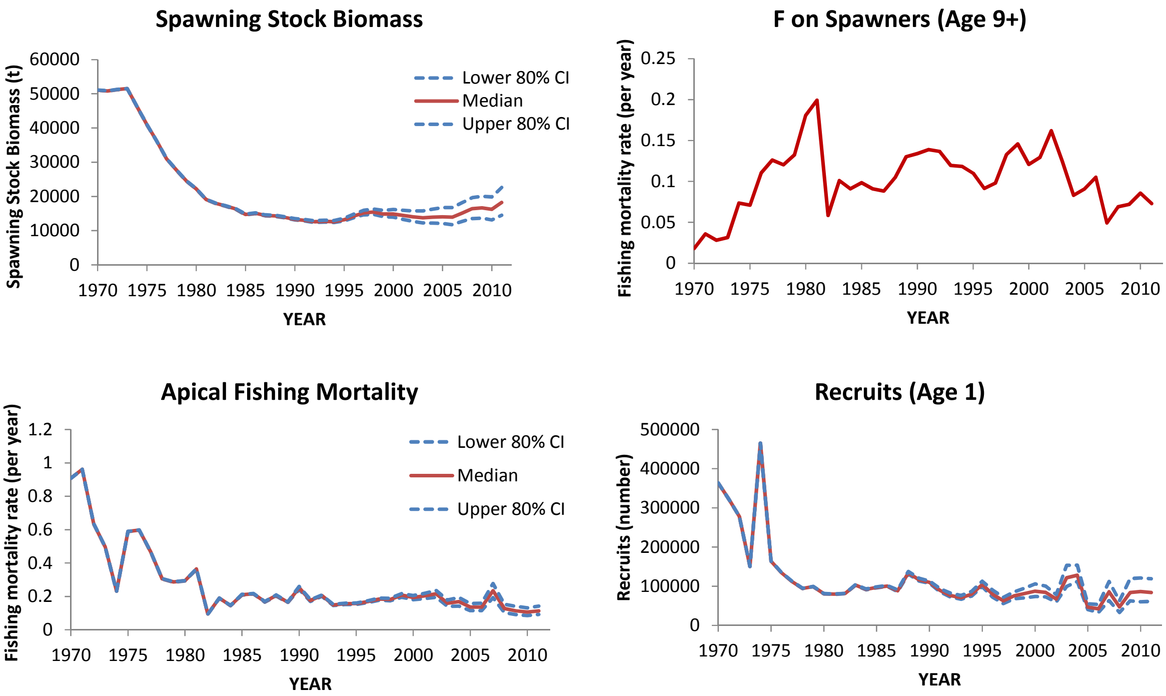
BFTW-Figure 1. Historical catches of western bluefin tuna: (a) by gear type and (b) in comparison to TAC levels agreed by the Commission.



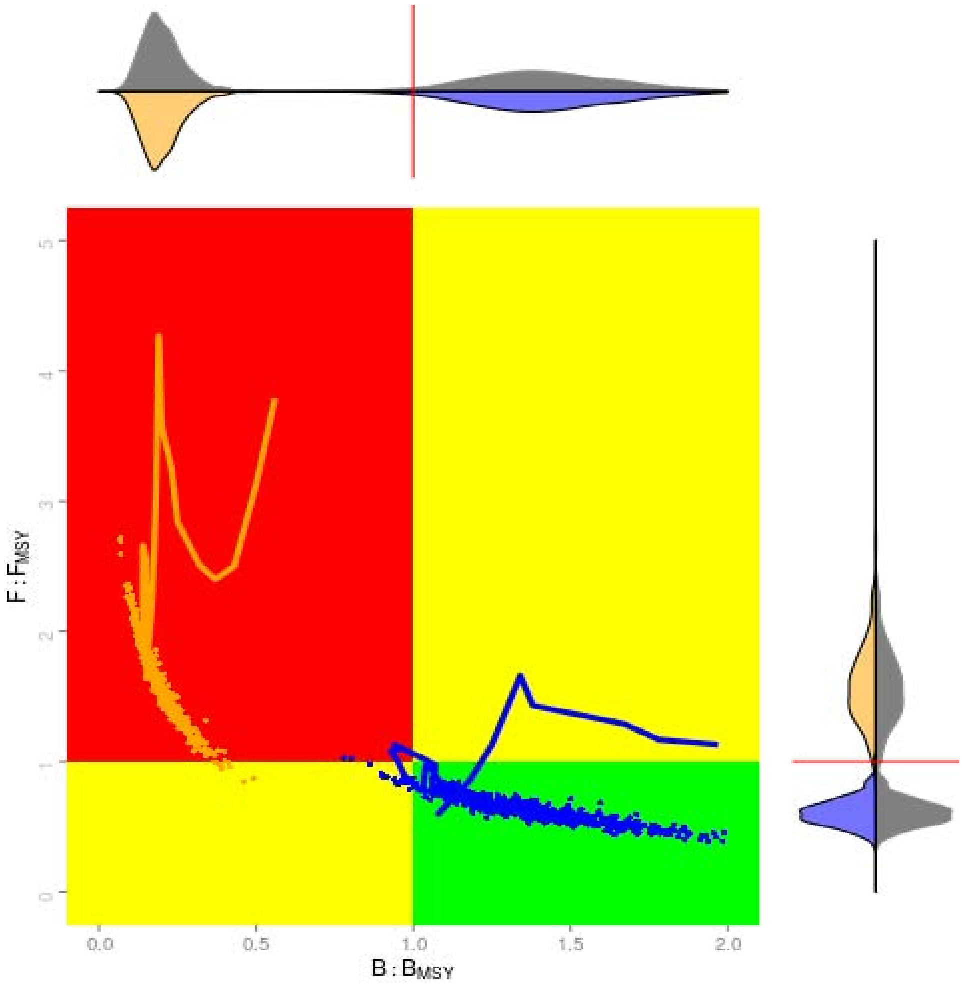
BFTW-Figure 2. Mean weight of western bluefin tuna catches by purse seine, longline, rod and reel, and all gears combined (estimated from the catch-at-size compiled information).



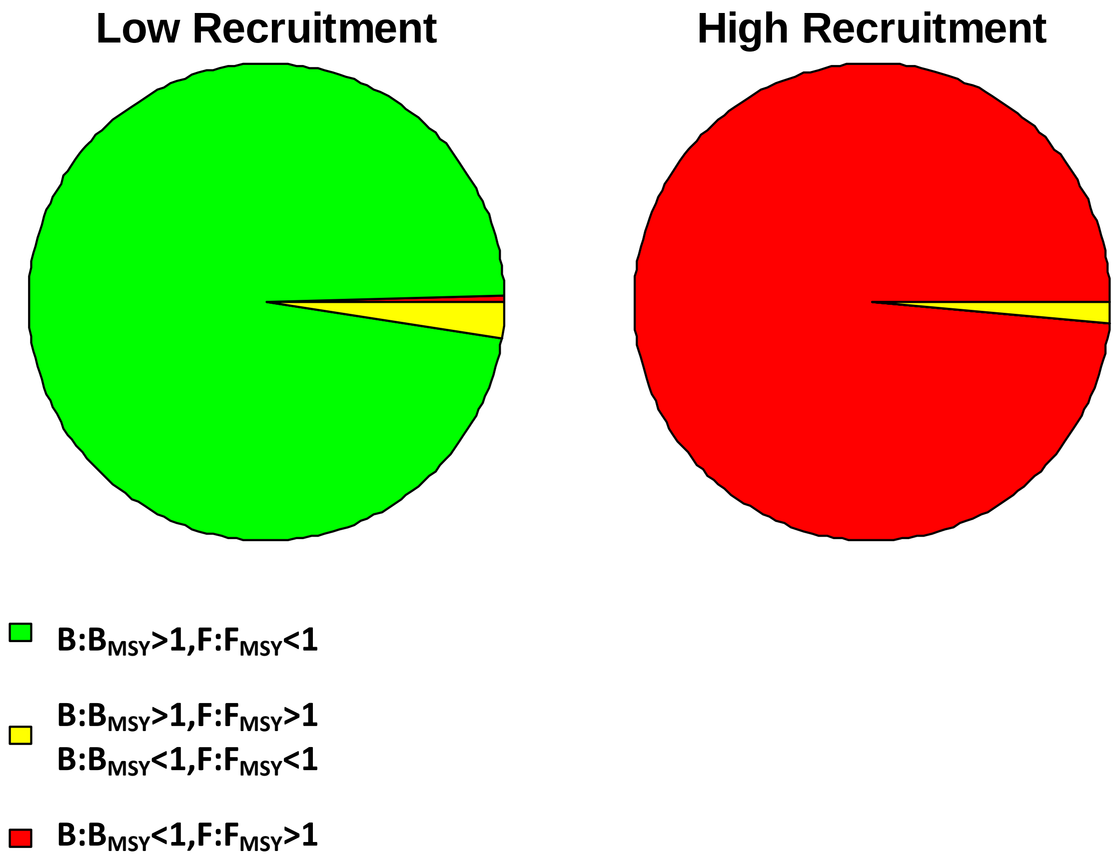
BFTW-Figure 3. Updated indices of abundance for western bluefin tuna. The dashed portions of the larval survey and Gulf of St. Lawrence CPUE series bridge the gaps between years where data were missing or otherwise considered unreliable by the 2012 SCRS (and not used in the base assessment).



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.

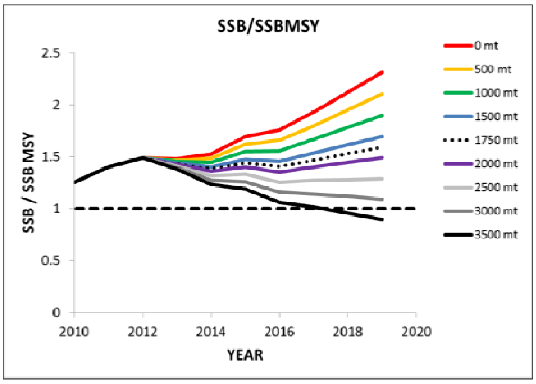


BFTW-Figure 5. Estimated status of stock relative to the Convention objectives (MSY) by year (1973 to 2011) and recruitment scenario (black=high recruitment potential, blue=low recruitment potential). The light blue dots represent the status estimated for 2011 and the clouds of symbols depict the corresponding bootstrap estimates of uncertainty..The lines give the historical point estimates. The marginal density plots shown above and to the right of the main graph reflect the frequency distribution of the bootstrap estimates of each model with respect to relative biomass (top) and relative fishing mortality (right). The frequency distributions of the combined model bootstraps are shown in light blue. The red lines represent the benchmark levels (ratios equal to 1.0)

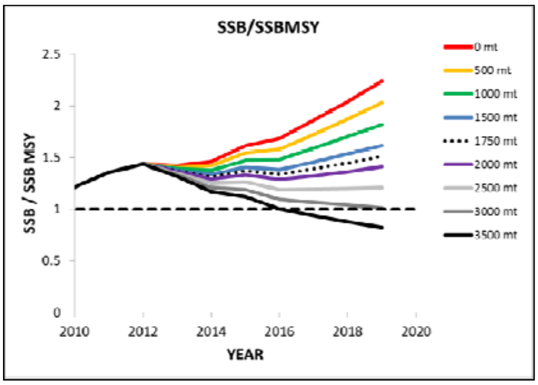


BFTW-Figure 6. Pie chart summarizing stock status, showing the proportion of model outputs that are not overfished and not undergoing overfishing (green), either overfished or undergoing overfishing (yellow) and both overfished and undergoing overfishing (red).

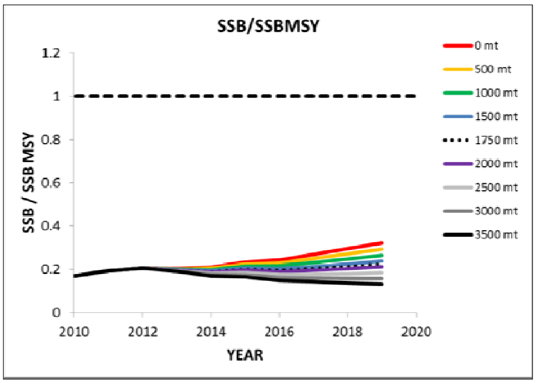
A) 50% probability
Low recruitment potential



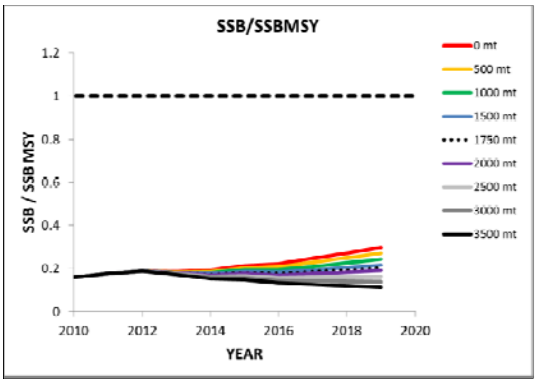
B) 60% probability
Low recruitment potential



C) 50% probability
High Recruitment potential



D) 60% probability
High recruitment potential



BFTW-Figure 7. 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.

8.6 BLUE 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. 2011b) and an assessment meeting in April 2011 (Anon. 2012a). The last year of fishery data used in the assessment was 2009.

BUM-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.

Atlantic blue marlin inhabits 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 800 m. They do not confine themselves to a narrow range of temperatures but most tend to be found in waters warmer than 17°C. The distribution of time at depth is 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 blue marlin indicates that simplistic assumptions about habitat usage made during the standardization of CPUE data may be inappropriate.

*BUM-***2***. Fishery indicators*

The decadal geographic distribution of the catches is given in **BUM-Figure 1**. The Committee used Task I catches as the basis for the estimation of total removals **(BUM-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 (Anon. 2012a) by modifying Task I values with the addition of blue 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 (Anon. 2012a) it was noted that catches continued to decline through 2009. 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 is more commonly caught with tuna schools associated with FADs than with free tuna schools. Task I catches of blue marlin (**BUM-Table 1)** in 2011 were 1,918 t, compared to 3,358 t reported for 2010. Task I catches of blue marlin for 2011 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 reduced.

A number of relative abundance indices were estimated during the blue marlin 2011 assessment. 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 to the lowest value in the series (**BUM-Figure 3**).

BUM-3. State of the stocks

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-Figure 4**). In contrast to the results of the 2006 assessment which indicated that the declining trend in biomass had partially stabilized, current results indicate a continued decline trend. Current status of the blue marlin stock is presented in **BUM Figure 5.** However, the Committee recognizes the high uncertainty with regard to data and the productivity of the stock.

BUM-4. Outlook

Although uncertain, the results of the 2011 stock assessment indicated that if the recent catch levels of blue marlin (3,358 t in 2010) are not substantially reduced, the stock will continue to decline further (**BUM-Figure 6**). The current management plan does not have the potential of recovering the blue marlin stock to the B_{MSY} level.

BUM-5. Effect of current regulations

Recommendations [Rec. 00-13], [Rec. 01-10] and [Rec. 02-13] placed additional catch restrictions for blue marlin. Recommendation [02-13] 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 50% for blue marlin of the 1996 or 1999 landing levels, whichever is greater. It also established that all blue marlin brought to pelagic longline and purse seine vessels alive shall be released in a manner that maximizes their survival. This provision does not apply to marlins that are dead when brought along side of 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 [Rec. 00-13] and [Rec. 02-13]. Catches of these fleets represent 97% of all longline caught blue 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. This analysis represents only longline caught blue marlin even though the recommendations referred to the combined catch of pelagic longline and purse seine, because the catch estimates of billfish by-catch 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 since 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-6. Management recommendations

The current blue marlin stock 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-Table 2**):

To facilitate the implementation of the TAC, the Commission may consider the adoption of measures such as, but not limited to the mandated use of non-offset circle hooks as terminal gear. An alternative approach to time-area closures could be the use of non-offset circle hooks as terminal gear. Recent research has demonstrated that in some longline fisheries the use of non-offset circle hooks resulted in a reduction of marlin mortality, while the catch rates of several of the target species remained the same or were greater than the catch rates observed with the use of conventional J hooks or offset circle hooks. The Committee considers that this approach may be more efficient and enforceable than time-area closures and, thus, it recommends that the Commission considers this alternative approach. Currently, three ICCAT member nations (Brazil, Canada, and the U.S.) already mandate or encourage the use of circle hooks on their pelagic longline fleets. In addition, reducing fishing mortality of blue marlin from non-industrial fisheries should be considered.

ATLANTIC BLUE MARLIN SUMMARY

	BUM
Maximum Sustainable Yield	2,837 t (2,343 – 3,331 t)[1]
Current (2011) Yield	1,918 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]
Overfished	Yes
Overfishing	Yes
Conservation and Management Measures 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] 2011 yield should be considered provisional. The 2009 yield used in the 2011 assessment was 3,341 t.

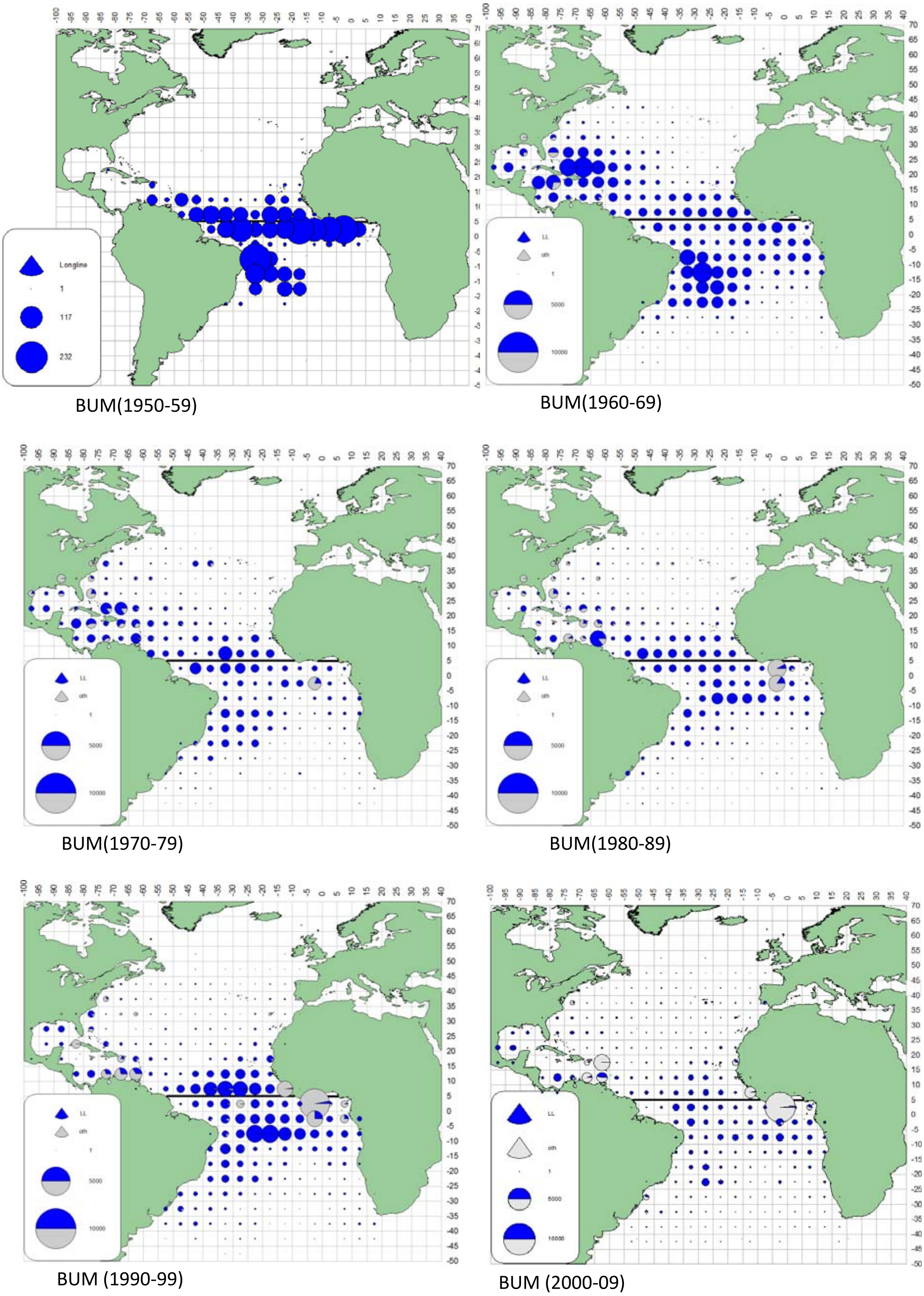
BUM-Table 1. Estimated catches (t) of Atlantic blue marlin (*Makaira nigricans*) by area, gear and flag.

			1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
TOTAL			2237	2882	4325	4565	4171	3027	3044	4127	4063	5199	5488	5458	5086	4980	4018	3290	3877	2404	3603	2478	3517	4665	3405	3358	1918
	ATN		1020	1027	1632	1970	1430	1122	1071	1537	1560	1961	2011	2494	2017	2156	1307	1082	1199	795	1592	832	1078	2126	1610	1695	927
	ATS		1217	1855	2693	2595	2741	1905	1974	2590	2503	3238	3478	2963	3069	2824	2711	2208	2678	1609	2011	1646	2439	2539	1795	1664	991
Landings	ATN	Longline	418	459	995	1607	982	625	613	1088	991	1339	1413	1300	1078	971	492	477	533	518	561	512	600	912	825	868	570
		Other surf.	284	258	300	155	245	261	217	220	343	363	440	1088	820	1089	694	466	625	212	988	221	316	980	651	697	173
		Sport (HL+RR)	181	186	147	49	62	90	113	118	73	64	60	56	38	36	97	90	22	31	18	62	120	197	92	110	133
	ATS	Longline	964	1530	2017	1958	2286	1490	1419	1767	1679	2194	2545	2068	1977	1776	1465	901	1234	909	1010	807	1400	1051	945	819	539
		Other surf.	253	324	675	634	453	414	553	821	822	1041	863	893	1090	1049	1245	1308	1444	701	1000	836	1030	1484	847	839	443
		Sport (HL+RR)	0	1	1	2	1	0	1	2	2	2	28	0	0	0	0	0	0	0	2	1	9	3	3	6	7
Discards	ATN	Longline	138	124	191	159	142	146	127	111	153	196	97	49	81	60	22	37	19	34	24	36	42	37	40	19	52
		Other surf.	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	1	42	2	2	0	0	0	0	0	0	2	0	0	0	0	2
Landings	ATN	Barbados	13	46	3	18	12	18	21	19	31	25	30	25	19	19	18	11	11	0	0	25	0	0	0	9	13
		Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
		Brasil	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0
		Canada	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	41	48	41	51	79	133	9	31	15	17	10	49	0	4	2	26	47	35
		Chinese Taipei	52	26	11	937	716	336	281	272	187	170	355	80	44	64	65	48	66	104	38	35	30	16	25	13	27
		Cuba	68	94	74	112	127	135	69	39	85	43	53	12	38	55	56	34	3	4	7	7	0	0	0	0	
		Curaçao	50	50	50	50	40	40	40	40	40	40	40	40	40	40	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	64	69	75	36	44	55	58	106	76	76	60
		Dominican Republic	0	0	0	0	0	0	0	0	0	0	41	71	29	19	23	0	207	0	0	0	0	0	0	0	
		EU.España	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	776	0	0	753	434	498	
		EU.Portugal	8	2	5	1	4	2	15	11	10	7	3	47	8	20	17	2	31	27	24	36	56	56	25	56	16
		Grenada	33	34	40	52	64	52	58	52	50	26	47	60	100	87	104	69	72	45	42	33	49	54	45	45	45
		Jamaica	0	0	0	0	0	0	0	0	0	0	24	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Japan	78	206	593	250	145	193	207	532	496	798	625	656	427	442	155	125	148	174	251	199	221	489	477	460	259
		Korea Rep.	13	14	252	240	34	11	2	16	16	41	16	0	0	0	0	0	0	0	3	14	30	43	0	53	44
		Liberia	0	0	0	0	0	0	0	0	87	148	148	701	420	712	235	158	115	0	0	0	0	0	0	0	
		Maroc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	**0**
		Mexico	0	0	0	0	0	0	3	13	13	13	13	27	35	68	37	50	70	90	86	64	91	81	93	89	68
		Mixed flags (FR+ES)	0	0	0	0	0	0	0	0	0	0	0	0	0	34	71	35	38	65	37	29	43	26	39	45	49
		NEI (BIL)	94	74	103	18	20	38	0	0	0	0	0	0	0	52	164	254	151	28	0	49	68	82	45	0	
		NEI (ETRO)	0	0	0	0	0	0	71	134	149	178	225	330	312	202	112	7	6	0	0	0	0	0	0	0	
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	
		Philippines	0	0	0	0	0	0	0	0	0	0	0	5	38	38	0	0	0	0	0	0	0	1	0	0	
		Senegal	0	0	1	1	4	8	0	9	0	2	5	0	0	0	11	24	32	11	1	5	91	114	61	41	64
		St. Vincent and Grenadines	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	4	1	0	10	5	0	18	17	21	53	46	70	72	58	58
		Trinidad and Tobago	93	45	13	11	6	1	2	16	28	14	49	15	20	51	17	16	9	11	7	14	16	34	26	22	22
		U.S.A.	291	221	124	29	33	51	80	88	43	43	46	50	37	24	16	17	19	26	16	17	9	13	6	4	7
		U.S.S.R.	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	6	8	15	17	18	19	11	15	15	15	3	5	1	2	2	2	2	2	2	2	2	2	2	1	2
		UK.British Virgin Islands	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**
		UK.Turks and Caicos	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	**0**
		Ukraine	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

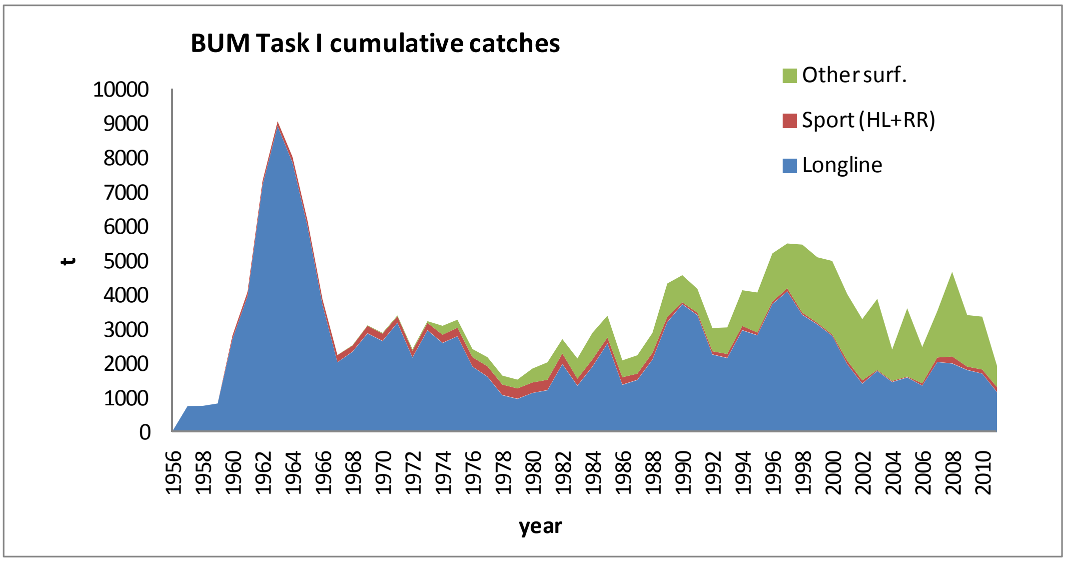
		Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	6	8
		Venezuela	60	76	149	70	49	66	74	122	106	137	130	205	220	108	72	76	84	83	138	131	206	120	107	136	96
	ATS	Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	2	3
		Benin	4	12	0	6	6	6	6	5	5	5	5	5	5	5	0	0	0	0	0	0	0	0	0	0	
		Brasil	51	74	60	52	61	125	147	81	180	331	193	486	509	452	780	387	577	195	612	298	262	182	150	133	63
		China P.R.	0	0	0	0	0	0	0	21	25	21	27	41	68	15	61	73	72	49	47	0	61	11	51	54	64
		Chinese Taipei	265	266	462	767	956	488	404	391	280	490	1123	498	442	421	175	246	253	211	113	64	203	132	170	140	172
		Cuba	137	191	77	90	62	69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Côte D'Ivoire	100	130	82	88	105	79	139	212	177	157	222	182	275	206	196	78	109	115	107	178	150	991	463	450	42
		EU.España	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	2	1	6	1	0	24	69	79	102	81	84	38
		Gabon	0	0	0	0	0	0	1	2	0	304	5	0	0	0	1	0	3	0	0	0	0	0	0	0	
		Ghana	5	7	430	324	126	123	236	441	471	422	491	447	624	639	795	999	415	470	759	405	683	191	140	116	332
		Japan	362	617	962	967	755	824	719	991	913	881	724	529	363	441	180	142	294	366	191	290	699	539	345	272	177
		Korea Rep.	139	361	437	84	503	13	11	40	40	103	40	2	3	1	1	0	0	1	4	19	33	47	8	32	13
		Mixed flags (FR+ES)	132	137	144	199	137	116	146	133	126	96	82	80	83	113	80	96	110	106	112	108	92	113	125	133	
		NEI (BIL)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	20	4	16	61	7	110	141	123	133	0	
		NEI (ETRO)	0	0	0	0	0	0	103	192	214	256	323	474	449	290	162	10	8	0	0	0	0	0	0	0	
		Namibia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	10
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	38	0	0	0	0	0	0	0	0	0	0	
		Philippines	0	0	0	0	0	0	0	0	0	0	0	2	33	0	0	0	0	0	0	0	0	7	0	0	
		Russian Federation	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	28	19	17	18	21	25	28	33	36	35	33	30	32	32	32	32	9	21	26	0	68	70	72	72
		South Africa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0	0	2	0	0	1	0
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
		Togo	0	0	0	0	0	0	0	0	0	0	23	0	73	53	141	103	775	0	0	0	0	0	0	0	
		U.S.S.R.	22	32	5	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	0	0	0	0	0	0	0	0	2	2
		Uruguay	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	1	1
Discards	ATN	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	3
		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.	138	124	191	159	142	146	127	111	153	196	97	50	81	60	25	49	19	35	25	36	42	38	42	19	49
	ATS	Brasil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	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	0	2
		U.S.A.	0	0	0	0	0	0	0	0	0	1	42	2	2	0	0	0	0	0	0	0	0	0	0	0	

BUM-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%.

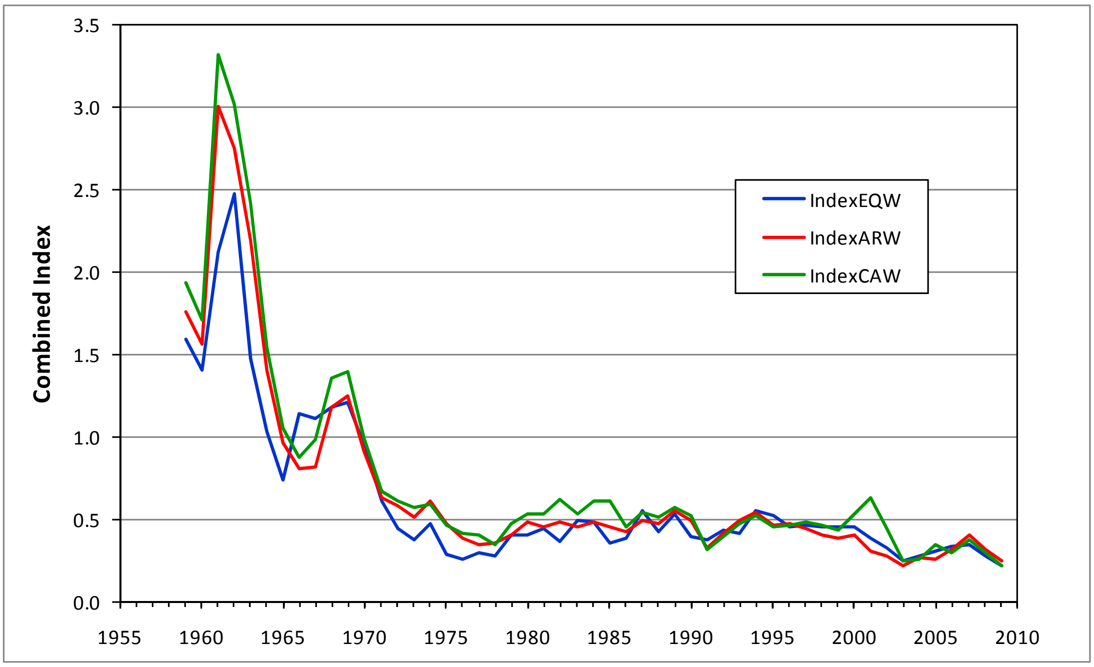
	TAC								
Year	**0**	**500**	**1000**	**1500**	**2000**	**2500**	**3000**	**3500**	**4000**
2012	0%	0%	0%	0%	0%	0%	0%	0%	0%
2013	2%	2%	1%	1%	1%	1%	0%	0%	0%
2014	9%	6%	4%	3%	2%	1%	1%	0%	0%
2015	19%	13%	9%	6%	3%	2%	1%	0%	0%
2016	33%	23%	15%	9%	5%	3%	1%	0%	0%
2017	49%	35%	22%	13%	7%	3%	2%	0%	0%
2018	63%	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%



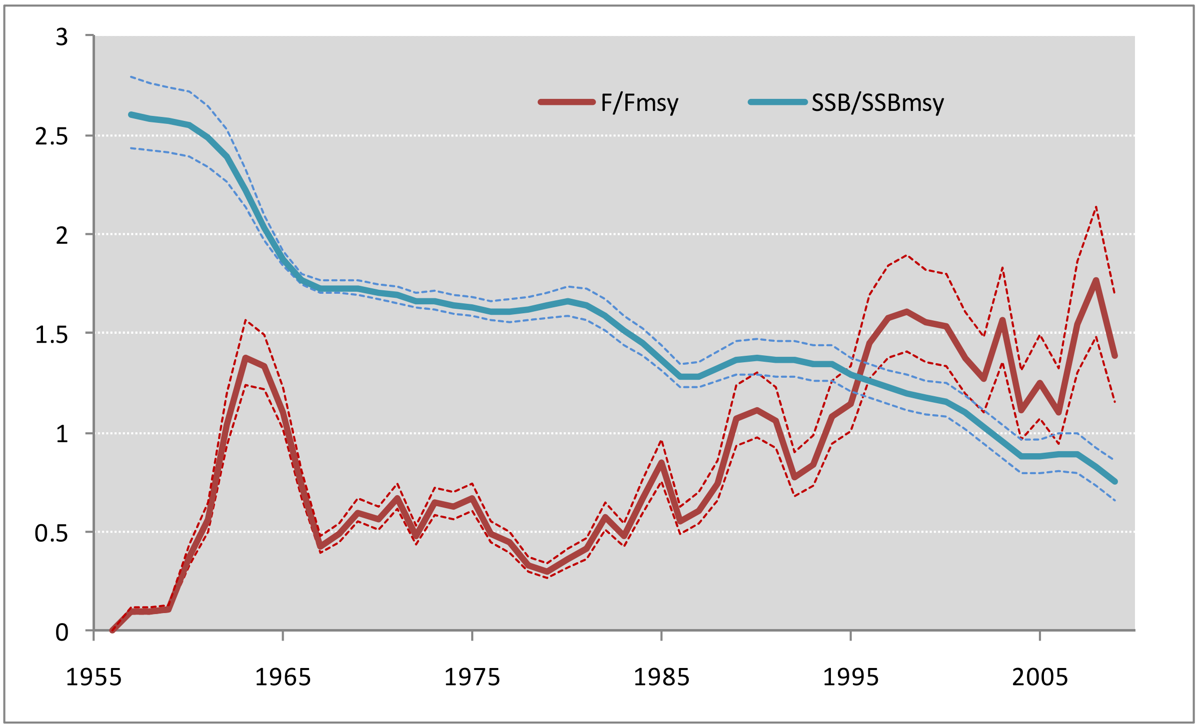
BUM-Figure 1. Geographic distribution of mean blue marlin catch by major gears and decade.



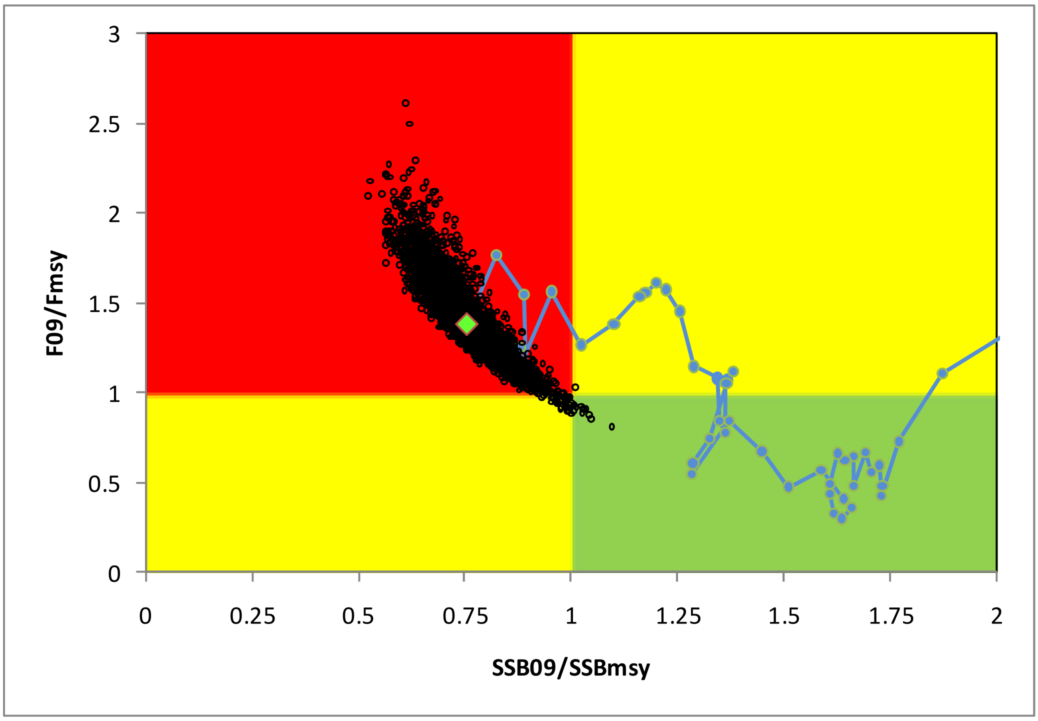
BUM-Figure 2. Total catch of blue marlin reported in Task I.



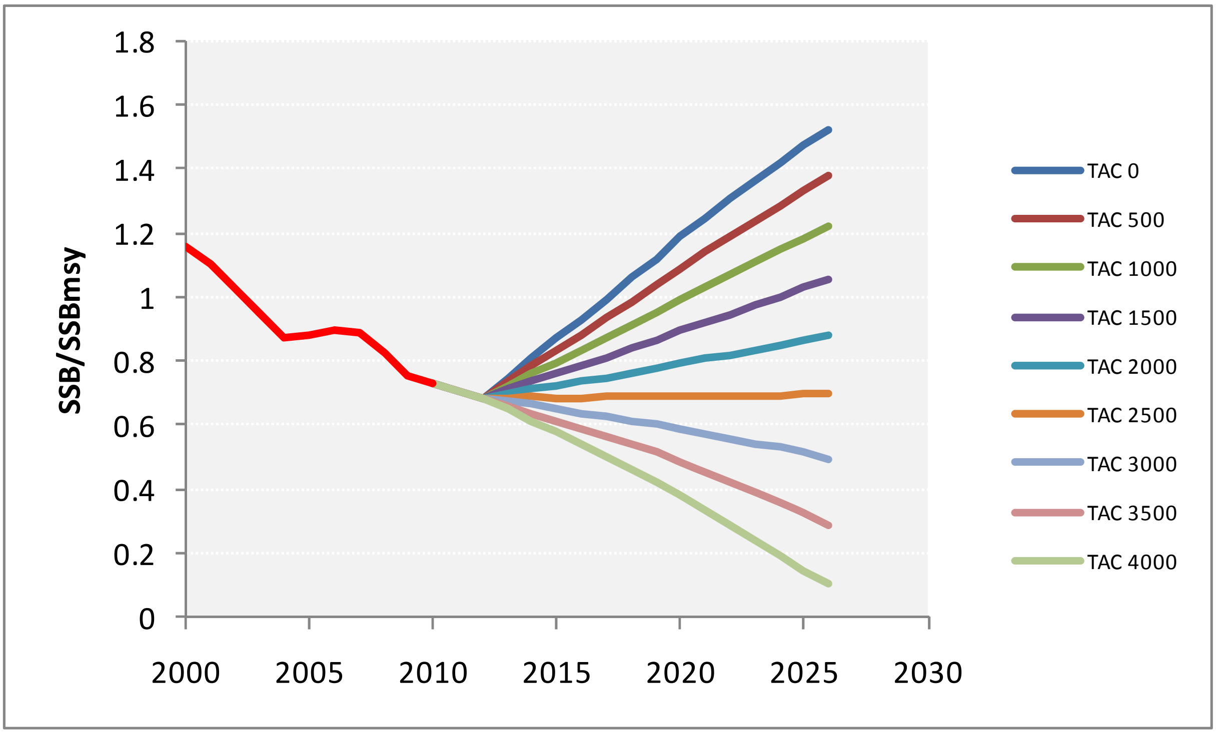
BUM-Figure 3. Blue marlin standardized combined CPUE indices estimated using equal weighting for all CPUE series (EQW), weighting the CPUE series by area (ARW) and by catch (CAW).



BUM-Figure 4. 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-Figure 5. 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-Figure 6. 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 a catch of 3,341 t was assumed.

8.7 WHM-WHITE MARLIN

The most recent assessment for white marlin was conducted in 2012 through a process that included a data preparatory meeting in April 2011 (Anon. 2012a) and an assessment meeting held in May 2012 (Report of the 2012 White Marlin Stock Assessment Meeting, SCRS/2012/012). The last year of fishery data used in the assessment was 2010.

WHM-1. Biology

White marlin spawning areas occur mainly in the tropical western North and South Atlantic, predominantly in the same offshore locations in their normal range. In the North Atlantic, spawning activity has been reported off eastern Florida (USA), the Windward Passage (between La Hispaniola and Cuba), and north of Puerto Rico. Seasonal spawning concentrations have been noted northeast of Hispaniola and Puerto Rico, and off the east coast of Hispaniola. Spawning activity has also been reported for the equatorial Atlantic (5°N-5°S) off northeastern Brazil, and in the South Atlantic off southern Brazil.

Previous reports have mentioned that spawning takes place during austral and boreal spring-summer. In the North Atlantic, reproduction events occur from April to July, with spawning activity peaking around April-May. In the equatorial Atlantic (5°N-5°S), spawning occurs during May-June, and in the South Atlantic, reproduction events take place from December to March.

White marlin inhabits the surface mixed layer of the open ocean. Although they spend most of their time in the warm waters of the epipelagic zone, they do not confine themselves to a narrow range of temperatures but are known to explore temperatures ranging 7.8-29.6 °C. Information from pop-up satellite archival tag (PSAT) data indicated frequent short-duration dives extending to >300 m depths, although most dives ranged from 100 to 200 m. Two types of diving behavior have been identified for white marlin, (1) a shorter duration V-shaped dive, and (2) a U-shaped dive characterized as those confined to a specific depth range for a prolonged period. These patterns, however, can be highly variable between individuals and also vary depending on the temperature and dissolved oxygen of the surface mixed layer. Therefore, it is important to consider vertical habitat use and the environmental factors that influence it during the standardization of CPUE data.

All white marlin biological material sampled prior to the confirmation of the presence of roundscale spearfish (*T. georgii*) in 2006, are now presumed to contain an unknown proportion of roundscale spearfish. Therefore reproductive parameters, growth curves and other biological studies previously thought to describe white marlin may not accurately represent this species.

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 most likely comprise a mixture of the two species. Studies of white marlin/roundscale spearfish ratios in the western Atlantic have been conducted, with overall estimated ratios between 23-27%, although they varied in time and space. Previously, these were thought to represent only white marlin. However, there is little information on these species ratios in the eastern Atlantic.

The decadal geographic distribution of the catches is given in **WHM-Figure 1**. The Committee used Task I catches as the basis for the estimation of total removals **(WHM-Figure 2)**. Total removals for the period 1990-2010 were obtained during the 2012 White Marlin Stock Assessment Session by modifying Task I values with the addition of white marlin that the Committee estimated from catches reported as billfish unclassified. Additionally the reporting gaps for some fleets were completed using estimates based on catch values reported for years before and/or after the gap(s) years.

Task I catches of white marlin in 2010 and 2011 were 431 t and 346 t, respectively (**WHM-Table 2)**. Task I catches of white marlin for 2011 are to be considered 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 series of indices of abundance for white marlin were presented and discussed during the 2011 and 2012 meetings. Following the guidelines developed by the SCRS Working Group on Stock Assessment Methods (WGSAM), seven CPUE series were selected for their inclusion in the assessment models. In general, the indices showed no discerning trend during the latter part of the time series examined (**WHM-Figure 3**). During the 2012 assessment, an estimated standardized combined CPUE index for white marlin showed a sharp decline during the period 1960-1991, and a relatively stable trend thereafter (**WHM-Figure 3**).

WHM-3. State of the stock

Unlike the partial assessment conducted in 2006, the Committee conducted a full assessment in 2012, which included estimations of management benchmarks. Two models were used to estimate the status of the stock, a surplus production model (ASPIC), and a fully integrated model (SS3). The methods used for the fully integrated model followed very closely to those used in the 2011 blue marlin assessment. As recommended by the Committee in 2010, the model configuration was an effort to use all available data on white marlin, including lengths, dimorphic growth patterns and other biological data. Although it is believed that the modeling methods employed were relatively robust, the input data for the models were very likely less so. Perhaps the most important uncertainty was that associated with the landings data. There remains uncertainty not only in the species composition but also the magnitude of the catch. This is especially a problem with the landings data starting in 2002 when CPCs were mandated to release billfish that were alive at haulback. This lead to a decrease in reported landings but not necessarily a decrease in fishing and/or release mortality. This apparent drop in landings lead to a marked decrease in the estimates of F/F_{MSY} from 2002-present, however the Committee considers that this trend is likely overly optimistic due to unreported catch and unaccounted release mortality.

The results of the 2012 assessment indicated that the stock remains overfished but most likely not undergoing overfishing (**WHM-Figure 4, Figure 5**). Relative fishing mortality has been declining over the last ten years and is now most likely to be below F_{MSY} (**WHM-Figure 6**). Relative biomass has probably stopped declining over the last ten years, but still remains well below B_{MSY} (**WHM-Figure 6**). There is considerable uncertainty in these results. The two assessment models provide different estimates about the productivity of the stock, with the integrated model suggesting that white marlin is a stock that can rebuild relatively fast whereas the surplus production model suggests the stock will rebuild very slowly. The results from both approaches are considered to be equally plausible. These results are conditional on the reported catch being a true reflection of the fishing mortality experienced by white marlin. Sensitivity analyses suggest that if recent fishing mortality has been greater than reported, because discards are not reported by many fleets, estimates of stock status would be more pessimistic and current relative biomass would be lower and overfishing would continue. The presence of unknown quantities of roundscale spearfish in the reported catches and data used to estimate relative abundance of white marlin increases the uncertainty for the stock status and outlook for this species.

WHM-4. Outlook

The outlook for this stock remains uncertain because of the possibility that reported catches underestimate fishing mortality and the lack of certainty in the productivity of the stock. As a result forecasts of how the stock will respond to different levels of catch are uncertain (**Table 2**). At current catch levels of about 400 t the stock will likely increase in size, but is very unlikely to rebuild to B_{MSY} in the next ten year period (**Table 2**). Fishing mortality is highly likely to remain below F_{MSY}. The speed at which the stock biomass may increase and the time necessary to rebuild the stock to B_{MSY} remain highly uncertain. This will depend on whether current reported catches are true estimates of fishing mortality, and on the true productivity of the white marlin stock.

WHM-5. Effect of current regulations

Recommendations [Rec. 00-13], [Rec. 01-10] and [Rec. 02-13] placed additional catch restrictions on white marlin. Recommendation [02-13] established that the annual amount of white marlin that can be harvested by pelagic longline and purse seine vessels and retained for landing must be no more than 33% with respect to 1996. It also established that all white marlin brought to pelagic longline and purse seine vessels alive shall be released in a manner that maximizes their survival. This provision does not apply to marlins that are dead when brought alongside 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 they thought would be affected by Recommendations [Rec. 00-13] and [Rec. 02-13]. Catches from these fleets represent 93% of all longline caught white marlin during the period 1990-2007. Catches of white marlin have declined since 1996-99, the period selected as the reference period by the recommendations. Since 2002, the year of implementation of [Rec. 01-10] and [Rec. 02-13], the catch of white marlin 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 white marlin catches originated from industrial fisheries. Since then, the Committee noted a significant increase in the contribution from non-industrial fisheries to the total of white marlin harvest and that these fisheries are not fully accounted for in the current management plan.

The Committee noted that more countries have started reporting data on live releases in 2006. However there is not enough information on the proportion of fish being released alive to evaluate the effectiveness of the ICCAT recommendation, relating to the live release of white marlin.

WHM-6. Management recommendations

Further reductions in fishing mortality are likely to speed up the rebuilding of the stock. Unfortunately, the inability to accurately estimate fishing mortality will continue to compromise our ability to monitor the stock's recovery period. This is due to the inadequate reporting of discards, as well as the lack of reports from some artisanal and recreational fisheries that take marlin species. It is therefore recommended that measures taken to ensure that monitoring and reporting of discards, including live releases, are appropriate and accurate. Only when the true magnitude of current fishing mortality is estimated can the level of catch required to rebuild the stock be precisely estimated. Until then the Commission, at the minimum, should ensure catches do not exceed current levels.

One approach to reduce fishing mortality could be the use of non-offset circle hooks as terminal gear. Recent research has demonstrated that in some longline fisheries the use of non-offset circle hooks resulted in a reduction of marlin mortality, while the catch rates of several of the target species remained the same or were greater than the catch rates observed with the use of conventional J hooks or offset circle hooks. The Committee considers that this approach may be more efficient and enforceable than time-area closures and, thus, it recommends that the Commission considers this alternative approach. Currently, three ICCAT Contracting Parties (Brazil, Canada, and the United States) already mandate or encourage the use of circle hooks on their pelagic longline fleets. In addition, reducing fishing mortality of white marlin from non-industrial fisheries should be considered.

ATLANTIC WHITE MARLIN SUMMARY

MSY	874 t [1] - 1604 t [2]
Current (2011) Yield	344 t [3]
Relative Biomass:	
B_{2010}/B_{MSY}	0.50 (0.42-0.60)[4]
SSB_{2010}/SSB_{MSY}	0.322 (0.23-0.41)[5]
Relative Fishing Mortality:	
F_{2010}/F_{MSY}	0.99 (0.75-1.27)[4] 0.72 (0.51-0.93)[5]
[6]$Catch_{recent}/Catch_{1996}$ Longline and Purse seine	0.36
Overfished	Yes
Overfishing	Not likely[7]
Conservation and Management Measure in Effect:	Recommendation [Rec. 06-09]. The annual amount of white 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 of the 1996 or 1999 landing levels, whichever is greater.

[1] ASPIC estimates.
[2] SS3 estimates.
[3] 2011 yield should be considered provisional, 2010 yield was 431 t.
[4]ASPIC estimates with 10 and 90 percentiles.
[5]SS3 estimates with approximate 95% confidence intervals.
[6] Catch $_{recent}$ is the average annual longline and purse seine catch for 2008-2010.
[7]Overfishing could be occurring if catches are under reported.

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

			1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
TOTAL			1552	1396	1829	1659	1627	1462	1544	2114	1761	1573	1430	1682	1569	1368	978	905	732	742	655	447	601	634	656	431	346
	ATN		648	436	376	407	239	610	543	660	639	669	483	529	492	484	431	293	253	257	287	196	162	136	203	217	165
	ATS		904	960	1453	1252	1388	853	1002	1454	1122	905	947	1152	1077	883	547	612	478	485	368	251	438	498	453	214	181
Landings	ATN	Longline	494	196	241	266	108	466	413	531	473	554	431	475	399	408	381	230	204	204	252	161	123	105	164	192	133
		Other surf.	54	150	11	40	21	35	34	57	48	31	10	17	29	34	30	24	32	24	17	23	30	19	23	12	6
		Sport (HL+RR)	38	29	16	21	19	21	30	30	18	20	9	6	6	2	4	6	1	1	1	2	1	2	2	6	3
	ATS	Longline	870	832	1333	1152	1328	805	950	1420	1086	860	853	979	1021	827	475	497	425	454	325	202	404	417	381	159	140
		Other surf.	34	128	119	96	60	48	52	33	31	40	57	173	55	56	71	116	53	31	43	48	15	80	72	53	39
		Sport (HL+RR)	0	0	0	4	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Discards	ATN	Longline	62	60	107	81	90	88	66	42	100	64	33	31	57	41	16	29	17	27	17	9	8	9	13	8	23
		Other surf.	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	4	0	0	0	0	0	0	2	0	0
	ATS	Longline	0	0	0	0	0	0	0	0	0	0	37	1	0	0	1	0	0	0	0	2	19	1	0	2	2
Landings	ATN	Barbados	0	117	11	39	17	24	29	26	43	15	41	33	25	25	24	15	15	0	0	33	0	0	0	6	3
		Brasil	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**
		Canada	1	0	0	0	0	0	0	4	4	8	8	8	5	5	3	2	1	2	5	3	2	2	1	2	1
		China P.R.	0	0	0	0	0	0	0	6	7	6	7	10	20	1	7	4	2	1	4	1	0	1	3	4	1
		Chinese Taipei	153	0	4	85	13	92	123	270	181	146	62	105	80	59	68	61	15	45	19	16	1	0	1	1	1
		Costa Rica	0	0	0	0	0	0	0	0	0	0	0	0	3	14	0	0	1	0	0	0	0	0	0	0	
		Cuba	30	13	21	14	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	
		EU.España	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	1	0	0	0
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	11	30	3	2	0	1	2	1
		Grenada	0	0	0	0	0	0	0	0	0	0	0	0	0	1	15	8	14	33	10	12	11	17	14	0	
		Japan	60	68	73	34	45	180	33	41	31	80	29	39	25	66	15	10	21	23	28	27	10	22	27	31	24
		Korea Rep.	2	2	82	39	1	9	4	23	3	7	5	0	0	0	0	0	0	0	4	0	0	0	8	19	19
		Liberia	0	0	0	0	0	0	0	0	0	1	1	3	8	4	3	4	3	0	0	0	0	0	0	0	
		Mexico	0	0	0	0	0	0	2	8	8	3	5	6	11	18	44	15	15	28	25	16	13	14	19	20	28
		Mixed flags (FR+ES)	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5	3	3	5	3	2	2	2	3	3	
		NEI (BIL)	0	0	0	0	0	0	0	0	0	0	0	0	0	34	72	4	8	0	26	9	14	18	20	0	
		NEI (ETRO)	0	0	0	0	0	0	23	43	47	57	72	105	100	64	36	2	2	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	
		Philippines	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	1	0	0	**0**
		St. Vincent and Grenadines	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	44	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	
		Trinidad and Tobago	61	29	7	6	3	0	1	11	18	8	32	10	13	4	2	5	12	6	6	5	12	10	11	15	15
		U.S.A.	124	42	10	17	13	11	19	13	7	12	8	5	5	1	3	6	1	1	1	1	0	2	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	0	0	0	0	1	1	1	1	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	1	0	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	**0**
		Venezuela	154	42	47	79	47	187	226	148	171	164	90	80	61	25	72	110	55	55	60	26	52	26	70	54	47
	ATS	Argentina	0	0	8	9	6	0	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	1	0	1	0	0	0	0	0	0	0	0	0	0	0	
		Brasil	93	149	204	205	377	211	301	91	105	75	105	217	158	105	172	407	266	80	244	90	52	55	53	36	60
		Cambodia	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	
		China P.R.	0	0	0	0	0	0	0	3	4	3	4	5	10	1	13	19	6	6	4	5	10	3	5	4	2
		Chinese Taipei	613	565	979	810	790	506	493	1080	726	420	379	401	385	378	84	117	89	127	37	28	53	38	27	19	27

		Cuba	62	24	22	6	10	10	0	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	1	2	1	5	1	2	2	3	1	1	1	1	3	2	0	1
		EU.España	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	8	0	19	0	35	39	9	16
		Gabon	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Ghana	6	88	68	31	17	14	22	1	2	1	3	7	6	8	21	2	1	1	1	0	0	4	4	0	1
		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	74	76	73	92	77	68	49	51	26	32	29	17	15	17	41	5	12	13	6	11	11	12	16	10	12
		Korea Rep.	25	17	53	42	56	1	4	20	20	52	18	0	0	0	0	0	11	40	3	0	113	96	70	24	24
		Mixed flags (FR+ES)	25	25	27	37	11	10	12	11	9	7	7	9	8	9	8	9	10	8	8	8	7	8	9	9	37
		NEI (BIL)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	21	134	16	27	156	186	179	0	
		NEI (ETRO)	0	0	0	0	0	0	91	171	190	228	288	421	399	258	144	9	7	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	
		Philippines	0	0	0	0	0	0	0	0	0	0	0	1	8	0	0	0	0	0	0	0	0	1	0	0	**0**
		S. Tomé e Príncipe	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	2	0	0	0	0	0	0	0	0	**0**
		Togo	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	2	0	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	6	1	1	1	1	3	0	3	0	1	24	22	0	0	0	1	9	2	5	9	3	0	5	0	
	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
Discards	ATN	U.S.A.	62	60	107	81	90	88	66	42	100	64	33	32	57	41	17	33	17	27	17	10	8	10	14	8	23
	ATS	Brasil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	19	1	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	2
		U.S.A.	0	0	0	0	0	0	0	0	0	0	37	1	0	0	1	0	0	0	0	0	0	0	0	0	

WHM-Table 2. Kobe II Strategy Matrix (K2SM) of the combined models (ASPIC and SS3). Percent values indicate the probability of achieving the goal of $F<F_{MSY}$, $B>B_{MSY}$, and $SSByr >= SSB_{MSY}$ and $Fyr < F_{MSY}$ for each year (yr) under different constant catch scenarios (TAC tons).

F<Fmsy

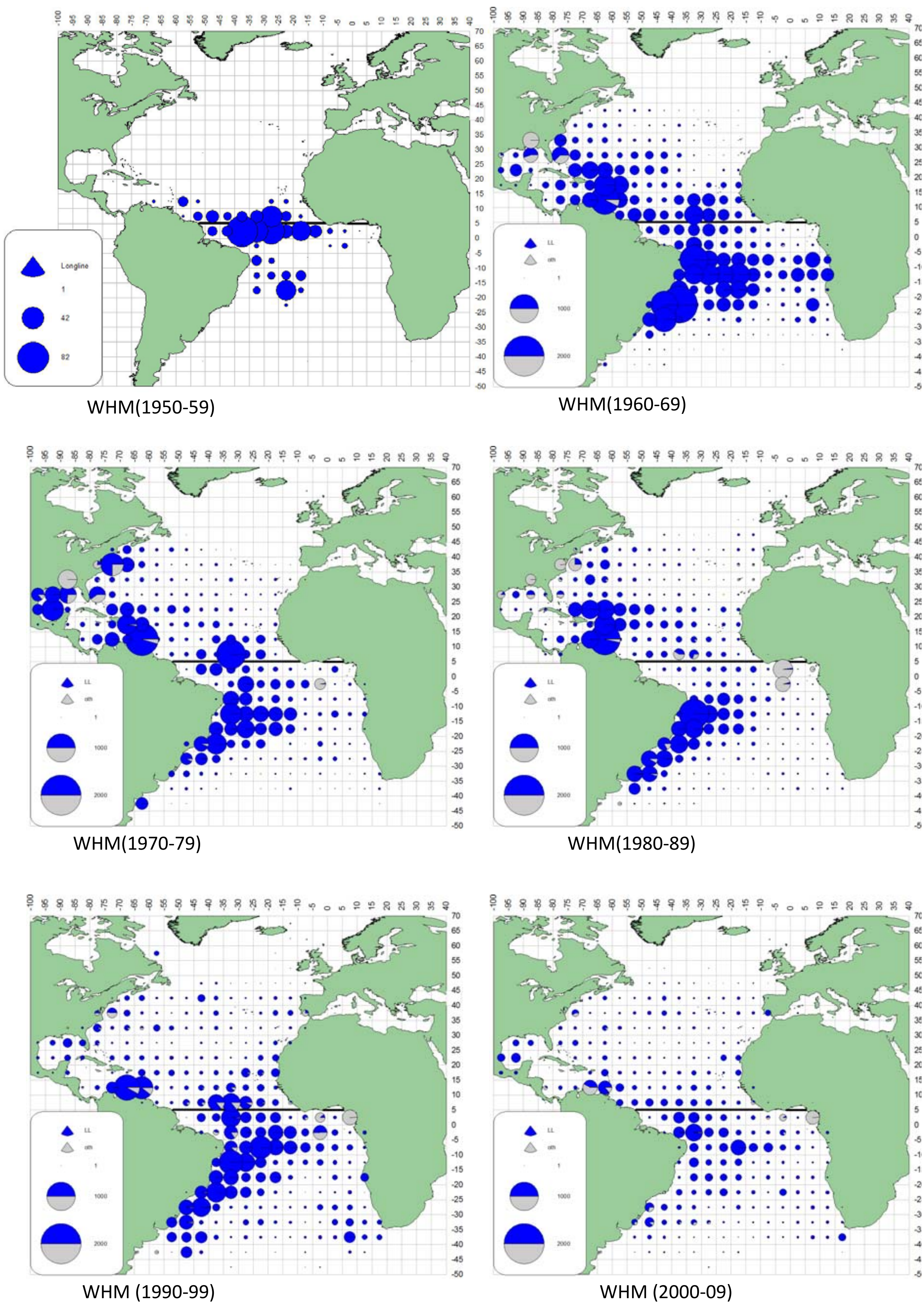
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
200	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
400	73%	74%	75%	77%	79%	79%	81%	82%	84%	85%
600	9%	11%	12%	12%	13%	14%	16%	16%	17%	19%
800	0%	0%	0%	0%	1%	1%	1%	1%	1%	1%
1000	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1200	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1400	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1600	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

B>Bmsy

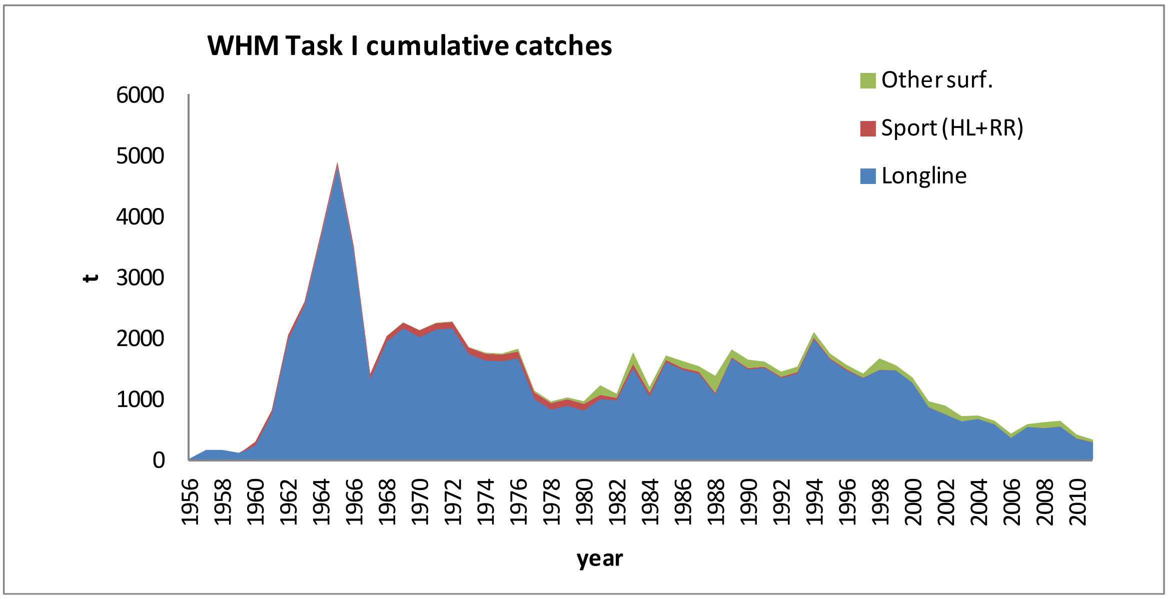
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
0	0%	0%	0%	0%	0%	0%	0%	1%	1%	2%
200	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%
400	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
600	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
800	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1000	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1200	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1400	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1600	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

F<Fmsy and B>Bmsy

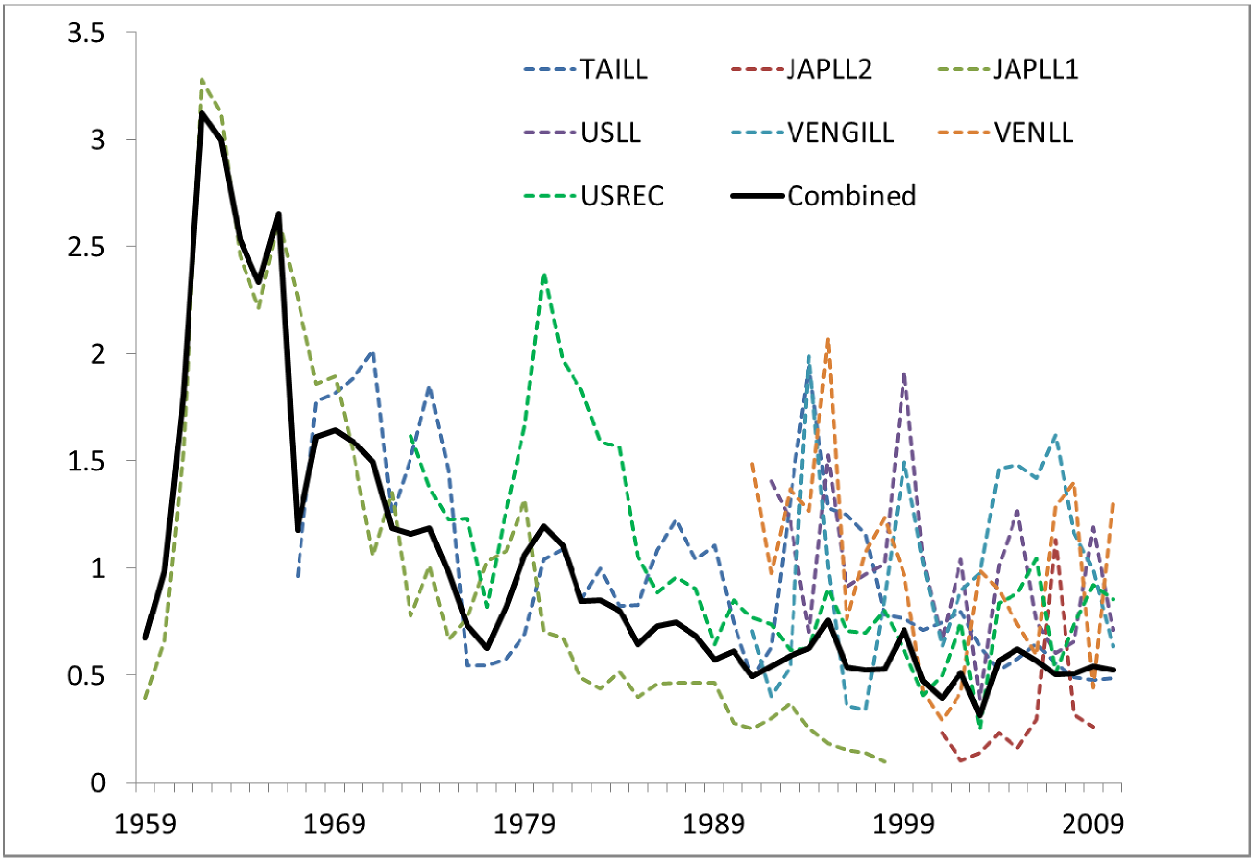
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
0	0%	0%	0%	0%	0%	0%	0%	1%	1%	2%
200	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%
400	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
600	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
800	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1000	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1200	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1400	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1600	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%



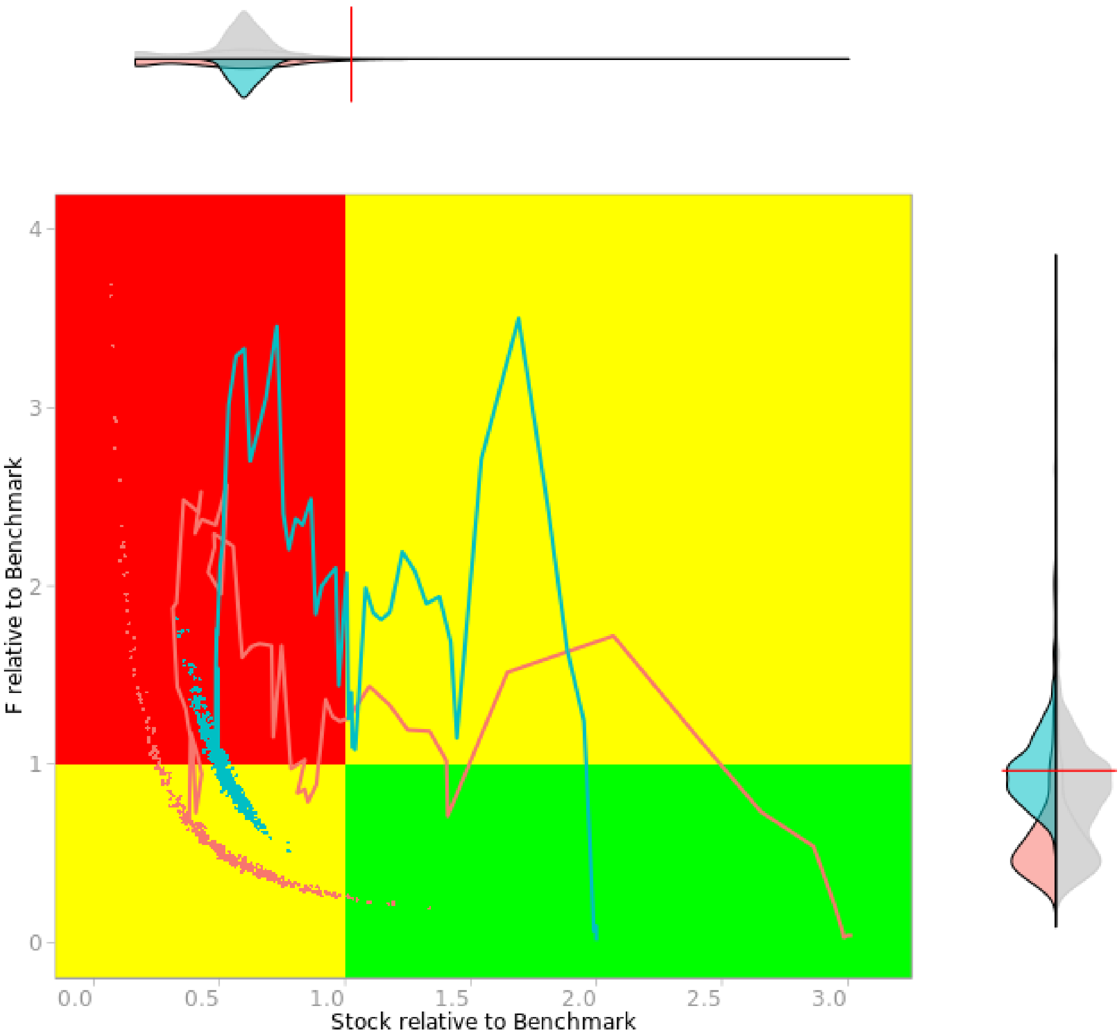
WHM-Figure 1. Geographic distribution of mean white marlin catch by major gears and decade.



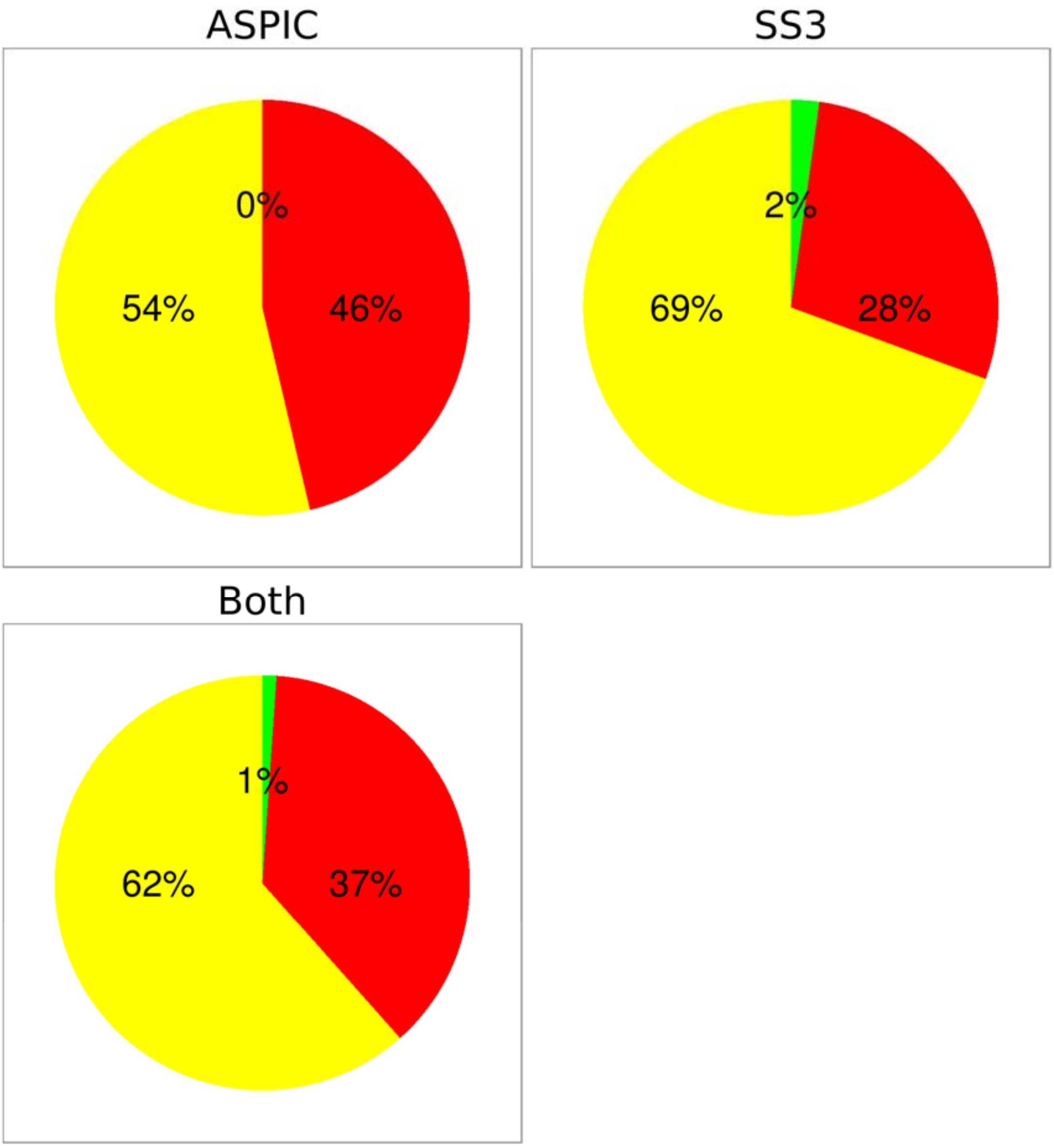
WHM-Figure 2. Total catch of white marlin reported in Task I for the period 1956-2011.



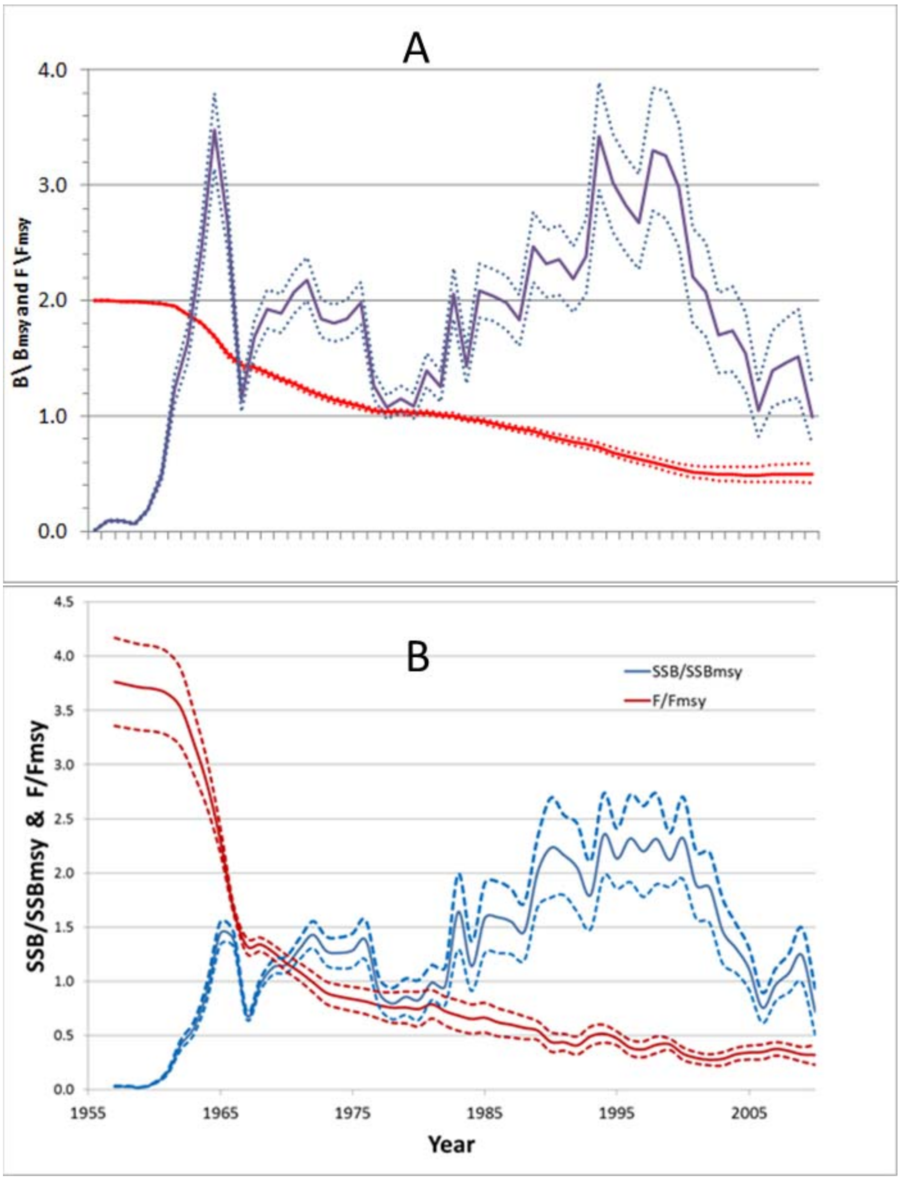
WHM-Figure 3. White marlin indices of abundance presented and selected during the meeting. For graphing purposes the indices were scaled to their respective mean value for the period 1990-2010.



WHM-Figure 4. Kobe phase plot panel showing the estimated trajectories for stock (B) relative to B_{MSY} and harvest rate (F) relative to F_{MSY} (line) along with the bootstrap estimates for 2012. The green quadrant corresponds to the stock not being overfished and no overfishing occurring and the red quadrant to the stock being overfished and overfishing occurring. The red line represents the SS3 model, and the blue line represents the ASPIC model (large panel). The marginal densities plots for stock relative to B_{MSY} and harvest rate relative to F_{MSY} are also shown (top and right of large panel); the upper part (grey) are combined probabilities for both ASPIC and SS3, and the lower part (blue and pink) are individual probabilities of ASPIC and SS3 overlaid. The red lines represent the benchmark levels (ratios equal to 1.0).



WHM-Figure 5. Pie chart showing the proportion of assessment results for 2012 that are within the green quadrant of the Kobe plot chart (not overfished, no overfishing), the yellow quadrant (overfished or overfishing), and the red quadrant (overfished and overfishing).



WHM-Figure 6. Historical ASPIC (A) and SS3 (B) estimates of biomass over biomass at MSY ratio (red) and fishing mortality over fishing mortality at MSY ratios (blue) for white marlin.

8.8 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, while 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 Committee **(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 2011 was 1,057 t and 566 t for the east and west stocks, respectively **(SAI-Figure 3)**. Task I catches of sailfish for 2011 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 are in effect for sailfish, 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.

One approach to reduce fishing mortality could be the use of non-offset circle hooks as terminal gear. Recent research has demonstrated that in some longline fisheries the use of non-offset circle hooks resulted in a reduction of istiophorid mortality, while the catch rates of several of the target species remained the same or were greater than the catch rates observed with the use of conventional J hooks or offset circle hooks. The Committee considers that this approach may be more efficient and enforceable than time-area closures and, thus, it recommends that the Commission considers this alternative approach. Currently, three ICCAT Contracting Parties (Brazil, Canada, and the United States) already mandate or encourage the use of circle hooks on their pelagic longline fleets. In addition, reducing fishing mortality of sailfish from non-industrial fisheries should be considered.

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
2011 Catches (Provisional)	566 t	1,057 t
B_{2007}/B_{MSY}	Possibly < 1.0	Likely < 1.0
F_{2007}/F_{MSY}	Possibly > 1.0	Likely > 1.0
Overfished	Possibly	Likely
Overfishing	Possibly	Likely
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.

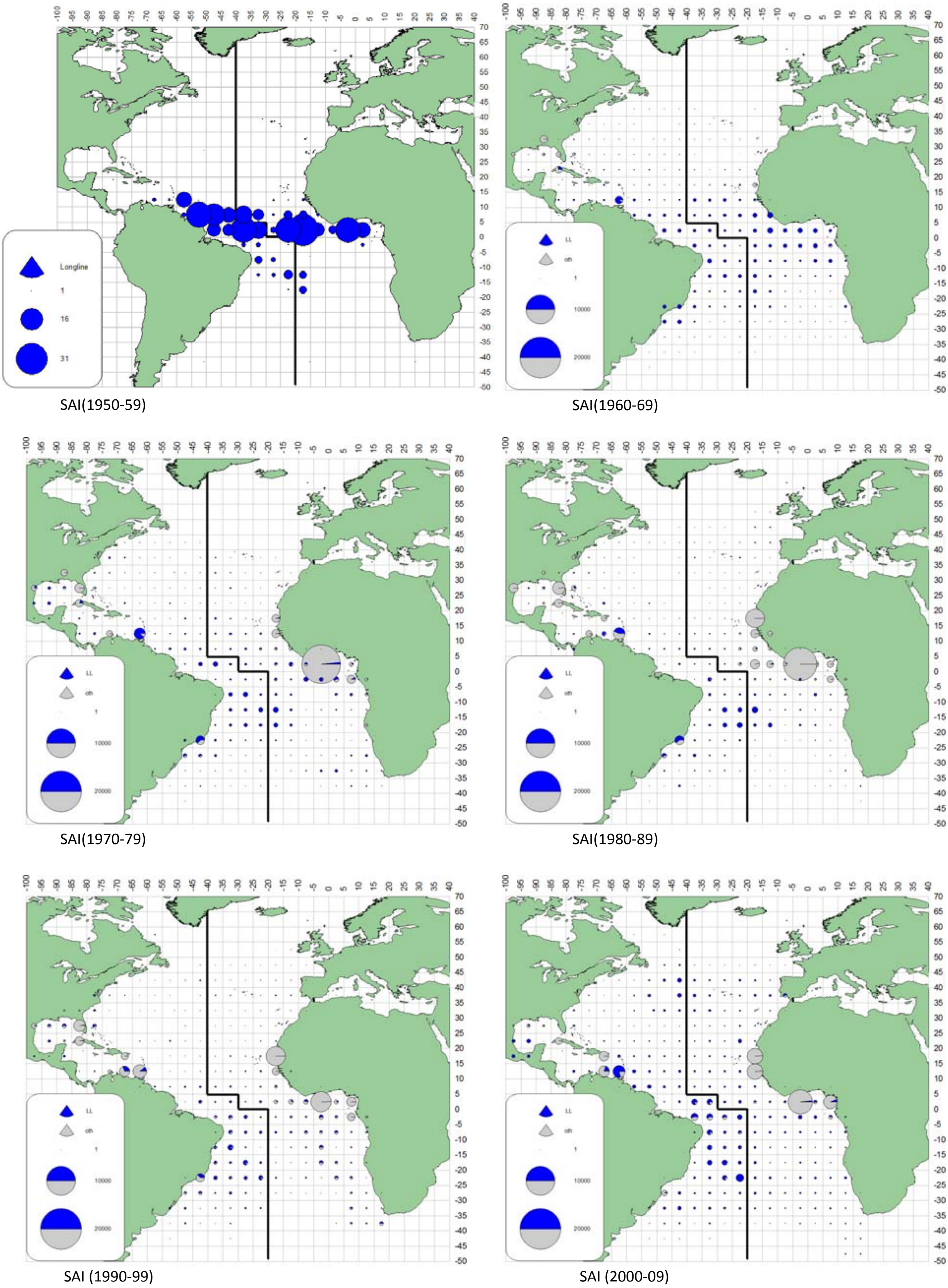
SAI-Table 1. Estimated catches (t) of Atlantic sailfish (*Istiophorus albicans*) by area, gear and flag.

			1987	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
TOTAL			3699	3180	2673	3475	2591	3105	3093	2231	2358	2923	2500	2709	2724	3798	4480	4294	3943	3984	3629	2997	3837	3734	3498	2553	1623
	ATE		2553	2109	1710	2315	1476	1780	1815	1172	1234	1881	1337	1362	1342	1978	2761	2313	2625	2587	2194	1901	2607	2196	2062	1925	1057
	ATW		1146	1071	963	1160	1115	1325	1278	1059	1124	1041	1163	1346	1382	1820	1719	1981	1318	1397	1435	1096	1230	1537	1437	627	566
Landings	ATE	Longline	99	93	112	109	47	104	256	151	189	196	206	275	273	195	269	354	322	261	294	566	620	596	555	611	273
		Other surf.	1870	1479	1153	1249	1000	983	1111	954	910	1504	644	859	883	1231	1725	1862	2022	2106	1756	1289	1798	1488	927	871	643
		Sport (HL+RR)	584	537	445	957	429	692	448	67	135	182	488	228	186	551	767	98	282	219	143	46	189	113	580	443	141
	ATW	Longline	425	334	316	316	159	357	484	346	338	260	323	499	533	1097	1245	1265	873	747	1062	646	765	1018	965	529	447
		Other surf.	187	208	238	514	521	599	498	468	410	482	433	553	615	602	402	603	440	642	368	442	452	502	457	92	95
		Sport (HL+RR)	491	472	352	267	371	333	233	217	348	230	350	267	163	76	60	106	0	0	0	2	6	7	4	2	14
Discards	ATE	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
	ATW	Longline	42	57	57	62	64	36	63	28	29	69	57	27	72	45	11	7	5	7	3	5	8	9	10	4	10
		Other surf.	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
Landings	ATE	Benin	32	40	8	21	20	21	20	20	20	19	6	4	5	5	12	2	2	5	3	3	4	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	3	3	3	3	5	9	4	5	11	4	4	8	16	8	1	4	5	2
		Chinese Taipei	1	2	3	5	4	80	157	38	58	24	56	44	66	45	50	62	49	15	25	36	109	121	80	21	51
		Cuba	50	22	53	61	184	200	77	83	72	533	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Côte D'Ivoire	40	66	55	58	38	69	40	54	66	91	65	35	80	45	47	65	121	73	93	78	52	448	74	0	108
		EU.España	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	1	2	1	2	1	2	27	53	11	3	8	13	19	31	136	43	49	103	170	121
		EU.United Kingdom	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	3	3	110	218	2	0	0	0	0	0	4	0	0	0	0	0	0	0	
		Ghana	1392	837	465	395	463	297	693	450	353	303	196	351	305	275	568	592	566	521	542	282	420	342	358	417	299
		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	16	26	26	31	6	15	27	45	52	47	19	58	16	26	6	20	22	70	50	62	144	199	94	115	120
		Korea Rep.	8	11	12	12	22	2	2	5	5	11	4	0	0	0	0	0	0	0	0	0	0	0	1	0	5
		Liberia	0	0	0	0	0	0	0	0	33	85	43	136	122	154	56	133	127	106	122	118	115	0	0	0	
		Maroc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	**0**
		Mixed flags (FR+ES)	394	408	432	595	174	150	182	160	128	97	110	138	131	353	400	365	413	336	264	274	205	251	308	265	56
		NEI (BIL)	0	0	0	0	0	0	0	0	0	0	0	0	0	28	269	408	213	55	1	105	43	20	11	0	
		NEI (ETRO)	0	0	0	0	0	0	27	51	57	69	86	127	120	77	43	3	2	16	7	8	10	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	
		Russian Federation	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	78	86	97	84	78	81	88	92	96	139	141	141	136	136	136	136	515	346	292	384	114	119	121	121
		Senegal	596	587	552	1040	466	860	462	162	167	240	560	260	238	786	953	240	673	567	463	256	737	446	630	484	174
		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	4	0	0	0	1	5	0	0	0	
		Togo	0	0	0	0	0	0	0	0	0	0	9	22	36	23	62	55	95	135	47	31	71	0	0	0	
		U.S.A.	0	0	0	0	2	4	1	1	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		U.S.S.R.	5	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	ATW	Aruba	23	20	16	13	9	5	10	10	10	10	10	10	10	10	0	0	0	0	0	0	0	0	0	0	
		Barbados	0	0	69	45	29	42	50	46	74	25	71	58	44	44	42	26	27	26	42	58	42	0	0	18	36
		Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	12	0	0	76	8
		Brasil	174	152	147	301	90	351	243	129	245	310	137	184	356	598	412	547	585	534	416	139	123	268	433	78	137
		China P.R.	0	0	0	0	0	0	0	3	3	3	3	3	9	4	3	1	0	1	0	0	0	1	2	1	1

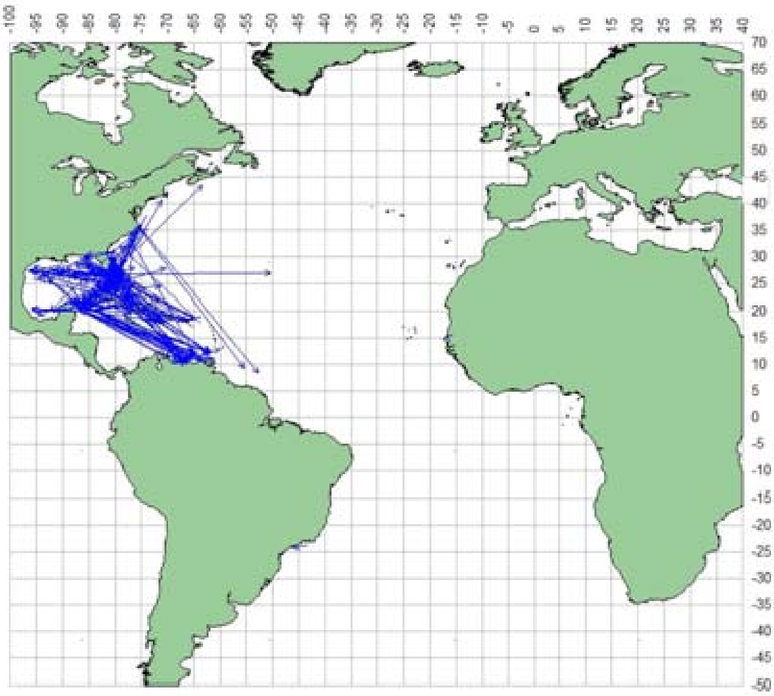
		Chinese Taipei	9	92	86	42	37	17	112	117	19	19	2	65	17	11	33	31	13	8	21	5	14	10	11	6	9
		Cuba	171	78	55	126	83	70	42	46	37	37	40	28	196	208	68	32	18	50	72	47	56	0	0	0	
		Curaçao	10	10	10	10	10	10	15	15	15	15	15	15	15	15	0	0	0	0	0	0	0	0	0	0	
		Dominica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	3	0	1	0	3	3	4	2	0	2
		Dominican Republic	40	44	44	40	31	98	50	90	40	40	101	89	27	67	81	260	91	144	165	133	147	0	0	0	
		EU.España	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	7	0	2	12	12	110	19	53	101	48	19	9
		Grenada	104	114	98	218	316	310	246	151	119	56	83	151	148	164	187	151	171	112	147	159	174	216	183	0	
		Japan	2	5	12	12	27	0	1	8	2	4	17	3	10	12	3	3	10	5	22	4	1	33	43	36	14
		Korea Rep.	1	1	12	16	1	2	3	4	4	12	4	0	0	0	0	0	0	0	0	0	0	0	1	0	45
		Mexico	0	0	0	0	0	0	2	19	19	10	9	65	40	118	36	34	45	51	55	41	46	45	48	34	32
		NEI (BIL)	0	0	0	0	0	0	0	0	0	0	0	0	0	297	268	0	0	0	0	68	81	252	17	0	
		NEI (ETRO)	0	0	0	0	0	0	15	27	30	36	46	67	64	41	23	1	1	9	4	4	6	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	
		Seychelles	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	
		St. Vincent and Grenadines	0	0	0	2	1	4	4	4	2	1	3	0	1	0	2	164	3	86	73	59	18	13	8	7	4
		Sta. Lucia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	2	2
		Trinidad and Tobago	35	24	10	7	3	3	1	2	1	4	10	25	37	3	7	6	8	10	9	17	13	32	16	16	16
		U.S.A.	454	451	324	242	343	294	202	179	345	231	349	267	163	76	58	103	0	0	0	0	0	3	3	0	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	**0**
		Venezuela	80	22	24	24	65	71	206	162	93	155	175	248	169	83	126	159	133	158	178	184	248	154	162	178	235
Discards	ATE	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	0
	ATW	Brasil	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.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Mexico	0	0	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.	42	57	57	62	64	36	63	28	29	69	57	27	72	45	11	7	5	7	4	5	7	10	10	4	10

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

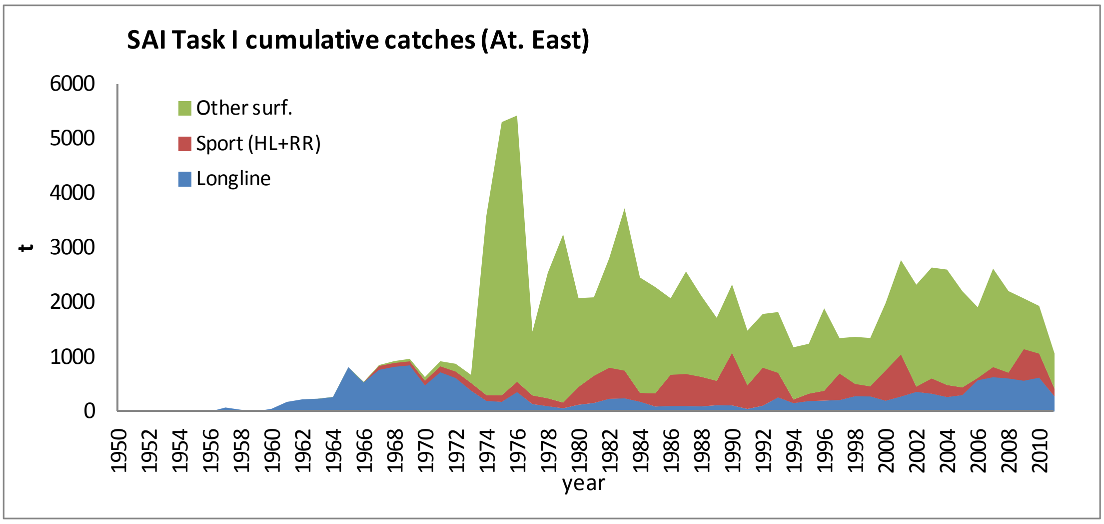
			1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
TOTAL			384	532	418	481	214	273	540	320	240	165	201	266	306	278	189	180	133	188	169	340	168	166	140	245	122
	ATE		284	295	310	417	131	255	419	198	207	128	194	192	255	178	80	86	50	51	68	75	66	60	78	111	48
	ATW		100	236	108	64	83	19	121	122	33	37	7	74	51	100	110	95	84	137	101	265	102	106	62	133	74
Landings	ATE	Longline	37	39	40	44	24	163	307	100	129	69	126	106	174	118	79	86	50	51	68	75	66	60	78	111	48
		Other surf.	247	256	270	373	107	92	112	98	78	59	68	86	81	60	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	
	ATW	Longline	100	236	108	64	83	19	121	122	26	34	7	74	51	100	110	95	84	137	101	265	102	106	62	133	73
		Other surf.	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		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		Longline	0	0	0	0	0	0	0	0	6	1	0	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	2	0	0	0	0	0	0	0	0	0	0	0	0	
		Chinese Taipei	4	4	4	8	6	135	263	63	97	41	94	73	112	75	52	62	25	15	25	37	22	2	6	16	10
		EU.España	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.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	8	2	6	25	9
		Japan	21	31	31	32	10	27	31	36	26	25	30	22	33	29	20	16	25	36	40	21	36	53	59	35	29
		Korea Rep.	12	4	5	4	8	1	1	1	1	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Mixed flags (FR+ES)	247	256	270	373	107	92	112	98	78	59	68	86	81	60	0	0	0	0	0	0	0	0	0	0	
		Senegal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	12	3
		Brasil	0	0	0	0	0	0	0	0	0	0	0	0	0	27	56	39	3	0	0	5	4	0	0	0	24
		Chinese Taipei	22	208	85	41	36	16	111	116	19	18	2	64	16	11	24	39	12	11	20	17	20	0	0	5	11
		EU.España	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	35	15	44	10	10	0
		Japan	4	17	10	13	46	1	1	2	3	4	1	8	11	11	3	12	40	41	58	54	25	45	26	71	19
		Korea Rep.	0	2	5	9	0	1	2	4	4	10	4	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	1	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	82	0	135	23	13	7	8	5
		Trinidad and Tobago	75	10	7	1	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	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Venezuela	0	0	0	0	0	0	1	0	0	1	0	1	0	0	4	0	3	3	17	5	15	3	14	24	12
Discards		U.S.A.	0	0	0	0	0	0	0	0	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

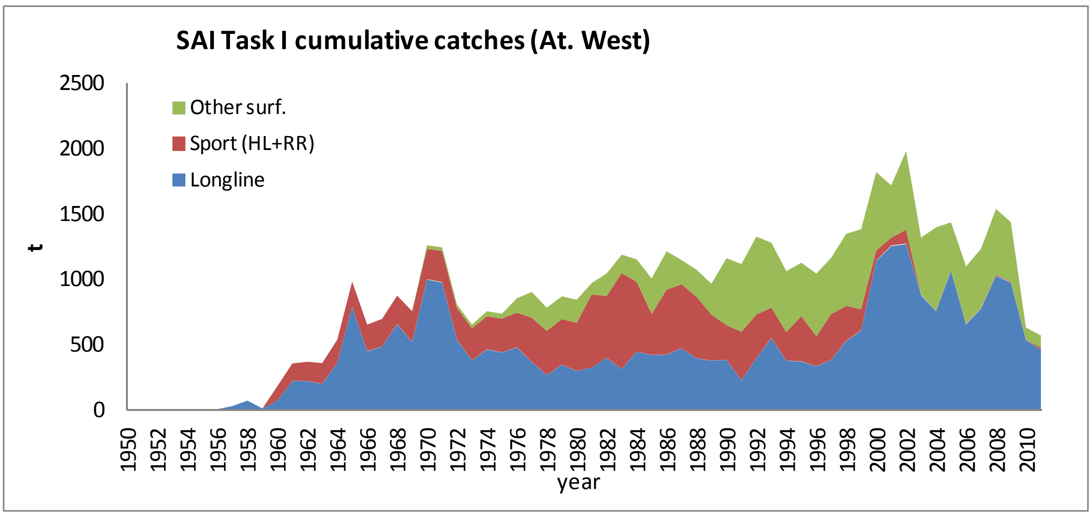


SAI-Figure 1. Geographic distribution of mean sailfish catch by major gears and by decade. The dark line denotes the separation between stocks.

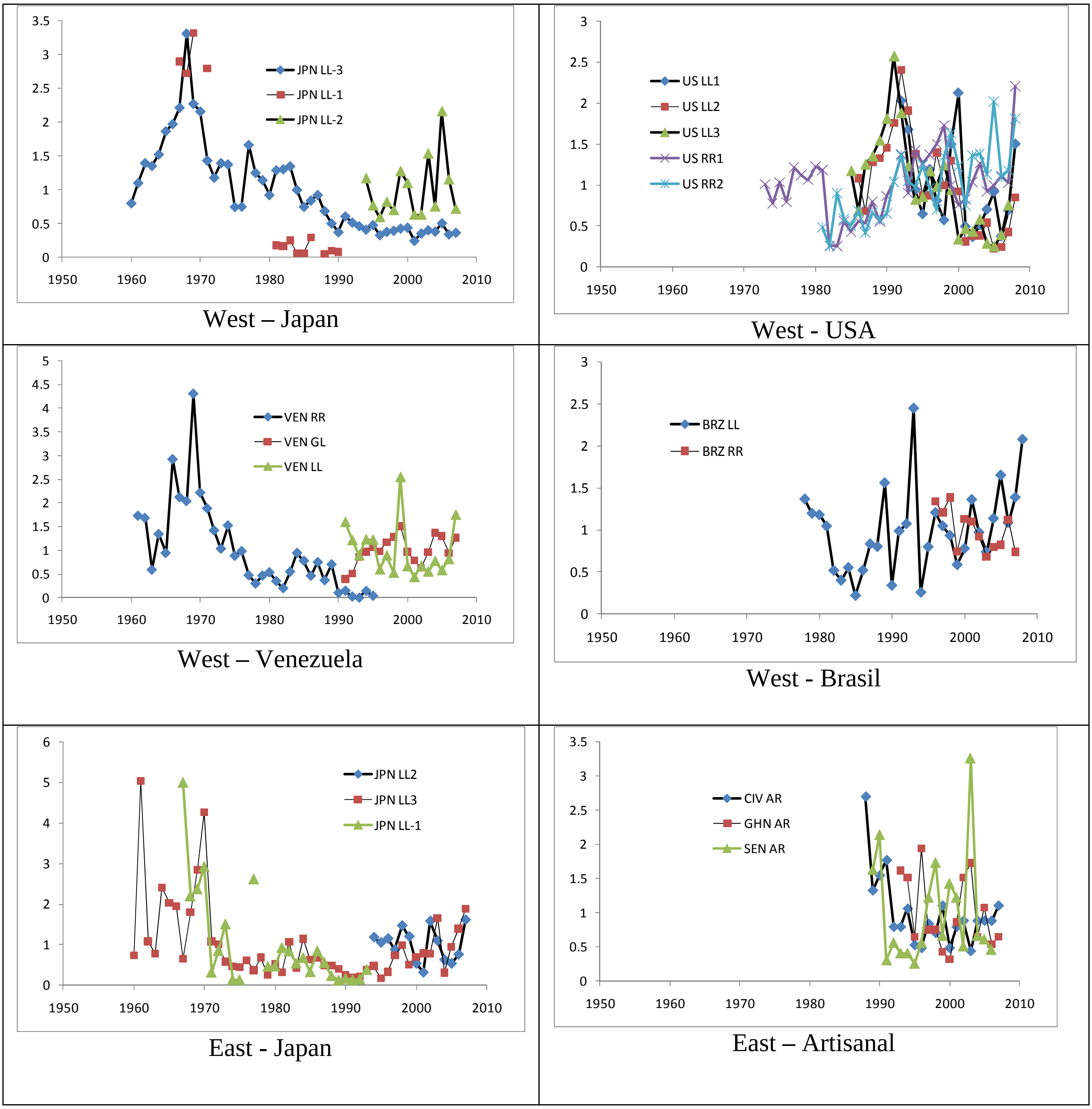


SAI-Figure 2. Conventional tag returns for Atlantic sailfish. Lines join the locations of release and recapture.





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.

8.9 SWO-ATL-ATLANTIC SWORDFISH

The last assessment for Atlantic swordfish was conducted in 2009 (Anon. 2010d). 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 Item 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.

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** shows total estimated catches for North and South Atlantic swordfish. 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.

The Group reviewed document SCRS/12/022 which described the occurrence of swordfish (1.5 to 2.65 m) off the Norwegian coast (58 to 70ºN latitude) from 1967 to 2011. During the 44 year period, a total of 25 fish were observed. Since the 1970s there has been an increase in abundance which was attributed by the authors to the Atlantic Multi-decadal Oscillation (AMO). The Group noted that the relationship between temperature and swordfish abundance was supported by relatively few data points and that the increased abundance of prey could also account for the increase in swordfish abundance. It was not clear from the document that the ability to detect the presence of swordfish was consistent across time or which gear types were involved.

Total Atlantic

The total Atlantic estimated catch (landings plus dead discards) of swordfish (North and South, including reported dead discards) in 2011 (25,599 t) is close to the reported catch in 2010 (24,208 t). As a small number of countries have not yet reported their 2011 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.

The SCRS received SCRS/2012/176, which reviewed recent catches in the Senegalese longline fishery (a recently developed fishery), as well as artisanal catches.

The trends in mean fish weight taken in the North and South Atlantic fisheries is shown in **SWO-ATL-Figure 3**.

North Atlantic

For the past decade, the North Atlantic estimated catch (landings plus dead discards) has averaged about 11,551 t per year (**SWO-ATL-Table 1** and **SWO-ATL-Figure 4**). The catch in 2011 (12,836 t) represents a 37 % 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 5**. 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 2012 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/2012/186). The unstandardized abundance series was shown for the unisex population as well as by gender. The series covered the period from 2002 to 2011 with a preliminary view of the 2012 estimate. The catch rates remain higher than observed in the 1990s and early 2000s, even as the fleet moved away from fishing in more offshore locations. The Group noted that the nominal series for each age and sex continued to use a sex ratio at length key developed in 2000 and therefore could misrepresent actual stock proportions if the ratios are changing over time. They concluded that new keys should be developed and until then the stock assessment should be based on the unisex series to avoid bias.

The national scientists present were asked to provide verbal updates on the abundance of the stock in their fishing zones. The Portuguese fleet has seen an increase in catch rates in the northern area above 35ºN latitude and east of 15ºW longitude.

The most frequently occurring ages in the catch include ages 2 and 3 (**SWO-ATL-Figure 6**).

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 2011, the 12,763 t reported catches were about 42 % lower than the 1995 reported level (**SWO-ATL-Figure 4**). The SCRS received reports from Brazil and Uruguay that those CPCs have reduced their fishing effort directed towards swordfish in recent years. Uruguay recently received increased albacore quotas that may allow increased effort for swordfish in the near future.

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 7**). 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 8.** 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 9**). 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 10**), 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 11)**. The median of MSY estimated for Run 1 was 18,130 t and for Run 2 was 17,934 t. **SWO-ATL-Figure 12** 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 tonnes. Catch in year 2009 was assumed to be the average of the last three years (2006-2008) (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 13**.

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 14**) 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 15** 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 16** 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. Effect 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 2011 catches of 12,836 t. Reports for 2011 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 2011 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, 10-02, and 11-02] 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

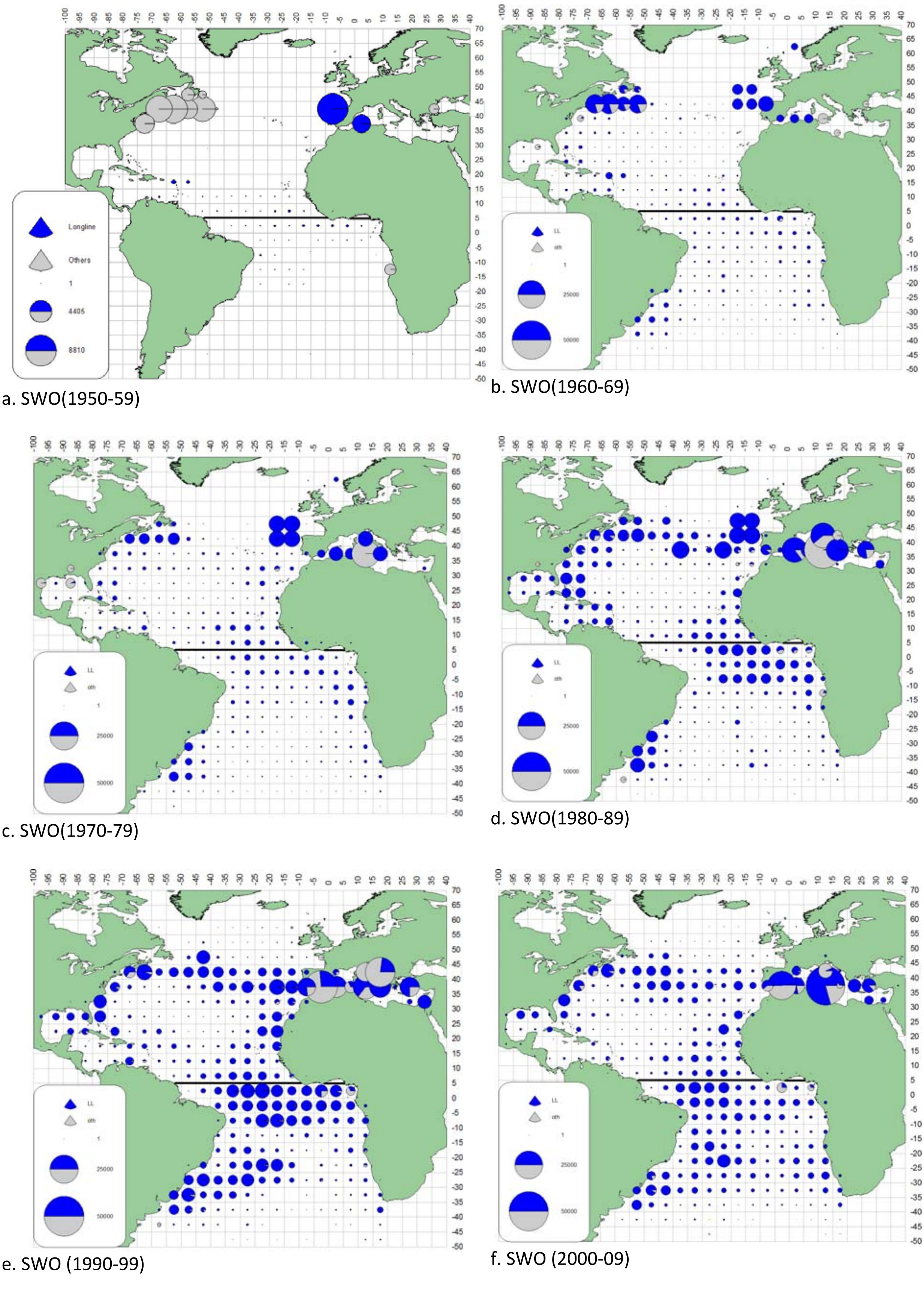
	North Atlantic	***South Atlantic***
Maximum Sustainable Yield[1]	13,730 t (13,020-14,182)[3]	~15,000 t[4]
Current (2011) TAC	13,700 t	15,000 t
Current (2011) Yield[2]	12,836 t	12,763 t
Yield in last year used in assessment (2008)	11,188 t[5]	12,363 t[5]
B_{MSY}	61,860 (53,280-91,627)	47,700
F_{MSY}	0.22 (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. 11-02]; 125/119cm LJFL minimum size	Country-specific TACs [Rec. 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.

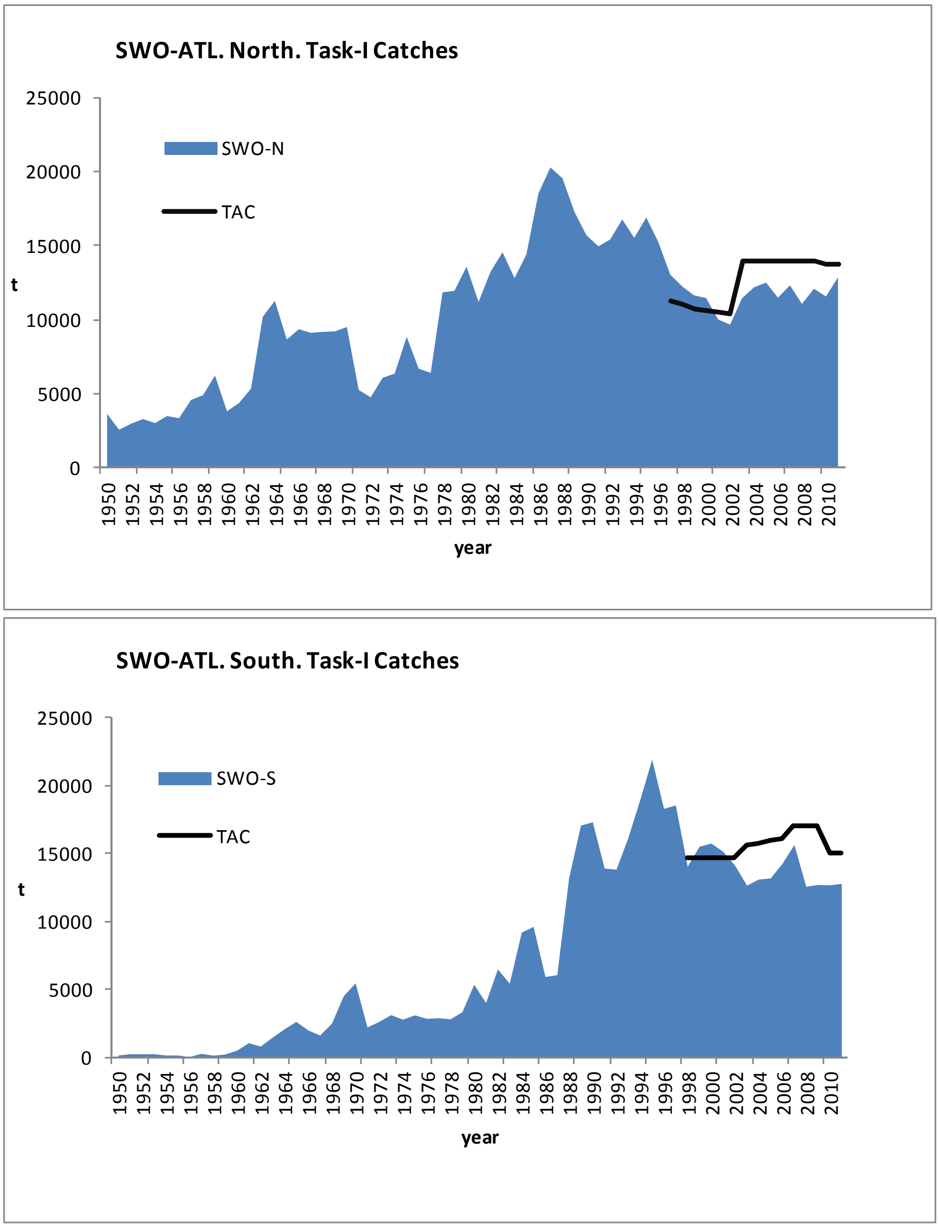
SWO-ATL-Table 1. Estimated catches (t) of Atlantic swordfish (*Xiphias gladius*) by gear and flag.

			1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
TOTAL			26266	32685	34305	32976	28826	29207	32868	34459	38803	33511	31567	26251	27123	27180	25139	23758	24075	25252	25643	25718	27932	23596	24761	24208	25599
	ATN		20236	19513	17250	15672	14934	15394	16738	15501	16872	15222	13025	12223	11622	11453	10011	9654	11442	12175	12480	11473	12302	11050	12081	11553	12836
	ATS		6030	13172	17055	17304	13893	13813	16130	18958	21930	18289	18542	14027	15502	15728	15128	14104	12633	13077	13162	14245	15630	12546	12679	12655	12763
Landings	ATN	Longline	20022	18927	15348	14026	14208	14288	15641	14309	15764	13808	12181	10778	10449	9642	8425	8664	9997	11406	11527	10840	11475	10335	11146	10963	11707
		Other surf.	214	586	1902	1646	511	723	689	484	582	826	393	961	643	672	685	374	822	449	620	409	546	471	778	437	815
	ATS	Longline	5446	12404	16398	16705	13287	13176	15547	17387	20806	17799	18239	13748	14823	15448	14302	13576	11712	12485	12915	13723	14967	11761	12106	11920	12205
		Other surf.	584	768	657	599	606	637	583	1571	1124	489	282	269	672	278	825	527	920	591	248	522	572	779	574	587	487
Discards	ATN	Longline	0	0	0	0	215	383	408	708	526	562	439	476	525	1137	896	607	618	313	323	215	273	235	151	148	305
		Other surf.	0	0	0	0	0	0	0	0	0	26	12	9	4	1	6	8	5	7	10	8	8	9	7	5	9
	ATS	Longline	0	0	0	0	0	0	0	0	0	1	21	10	6	1	0	0	0	1	0	0	91	6	0	147	70
		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	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	9	1	112	106	184
		Brasil	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	954	898	1247	911	1026	1547	2234	1676	1610	739	1089	1115	1119	968	1079	959	1285	1203	1558	1404	1348	1334	1300	1346	1551
		China P.R.	0	0	0	0	0	0	73	86	104	132	40	337	304	22	102	90	316	56	108	72	85	92	92	73	75
		Chinese Taipei	52	23	17	270	577	441	127	507	489	521	509	286	285	347	299	310	257	30	140	172	103	82	89	88	192
		Cuba	910	832	87	47	23	27	16	50	86	7	7	7	7	0	0	10	3	3	2	2	0	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	25	30	
		Dominica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0
		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	**0**
		EU.España	11135	9799	6648	6386	6633	6672	6598	6185	6953	5547	5140	4079	3996	4595	3968	3957	4586	5376	5521	5448	5564	4366	4949	4147	4885
		EU.France	0	0	0	75	75	75	95	46	84	97	164	110	104	122	0	74	169	102	178	92	46	14	15	35	16
		EU.Ireland	0	0	0	0	0	0	7	0	0	15	15	132	81	35	17	5	12	1	1	3	2	2	1	1	2
		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	1
		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	994	617	300	475	773	542	1961	1599	1617	1703	903	773	777	732	735	766	1032	1320	900	949	778	747	898	1054	1203
		EU.United Kingdom	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	10	3	36	48	0	82	48	17	90	1
		Faroe Islands	0	0	0	0	0	0	0	0	0	0	0	0	5	4	0	0	0	0	0	0	0	0	0	0	
		Grenada	0	56	5	1	2	3	13	0	1	4	15	15	42	84	0	54	88	73	56	30	26	43	0	0	
		Iceland	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	**0**
		Japan	413	621	1572	1051	992	1064	1126	933	1043	1494	1218	1391	1089	161	0	0	0	575	705	656	889	935	778	1062	723
		Korea Rep.	60	30	320	51	3	3	19	16	16	19	15	0	0	0	0	0	0	0	51	65	175	157	3	0	
		Liberia	30	19	35	3	0	7	14	26	28	28	28	28	28	0	0	0	0	0	0	0	0	0	0	0	
		Libya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	**0**
		Maroc	197	196	222	91	110	69	39	36	79	462	267	191	119	114	523	223	329	335	334	341	237	430	724	963	782
		Mexico	0	0	0	0	0	0	6	14	0	22	14	28	24	37	27	34	32	44	41	31	35	34	32	35	38
		NEI (ETRO)	0	76	112	529	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		NEI (MED)	3	131	190	185	43	35	111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Norway	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	17	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	0	1	4	44	5	0	8	0	22	28	0	17
		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	1	0	0	0	0	0	
		Senegal	0	0	1	0	6	6	0	0	0	0	0	0	0	0	0	0	0	108	108	0	38	0	28	11	43
		Seychelles	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	
		Sierra Leone	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	
		St. Vincent and Grenadines	0	0	0	3	0	3	23	0	4	3	1	0	1	0	22	22	7	7	7	0	51	7	34	13	11
		Sta. Lucia	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	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.	5247	6171	6411	5519	4310	3852	3783	3366	4026	3559	2987	3058	2908	2863	2217	2384	2513	2380	2160	1873	2463	2387	2730	2274	2752
		U.S.S.R.	4	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	1	1	5	5	3	3	2	0	0	1	1	0	3	4	3	3	3
		UK.British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	7	0	3	0	0	4
		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	**0**

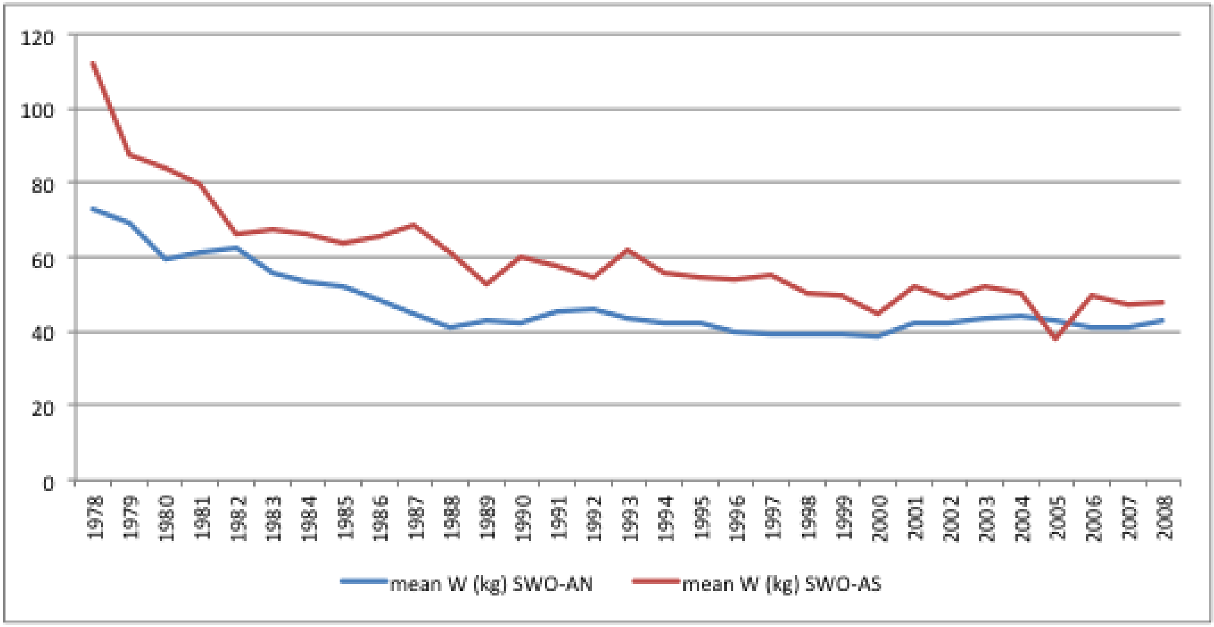
		Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	29	14	0	0	0	10	23
		Venezuela	86	2	4	9	75	103	73	69	54	85	20	37	30	44	21	34	45	53	55	22	30	11	13	24	18
	ATS	Angola	84	84	84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	
		Argentina	351	198	175	230	88	88	14	24	0	0	0	0	38	0	5	10	8	0	0	0	0	0	0	0	
		Belize	0	0	0	0	0	0	0	0	1	0	0	0	17	8	0	0	0	0	0	0	120	32	111	121	207
		Benin	13	19	26	28	28	26	28	25	24	24	10	0	3	0	0	0	0	0	0	0	0	0	0	0	
		Brasil	947	1162	1168	1696	1312	2609	2013	1571	1975	1892	4100	3847	4721	4579	4082	2910	2920	2998	3785	4430	4153	3407	3386	2926	3033
		Cambodia	0	0	0	0	0	0	0	0	0	0	0	0	6	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	29	534	344	200	423	353	278	91	300	473	470	291	296	248
		Chinese Taipei	338	798	610	900	1453	1686	846	2829	2876	2873	2562	1147	1168	1303	1149	1164	1254	745	744	377	671	727	612	410	424
		Cuba	173	159	830	448	209	246	192	452	778	60	60	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Côte D'Ivoire	10	12	7	8	18	13	14	20	19	26	18	25	26	20	19	19	43	29	31	39	17	159	100	114	145
		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	4393	7725	6166	5760	5651	6974	7937	11290	9622	8461	5832	5758	6388	5789	5741	4527	5483	5402	5300	5283	4073	5183	5801	6450
		EU.Lithuania	0	0	0	0	0	0	0	794	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Portugal	0	0	0	0	0	1	0	0	380	389	441	384	381	392	393	380	354	345	493	440	428	271	367	232	263
		EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	49	0	0	3	0	
		Gabon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	
		Ghana	123	235	156	146	73	69	121	51	103	140	44	106	121	117	531	372	734	343	55	32	65	177	132	116	60
		Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Honduras	0	0	0	0	0	3	0	0	6	4	5	2	8	0	0	0	0	0	0	0	0	0	0	0	
		Japan	2620	4453	4019	6708	4459	2870	5256	4699	3619	2197	1494	1186	775	790	685	833	924	686	480	1090	2155	1600	1340	1314	912
		Korea Rep.	666	1012	776	50	147	147	198	164	164	7	18	7	5	10	0	2	24	70	36	94	176	223	10	0	
		Mixed flags (FR+ES)	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	
		NEI (ETRO)	0	0	856	439	0	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	22	0	0	0	0	730	469	751	504	191	549	832	1118	1038	518	25	417	414
		Nigeria	0	0	0	0	0	3	0	0	0	9	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	29	105	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	0	6	1	8	1	1	4	58	41	49	14	35
		S. Tomé e Príncipe	0	216	207	181	179	177	202	190	178	166	148	135	129	120	120	120	120	126	147	138	138	183	188	193	
		Senegal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	77	138	195	180	222
		Seychelles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	
		South Africa	5	4	0	0	5	9	4	1	4	1	1	240	143	328	547	649	293	295	199	186	207	142	170	145	97
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	7	16	4	3
		Togo	1	0	2	3	5	5	8	14	14	64	0	0	0	0	0	0	0	9	10	2	0	0	0	0	
		U.S.A.	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	20	4	0	0	0	0	0	0	0	0	
		Uruguay	699	427	414	302	156	210	260	165	499	644	760	889	650	713	789	768	850	1105	843	620	464	370	501	222	179
		Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	26	6	3	0	3	1
Discards	ATN	Canada	0	0	0	0	0	0	0	0	0	0	5	52	35	50	26	33	79	45	106	38	61	39	9	15	8
		Japan	0	0	0	0	0	0	0	0	0	0	0	0	0	598	567	319	263	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	0	170
		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	1
		U.S.A.	0	0	0	0	215	383	408	708	526	588	446	433	494	490	308	263	282	275	227	185	220	205	148	138	135
		UK.Bermuda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ATS	Brasil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	91	6	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	147	70
		U.S.A.	0	0	0	0	0	0	0	0	0	1	21	10	6	1	0	0	0	1	0	0	0	0	0	0	



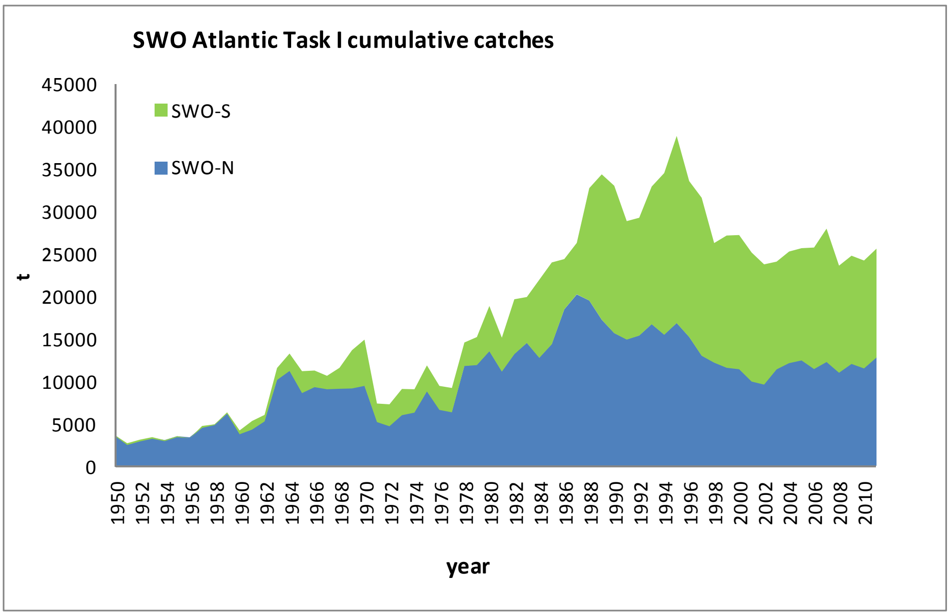
SWO-ATL-Figure 1. Geographic distribution of swordfish cumulative catch (t) by gear, in the Convention area, shown on a decadal scale. The more contemporary period (2000 to 2009) is shown on the bottom right. The symbols for the 1950s information (top left) are scaled to the maximum catch observed during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



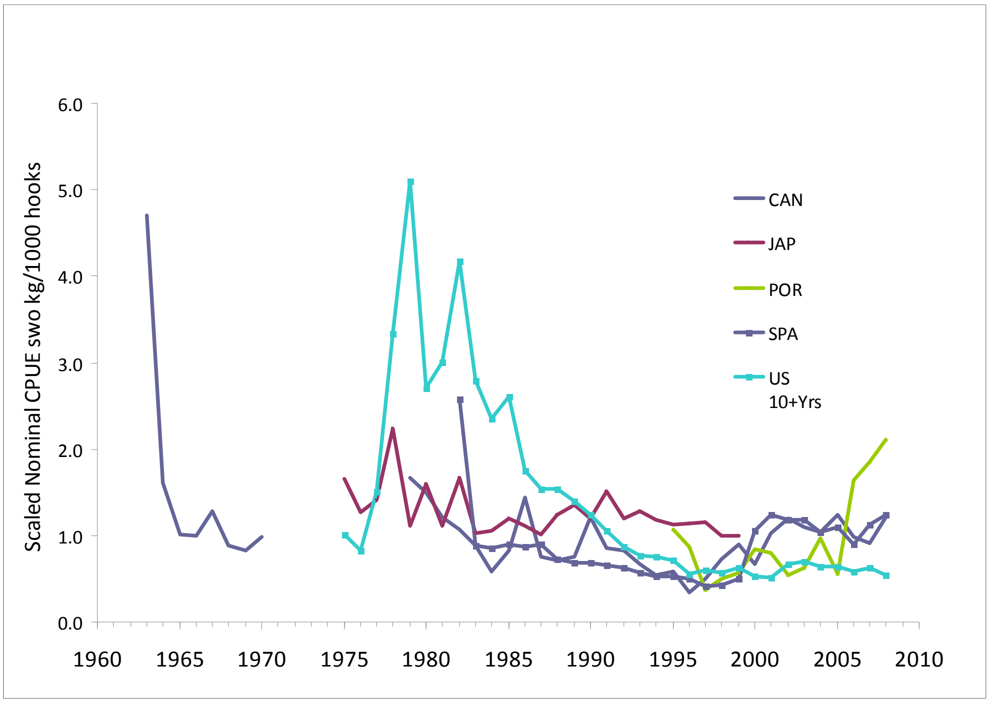
SWO-ATL-Figure 2. North and South Atlantic swordfish catches and TAC (t).



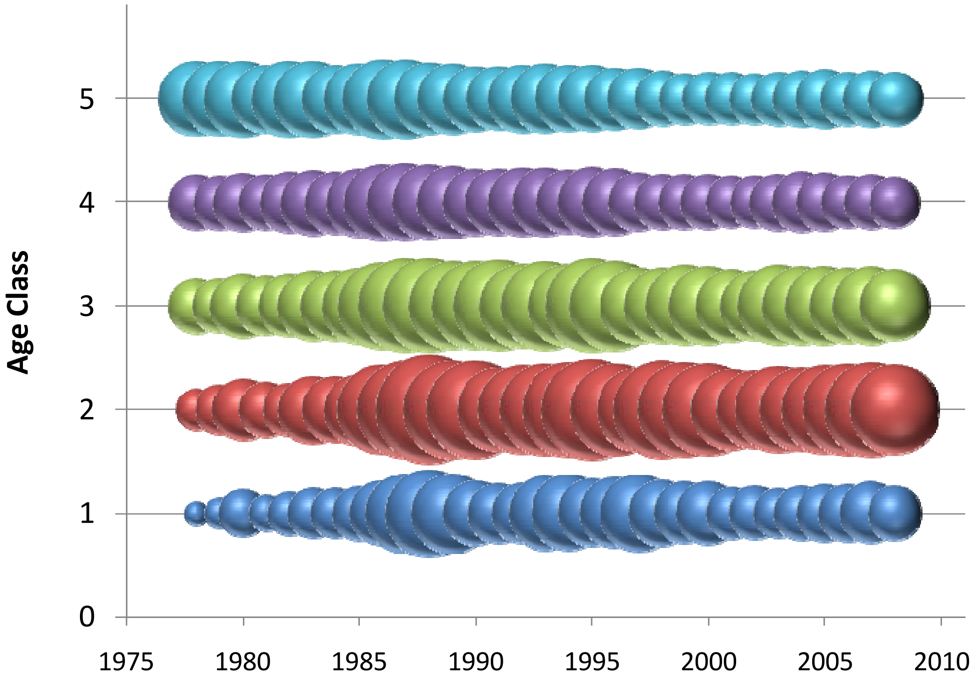
SWO-ATL-Figure 3. Trends in mean weight (kg) for the entire north and south Atlantic swordfish stocks.



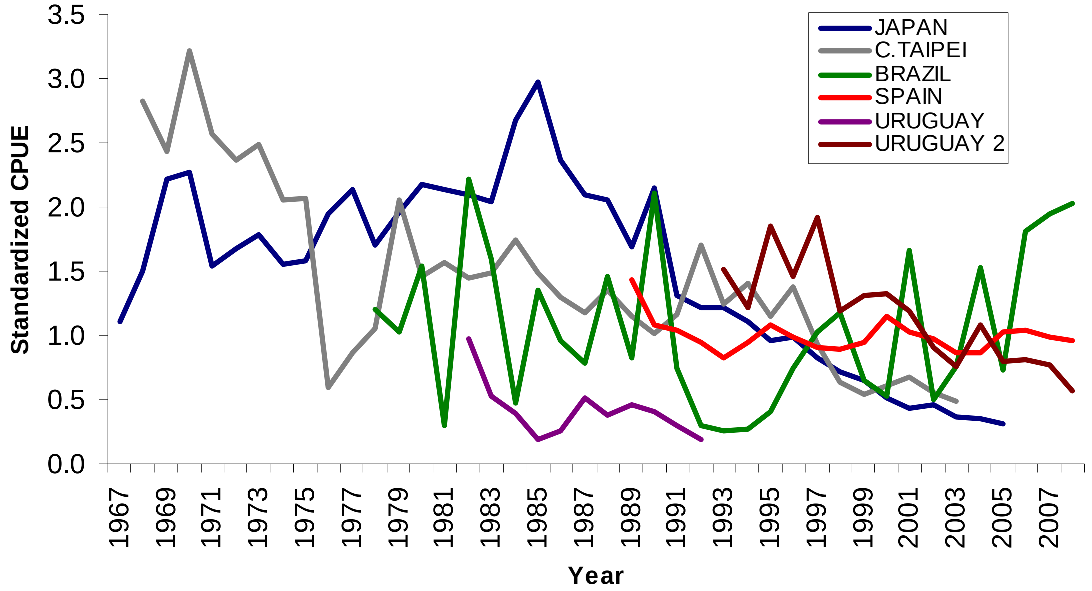
SWO-ATL-Figure 4. Swordfish reported catches (t) for North and South Atlantic, for the period 1950-2009 and the corresponding TAC.



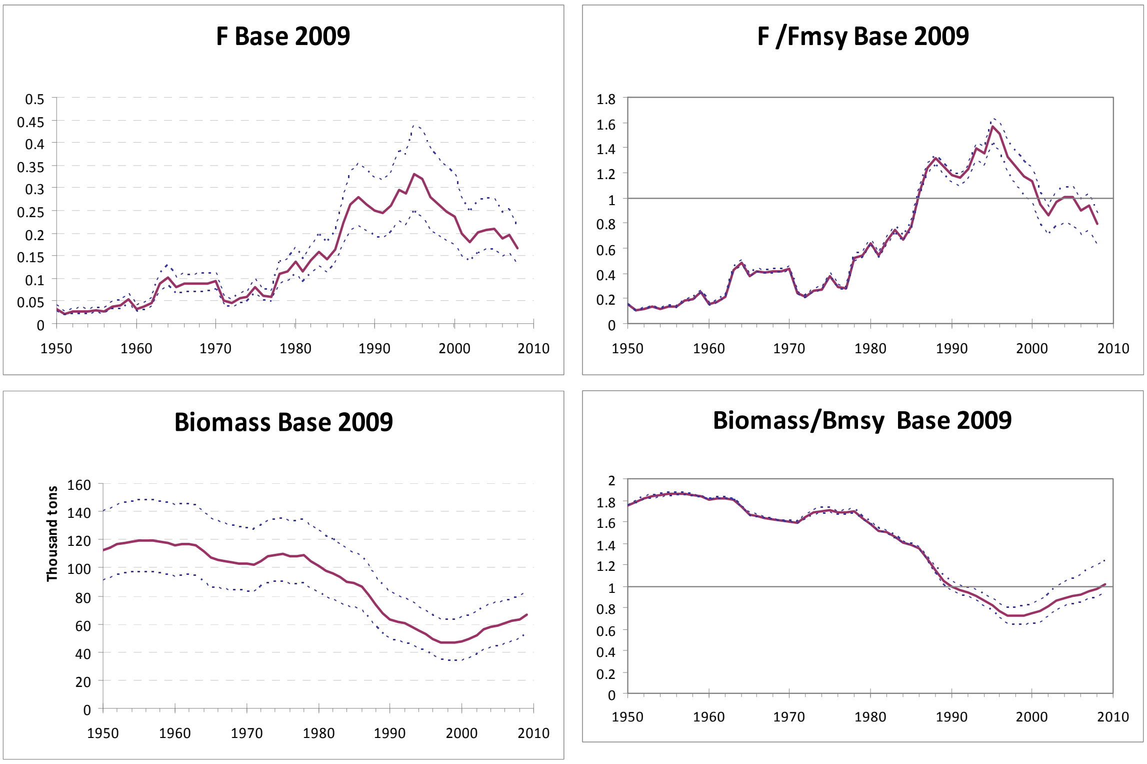
SWO-ATL-Figure 5. North Atlantic swordfish scaled nominal catch rate series used as input in the combined index of the base production model.



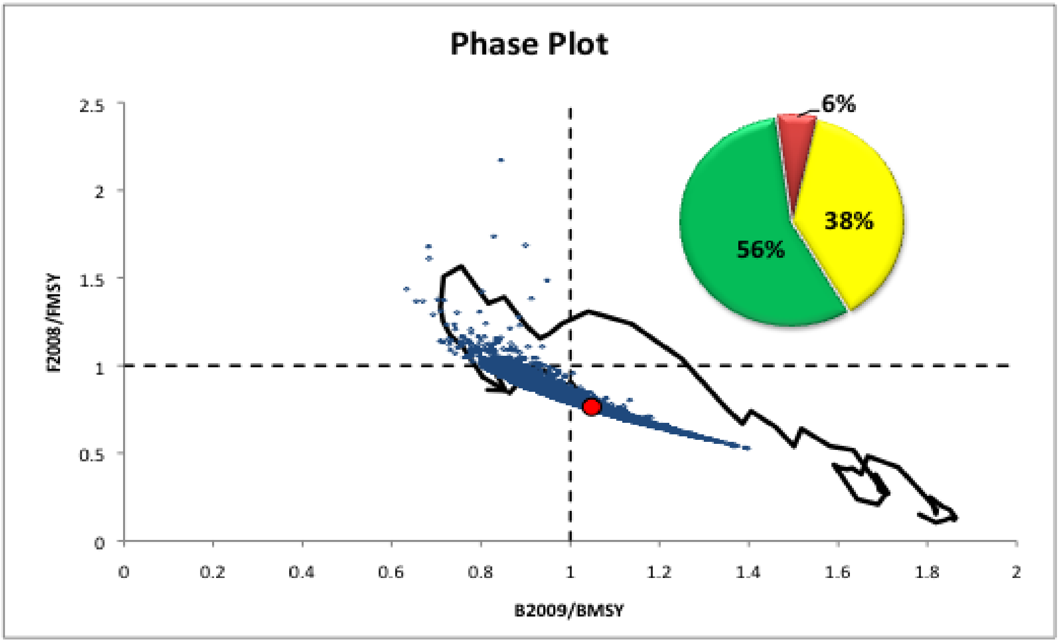
SWO-ATL-Figure 6. North Atlantic swordfish, catch at age (numbers) converted from catch at size. The area of the filled circle shows the proportional catch at age. Note: Age 5 is a plus group.



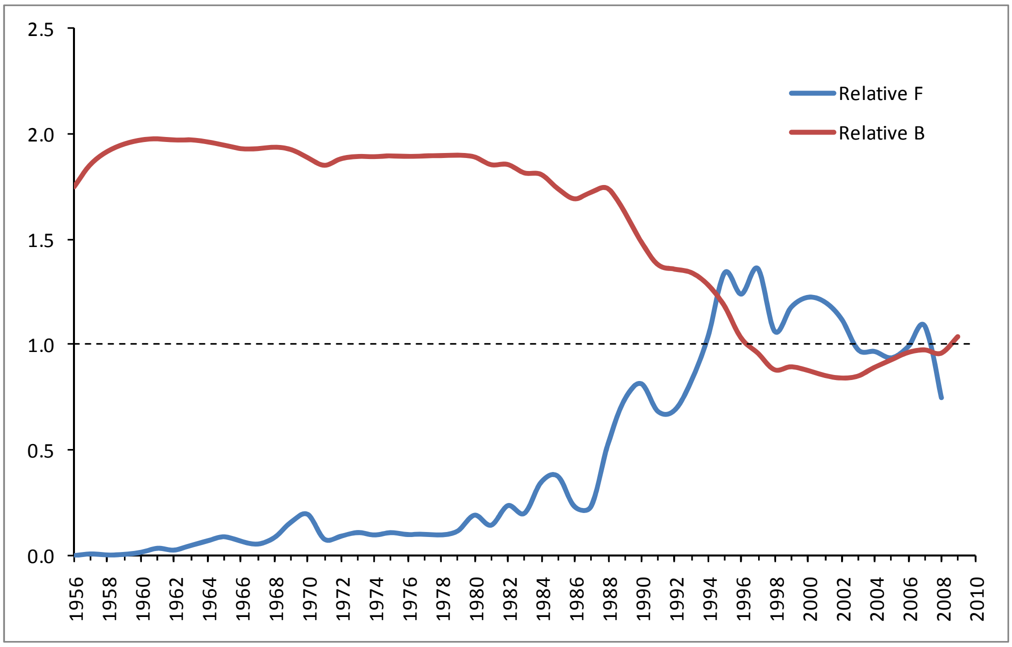
SWO-ATL-Figure 7. South Atlantic swordfish, standardized CPUE series for the production model (ASPIC) for characterizing the status of southern Atlantic swordfish (Scaled relative to mean of overlap).The series for Uruguay was treated as two series.



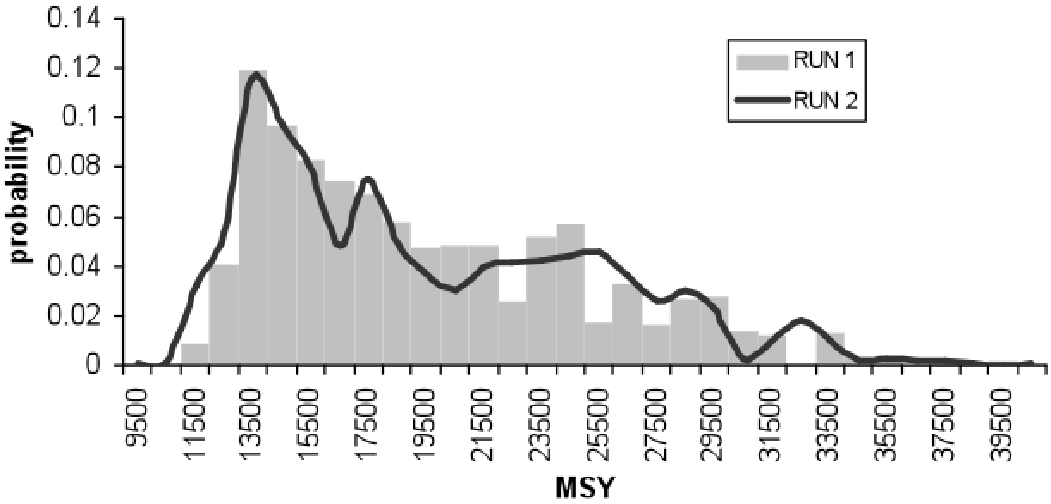
SWO-ATL-Figure 8. North Atlantic swordfish, biomass, fishing mortality and relative ratio trends for the base production model. The solid lines represent point estimates and broken lines represent estimated 80% bias corrected confidence intervals.



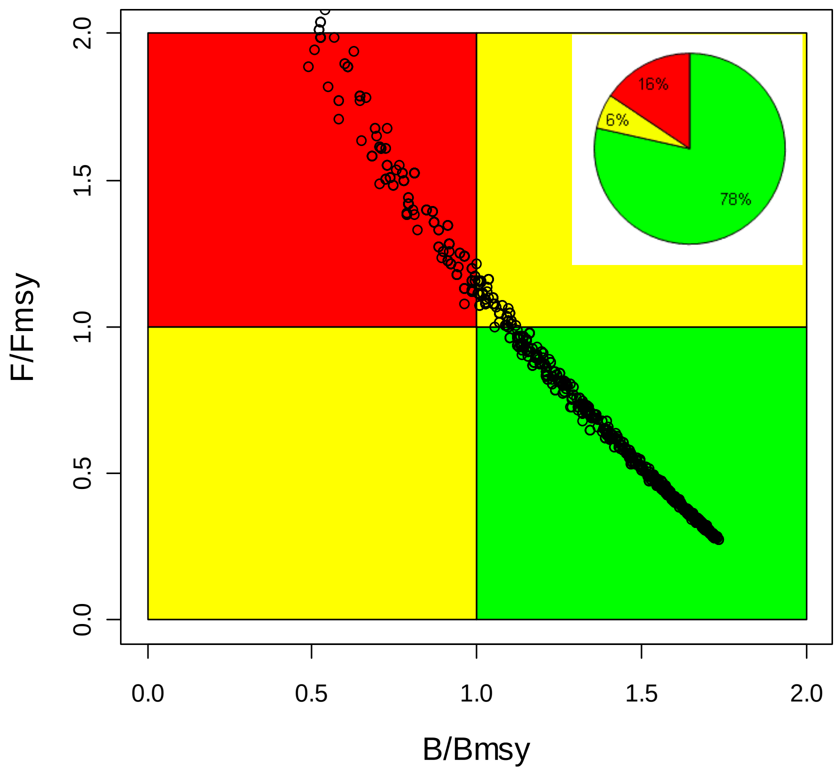
SWO-ATL-Figure 9. Summary figure of the current northern Atlantic swordfish stock status which includes different representation of the bootstraps results of the base ASPIC model: percentage, phase-plots (marked dot corresponds to the deterministic result) and stock status trajectories for the period 1950-2008. The x-axis represents relative biomass, and the y-axis relative exploitation rate.



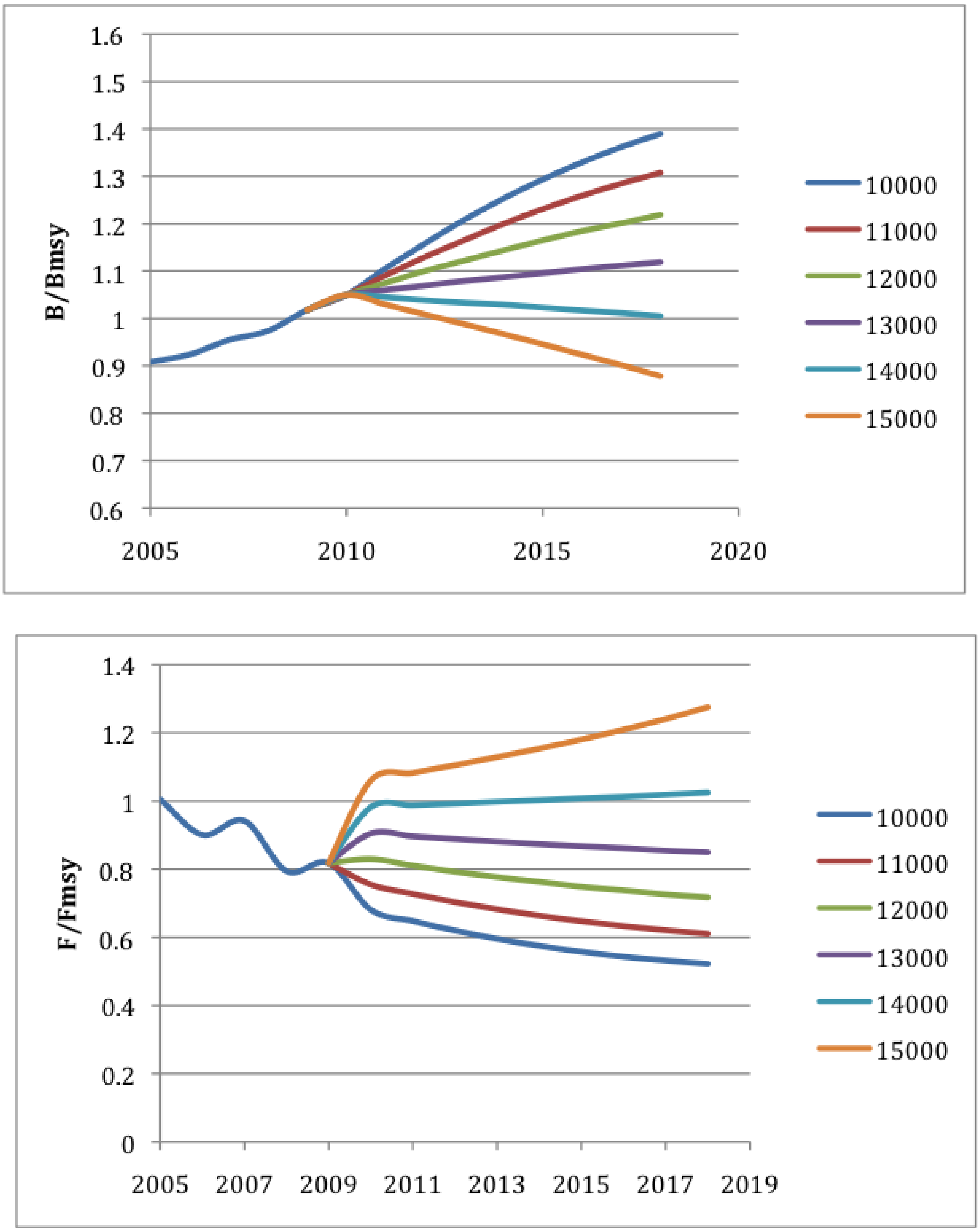
SWO-ATL Figure 10. South Atlantic, relative biomass (B/B_{MSY}) and relative fishing mortality (F/F_{MSY}) trajectories estimated by the base case production model.



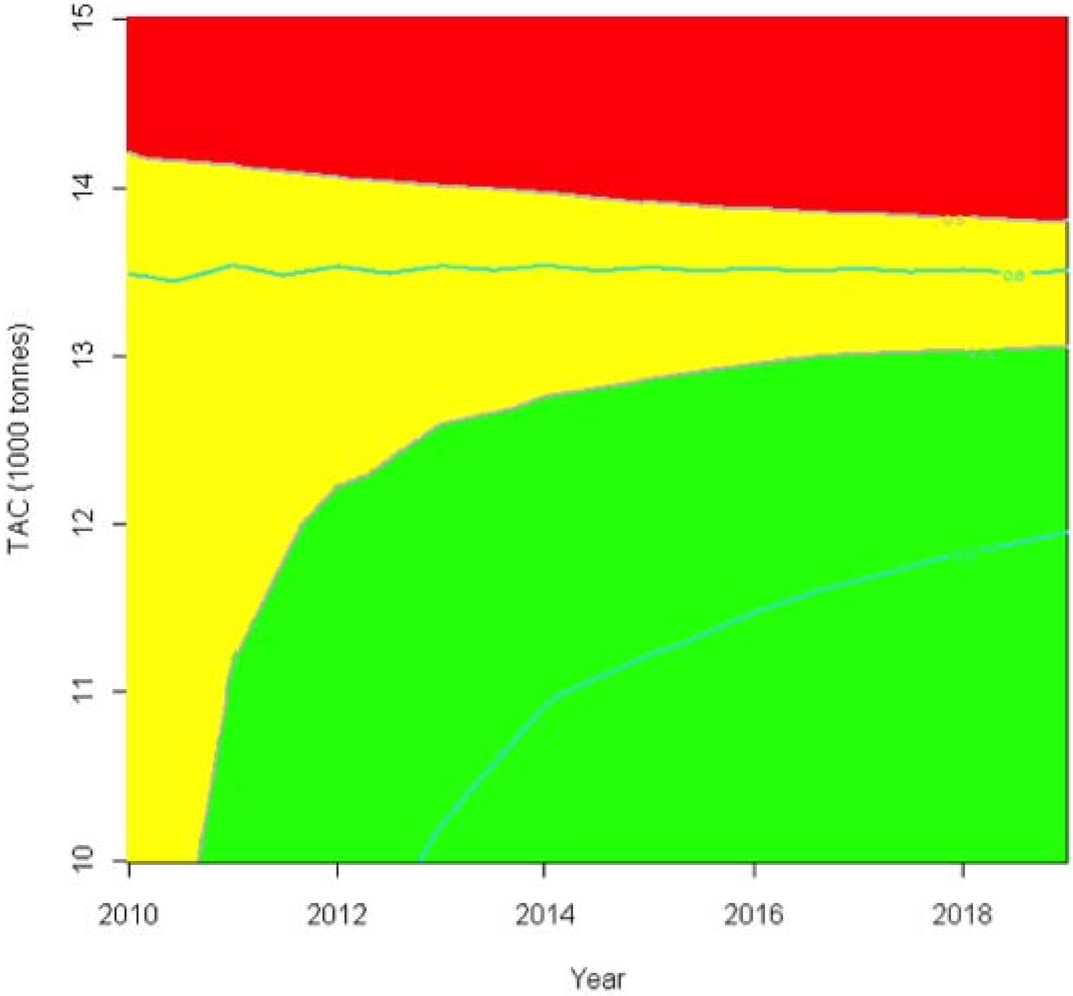
SWO-ATL-Figure 11. Posterior probability density estimates of MSY for South Atlantic swordfish from the catch-only model fitted to catch data from 1950 to 2009. Runs 1 and 2 refer to two scenarios with different assumptions for the intrinsic rate of population increase.



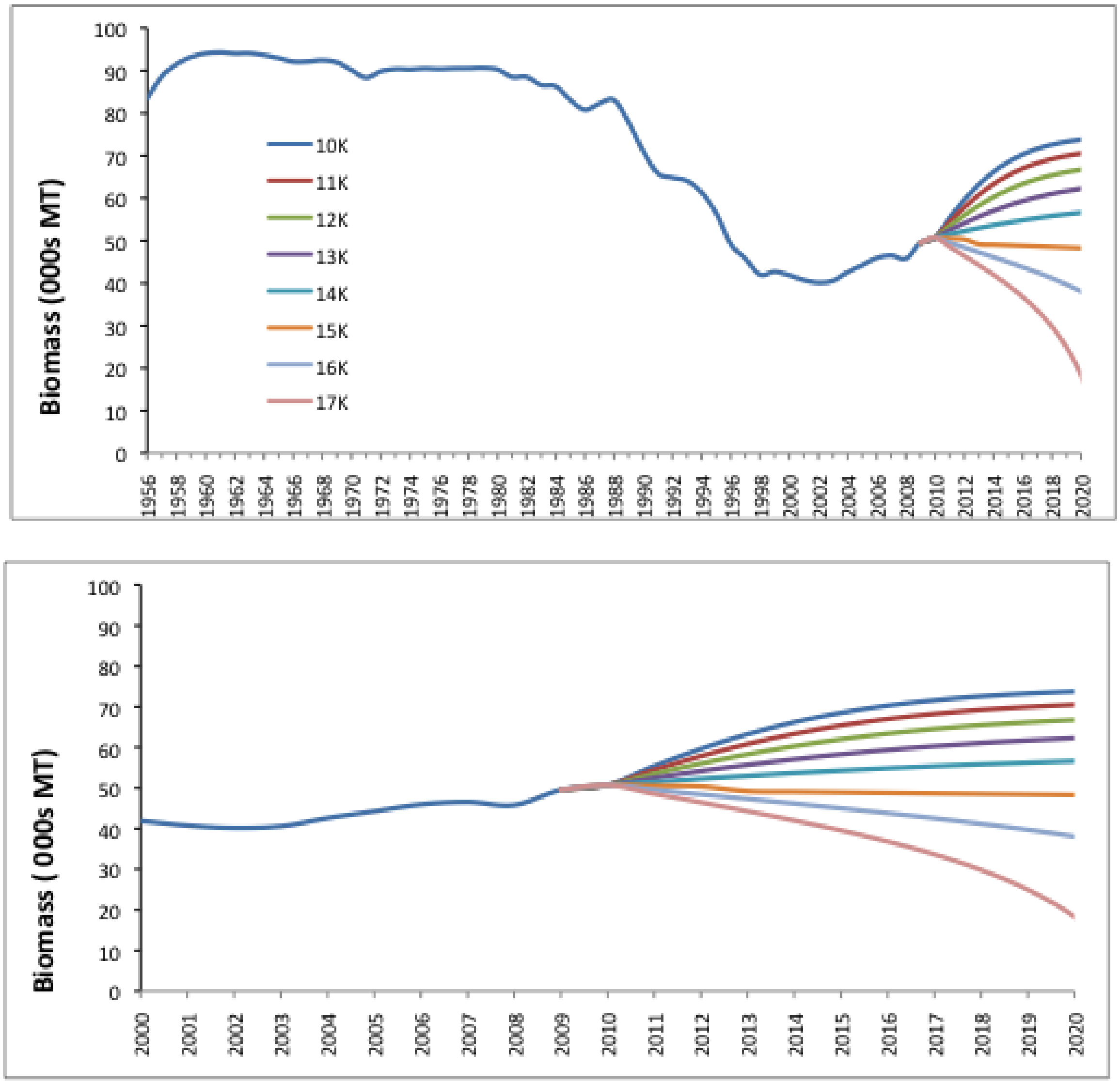
SWO-ATL-Figure 12. Summary figure of the current southern Atlantic swordfish stock status which includes the level of uncertainty on the knowledge of the state of the stock. Conditioned only on the catches**,** the model estimated a probability of 0.78 that the stock is not overfished and it is not undergoing overfishing.



SWO-ATL-Figure 13. 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 14. 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 15. 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 16. 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%.

8.10 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 much larger areas such as the North and South Atlantic. This situation supports the hypothesis that the biological and oceanographic conditions prevailing in the Mediterranean favour the high productivity of large pelagic fish. The most recent assessment was conducted in 2010 (Anon. 2011d), 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 Strait 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 fluctuated 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 2011 catch was 11,334 t, which is about 18% lower than the mean of the last ten years. Gillnet catches show a declining trend in the last years due to the enforcement of a Mediterranean-wide driftnet ban. It should be noted that the Moroccan driftnet fishery which was among the most important ones has closed since the beginning of 2012 The biggest producers of swordfish in the Mediterranean Sea in 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 longlines and, to a lesser extent, 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 mid 1980s **(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 than 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. Effect 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. An additional one month closure accompanied by minimum landing size regulations, a fishing license control system, and specifications on the technical characteristics of the longline gear have been recently imposed through Recommendation 11-03. Several countries have also adopted additional fishery restrictions at the national level. The EU 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.

Through Recommendation 11-03 the Commission has recently adopted additional management measures that will facilitate bringing the stock back to 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 two-month closure imposed in 2009 could not be evaluated during the 2010 assessment session due to incomplete 2009 data. The additional measures imposed through Recommendation 11-03 are not yet fully implemented and it is expected that their impact on the stock and the fisheries will be evaluated during the next assessment session.

SWO-MED-6. Management recommendations

Recommendation [11-03] has not been discussed in past SCRS sessions and it does not reproduce correctly the weight conversion factors that have been adopted for the stock and appear under the “Conversion Factors” headings in the ICCAT web-site; hence the phrase defining the minimum landing sizes in terms of weight should be modified as follows: “....weighing less than 10 kg of round weight or 9 kg of gilled and gutted weight, or 7.5 kg of dressed weight (gilled, gutted, fins off, part of head off)”.

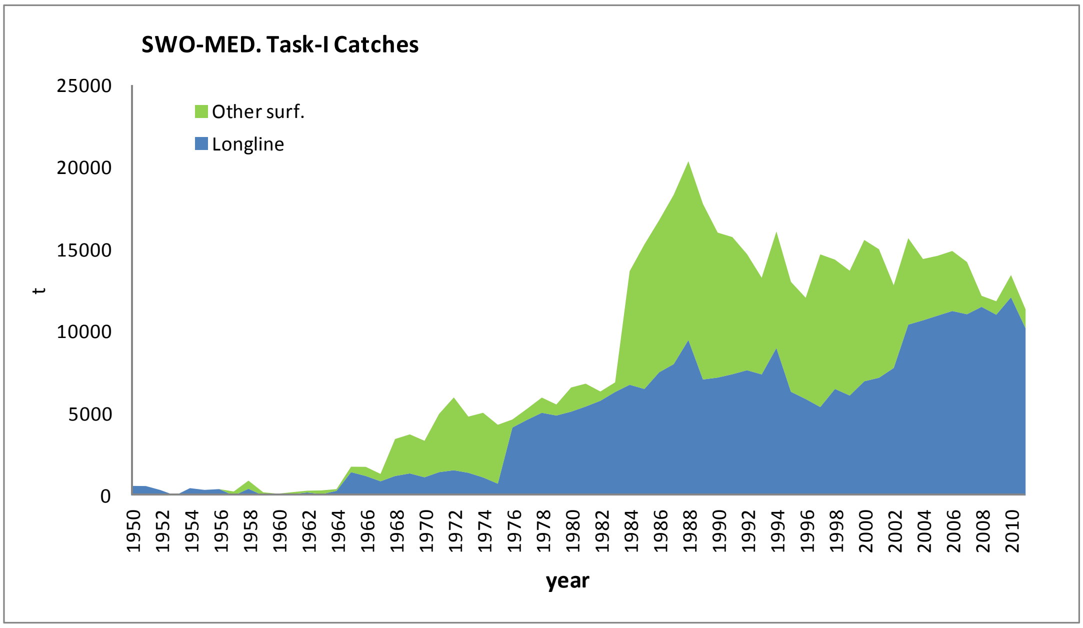
Given that the current capacity in the Mediterranean swordfish fishery exceeds that needed to efficiently extract MSY, management measures aimed at reducing this capacity should also be considered part of a Mediterranean swordfish management plan adopted by the Commission, building upon the current Recommendation 11-03.

MEDITERRANEAN SWORDFISH SUMMARY	
Maximum Sustainable Yield	~14,600 [1]
Current (2011) Yield	11,334 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] Three month fishery closure, gear specifications (number and size of hooks and length of gear), MLS regulations, and a license registry. [2]

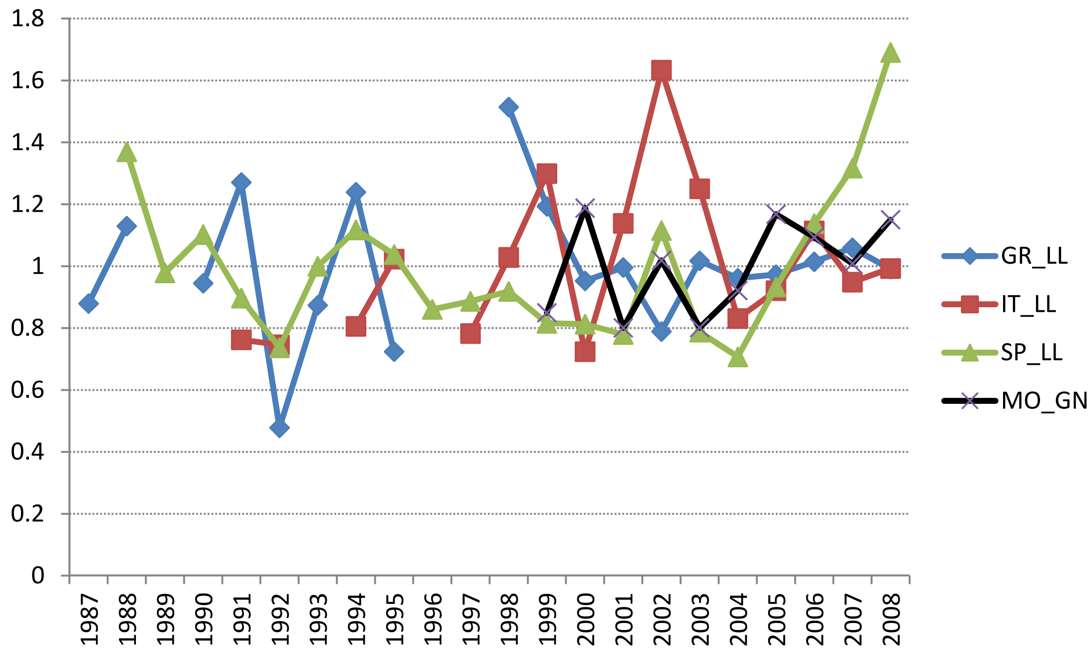
[1] Based on the age-structured analysis.
[2] Certain additional fishery restrictions are implemented at the national level.

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

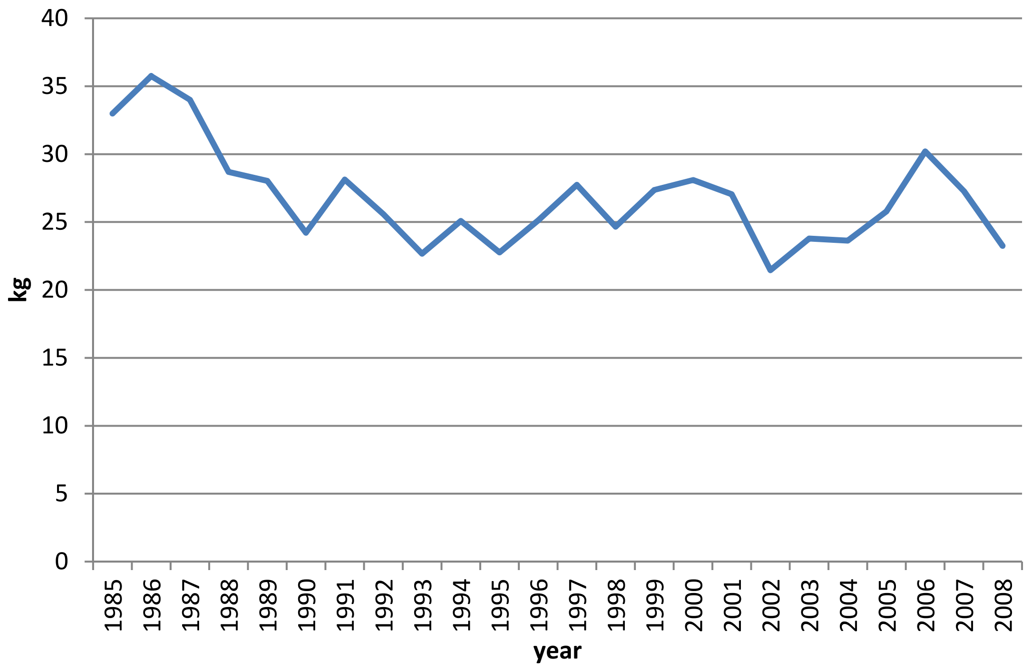
			1987	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
TOTAL	MED		18320	20365	17762	16018	15746	14709	13265	16082	13015	12053	14693	14369	13699	15569	15006	12814	15674	14405	14600	14893	14227	12164	11840	13430	11334
Landings		Longline	8007	9476	7065	7184	7393	7631	7377	8985	6319	5884	5389	6496	6097	6963	7180	7767	10415	10667	10848	11228	11028	11465	11020	12083	10186
		Other surf.	10313	10889	10697	8834	8353	7078	5888	7097	6696	6169	9304	7873	7602	8606	7826	5047	5259	3729	3639	3649	3179	672	819	1347	1149
Discards		Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	113	16	19	27	0	0	
Landings		Albania	0	0	0	0	0	0	0	0	0	13	13	13	13	0	0	0	0	0	0	0	0	0	0	0	
		Algerie	1820	2621	590	712	562	395	562	600	807	807	807	825	709	816	1081	814	665	564	635	702	601	802	468	624	216
		Chinese Taipei	0	0	0	0	0	0	1	1	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		Croatia	0	0	0	0	0	0	0	0	0	0	0	10	20	0	0	0	0	0	0	0	0	4	3	6	6
		EU.Cyprus	84	121	139	173	162	56	116	159	89	40	51	61	92	82	135	104	47	49	53	43	67	67	38	31	35
		EU.España	1134	1762	1337	1523	1171	822	1358	1503	1379	1186	1264	1443	906	1436	1484	1498	1226	951	910	1462	1697	2095	2000	1792	1655
		EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	27	0	19	0	0	14	14	16	78	81
		EU.Greece	1303	1008	1120	1344	1904	1456	1568	2520	974	1237	750	1650	1520	1960	1730	1680	1230	1120	1311	1358	1887	962	1132	1494	1306
		EU.Italy	12325	13010	13009	9101	8538	7595	6330	7765	7310	5286	6104	6104	6312	7515	6388	3539	8395	6942	7460	7626	6518	4549	5016	6022	5274
		EU.Malta	163	233	122	135	129	85	91	47	72	72	100	153	187	175	102	257	163	195	362	239	213	260	266	423	532
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	13	115	8	1	120	14	16	0	0	0	0	
		Japan	3	4	1	2	1	2	4	2	4	5	5	7	4	2	1	1	0	2	4	0	3	1	1	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	1	0	
		Libya	0	0	0	0	0	0	0	0	0	0	0	11	0	8	6	0	10	2	0	14	0	0	0	0	**0**
		Maroc	40	62	97	1249	1706	2692	2589	2654	1696	2734	4900	3228	3238	2708	3026	3379	3300	3253	2523	2058	1722	1957	1587	1610	1027
		NEI (MED)	828	875	979	1360	1292	1292	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	37	28	0	0	
		Tunisie	63	80	159	176	181	178	354	298	378	352	346	414	468	483	567	1138	288	791	791	949	1024	1011	1012	1016	1013
		Turkey	557	589	209	243	100	136	292	533	306	320	350	450	230	370	360	370	350	386	425	410	423	386	301	334	190
Discards		EU.Greece	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	113	16	19	27	0	0	



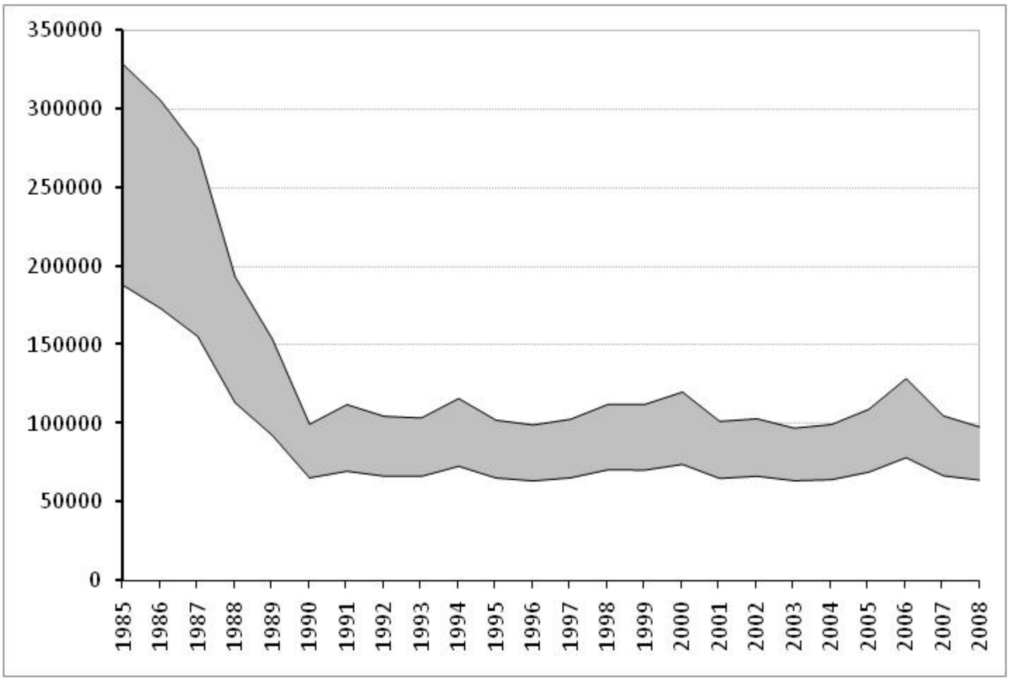
SWO-MED-Figure 1. Cumulative estimates of swordfish catches (t) in the Mediterranean by major gear types, for the period 1950-2011 (the 2011 data are provisional).



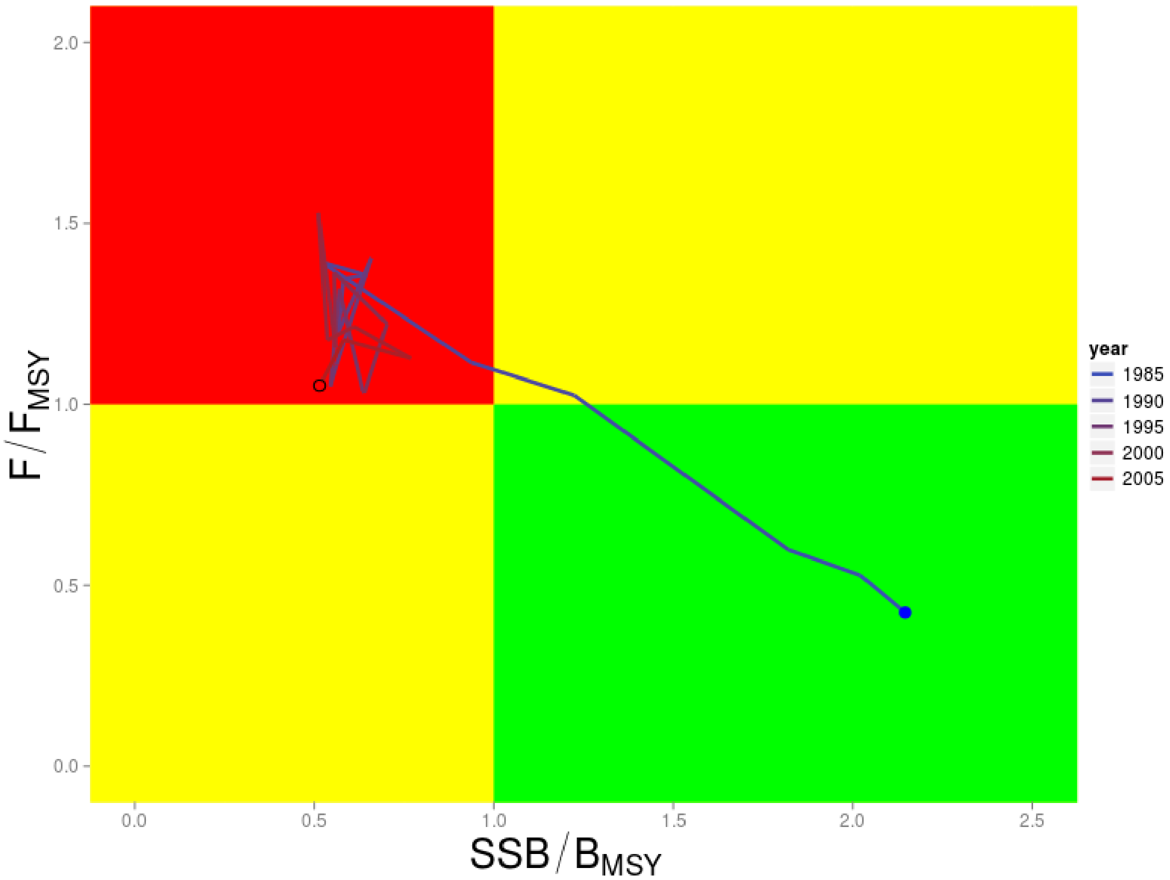
SWO-MED-Figure 2. Time series of standardized CPUE rates scaled to the corresponding mean value for the Spanish longliners (SP_LL), Italian longliners (IT_LL), Greek longliners (GR_LL), and Moroccan gillnetters (MO_GN).



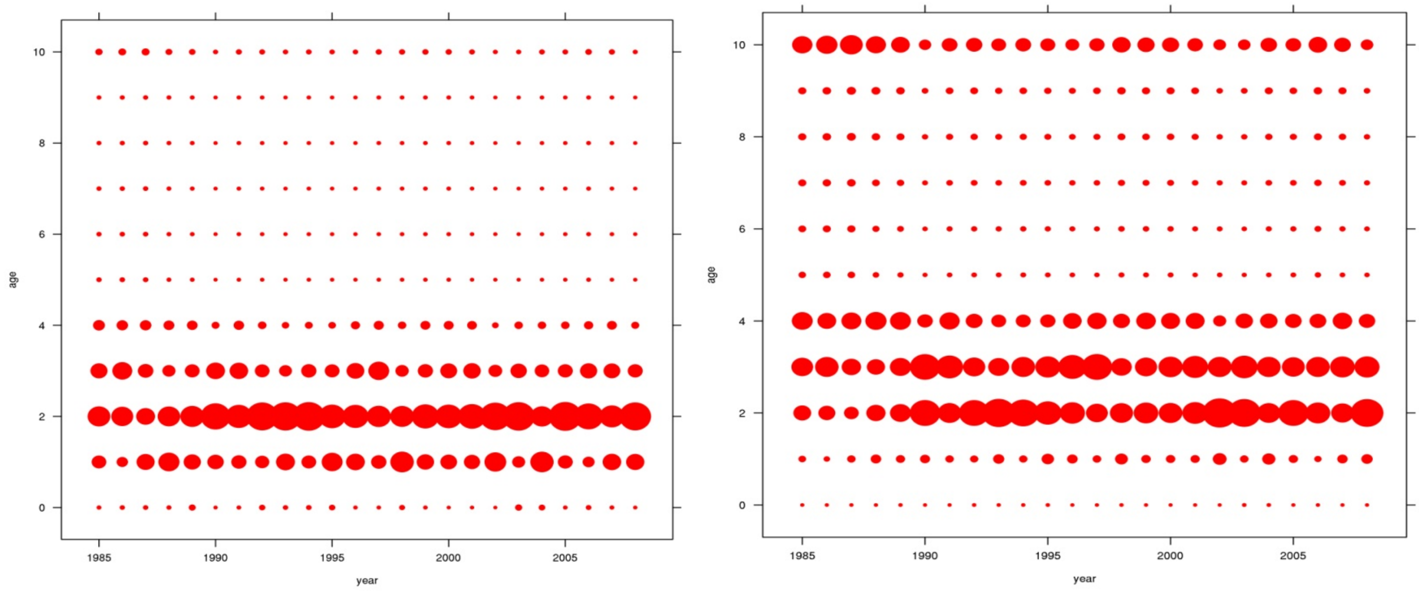
SWO-MED-Figure 3. Time series of mean fish weight in the catches.



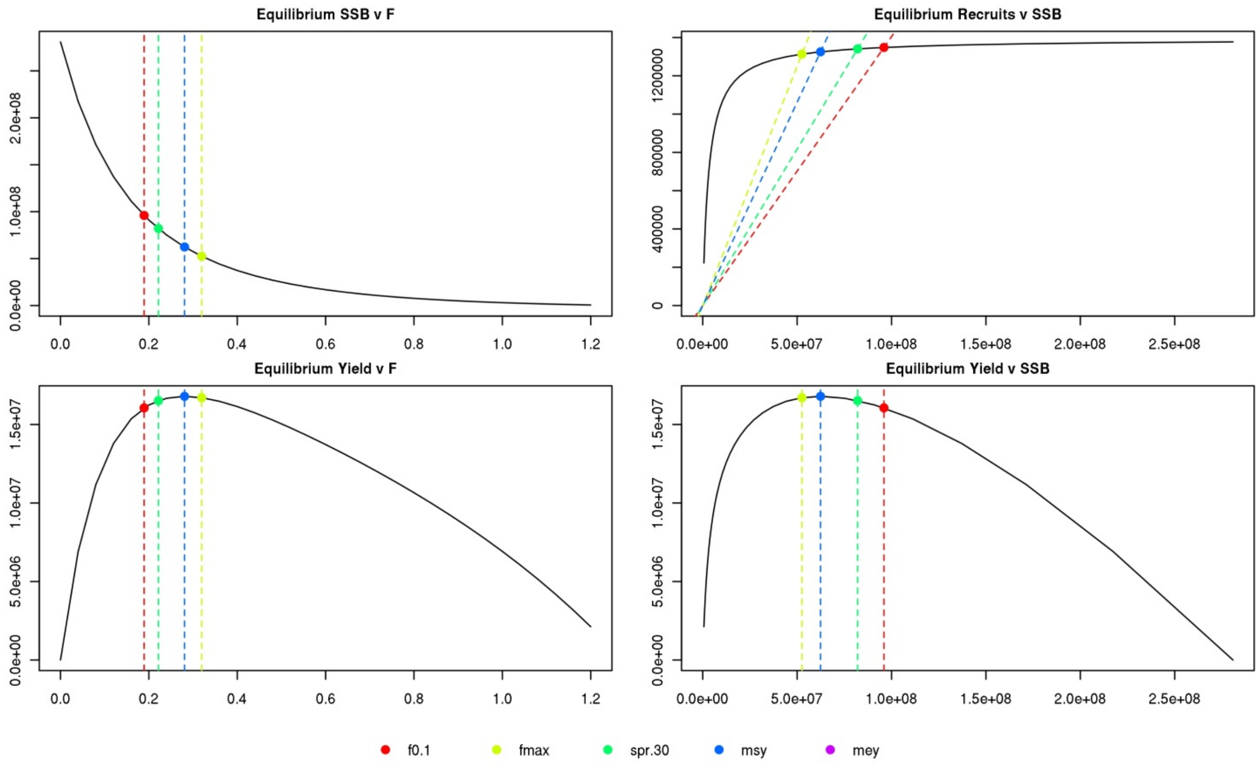
SWO-MED-Figure 4. Total and spawning stock biomass (SSB) estimates (grey color) obtained from the age-structured analysis.



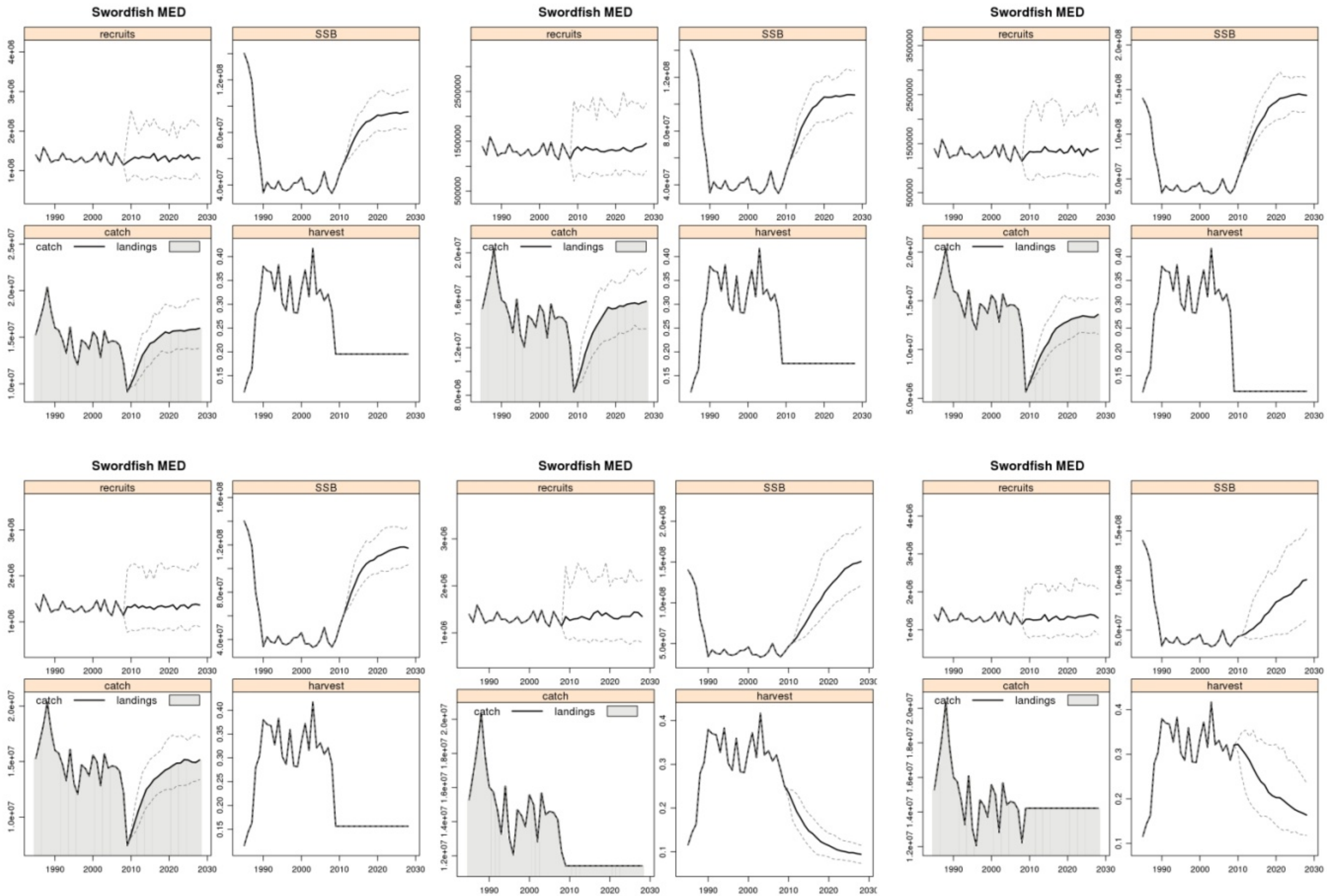
SWO-MED-Figure 5. Time trends for stock status (B/B_{MSY} and F/F_{MSY}) derived from the age-structured analysis. The open circle indicates the ratio estimates for the last assessment year (2008).



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.

8.11 SBF – SOUTHERN BLUEFIN TUNA

The Commission for the Conservation of Southern Bluefin Tuna (CCSBT) is charged with assessing the status of southern bluefin tuna. Each year, the SCRS reviews the CCSBT reports to learn about southern bluefin research and stock assessments. These reports are available from CCSBT.

8.12 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 (Chavance *et al.* 2010). 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, Regional Fisheries Organizations (RFOs) and countries in the various regions is imperative to advance understanding of the distribution, biology and fisheries 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 related to the reproduction biology of West African Spanish mackerel (SCRS/2012/150) was presented. This study based on the histological analysis and the gonado-somatique index of female gonads concluded that the spawning season for this species extends from April to July in the Gulf of Guinea. As regards the Atlantic bonito, the observations made from the Norwegian purse seine pelagic fishery confirm that this species extends its northern limit of distribution to south of the Norwegian waters (SCRS/2012/021).

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 trawl (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.

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. A new document analyzing the standardized CPUE from the Moroccan artisanal Gill net fishery in the Atlantic was presented. The preliminary analysis showed that there is no clear trend in the standardized index from 2004 to 2010 (SCRS/2012/179).

SMT-Table 1 shows historical landings of small tunas for the 1987 to 2011 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 2a-L)**. 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 59,024 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 2011 is 76,884 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 and regional perspective since these species have limited movements as compared to the major tuna species.

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. Effect 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.

				1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
BLF	TOTAL	A+M		3462	3322	2834	3888	4202	4353	3535	2719	4051	4488	3027	3238	3185	2465	4034	4756	1303	1926	1031	1937	1927	1669	1442	1516	1462
	Landings		All gears	3462	3322	2834	3888	4202	4353	3535	2719	4051	4488	3027	3238	3185	2465	4034	4756	1303	1926	1031	1937	1927	1669	1442	1516	1462
	Discards		All gears	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Landings	A+M	Brasil	254	229	120	335	130	49	22	38	153	649	418	55	55	38	149	1669	1	118	91	242	233	266	10	9	46
			Cuba	634	332	318	487	318	196	54	223	156	287	287	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Curaçao	60	70	70	70	60	60	65	60	50	45	45	45	45	45	45	45	0	0	0	0	0	0	0	0	
			Dominica	0	1	4	19	10	14	15	19	30	0	0	0	79	83	54	78	42	20	38	47	29	37	45	41	37
			Dominican Republic	199	4	564	520	536	110	133	239	892	892	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			EU.España	0	0	0	0	0	307	46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			EU.France	669	816	855	865	1210	1170	1140	1330	1370	1040	1040	1040	1040	1040	1040	1040	0	0	0	0	0	0	0	0	0
			Grenada	141	220	134	293	195	146	253	189	123	164	126	233	94	164	223	255	335	268	306	371	291	290	291	291	291
			Jamaica	0	0	0	0	0	0	0	0	0	148	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Liberia	0	229	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	10	9	10	10	12	6	7	6	9
			NEI (ETRO)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
			St. Vincent and Grenadines	0	19	15	38	11	7	53	19	20	18	22	17	15	23	24	24	0	0	0	0	0	0	0	0	
			Sta. Lucia	2	1	1	17	14	13	16	82	47	35	40	100	41	45	108	96	169	96	126	182	151	179	165	203	184
			Trinidad and Tobago	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.	44	154	87	81	112	127	508	492	582	447	547	707	617	326	474	334	414	675	225	831	422	649	619	622	414
			UK.Bermuda	11	7	14	13	8	6	5	7	4	5	4	6	6	5	4	5	9	4	5	8	7	6	7	9	8
			UK.British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
			Venezuela	1448	1240	652	1150	1598	2148	1224	21	624	758	498	1034	1192	696	1902	1210	319	732	225	237	777	231	293	331	473
	Discards	A+M	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	A+M		3740	6483	7110	11994	8777	5715	3421	5300	4301	5909	3070	3986	2646	3924	5819	6049	3798	6217	4438	4079	5701	6837	5557	9307	7876
			Algerie	0	0	0	0	174	270	348	306	230	237	179	299	173	225	230	481	0	391	547	586	477	1134	806	970	1119
			Croatia	0	0	0	0	24	21	52	22	28	26	26	26	26	0	0	0	0	0	0	0	0	0	0	8	13
			EU.España	631	2669	2581	2985	2226	1210	648	1124	1472	2296	604	487	669	1024	861	493	495	1009	845	1101	3083	3389	726	3812	2269
			EU.France	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	1426	1426	0	0	196	125	120	246	226	180	274	157	620	506	169	420
			EU.Italy	906	609	509	494	432	305	379	531	531	229	229	229	462	462	462	2452	1463	1819	866	0	0	342	732	574	653
			EU.Malta	5	8	18	21	20	11	10	1	2	3	6	6	3	1	0	0	0	0	0	0	4	12	7	11	23
			EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	28	263	494	208	166	231	300	791	867	849	322	436	654	387
			Maroc	178	811	1177	2452	1289	1644	170	1726	621	1673	562	1140	682	763	256	621	246	326	50	199	35	83	336	525	237
			Russian Federation	0	0	0	0	2171	814	70	100	0	0	0	1672	0	420	1053	468	128	102	139	22	5	23	48	67	119
			Serbia & Montenegro	0	0	0	0	13	1	0	0	2	6	6	6	7	8	8	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	
			Syria Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	99	75	87	81	84
			Tunisie	606	588	660	985	985	35	20	13	14	13	32	93	45	15	2300	932	989	1760	0	0	0	0	0	0	
			Turkey	0	0	0	0	35	0	324	77	0	0	0	0	316	316	316	316	0	284	1020	1031	993	836	1873	2436	2552
			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.	0	357	723	3634	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Yugoslavia Fed.	14	41	42	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BON	TOTAL			29712	46382	29721	28908	33334	21992	30595	21719	21219	25134	24519	45253	35702	27151	27637	24580	14424	15828	78766	38506	14174	14735	19483	19889	24562
		ATL		7395	22354	17766	6811	8079	6881	4598	6037	6030	7939	10441	15523	7532	5179	5400	8864	3307	4580	4391	6766	5542	4694	9461	7305	11733
		MED		22317	24028	11955	22097	25255	15111	25997	15682	15189	17195	14078	29730	28170	21972	22236	15716	11117	11247	74375	31740	8632	10042	10021	12584	12829
		ATL	Angola	144	180	168	128	102	4	49	20	9	39	32	0	2	118	118	118	0	0	138	0	931	0	1979	990	1484
			Argentina	1607	2794	1327	1207	1794	1559	434	4	138	108	130	12	68	19	235	1	129	269	110	0	0	0	0	0	
			Barbados	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	0	0	0	0	0	0	0	
			Benin	3	4	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Brasil	345	214	273	226	71	86	142	142	137	0	0	0	0	0	0	0	0	0	90	0	0	0	0	0	171
			Cuba	23	173	26	28	0	0	0	0	0	0	0	230	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	0	0	0	0	0	0	539	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	755	**0**
			Dominica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	16	16	9	4	0	0
			EU.Bulgaria	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			EU.España	41	91	57	18	8	39	5	3	2	2	1	0	12	12	10	5	23	9	2	15	14	13	36	45	16
			EU.Estonia	0	668	859	187	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

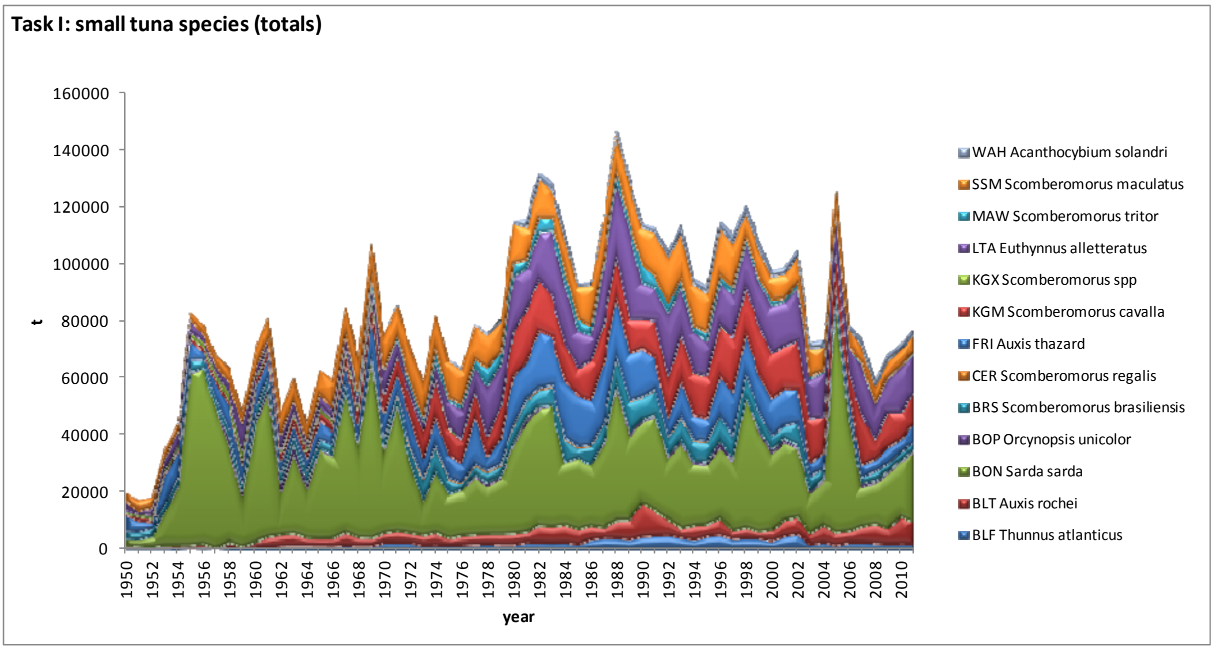
			EU.France	331	395	427	430	820	770	1052	990	990	610	610	610	24	32	0	18	0	0	0	0	122	59	25	208	241
			EU.Germany	0	0	0	53	0	0	0	0	0	714	0	0	0	0	0	38	0	0	0	0	0	0	0	0	
			EU.Greece	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			EU.Ireland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48	0	0	0	0	56	125	91
			EU.Latvia	0	1191	1164	221	7	4	0	3	19	301	887	318	0	416	396	639	0	0	0	0	0	0	0	0	
			EU.Lithuania	0	1041	762	162	11	10	0	0	0	0	0	0	0	0	0	793	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	344	539	539	0	2047
			EU.Poland	0	0	0	0	0	0	0	0	0	225	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			EU.Portugal	371	377	80	202	315	133	145	56	78	83	49	98	98	162	47	61	40	50	38	318	439	212	124	476	461
			EU.United Kingdom	0	0	0	0	0	0	0	0	0	287	0	0	0	0	0	0	0	0	0	35	0	0	30	71	113
			Gabon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	58	0	0	0	0	0	0	0	0	
			Georgia	0	39	54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Germany Democratic Rep.	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Ghana	943	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	24	6	14	16	7	10	10	0	0	0	0	0	0	0	0	
			Jamaica	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Maroc	241	589	566	492	794	1068	1246	584	699	894	1259	1557	1390	2163	1700	2019	928	989	1411	1655	1053	1419	2523	109	145
			Mexico	391	356	338	215	200	657	779	674	1144	1312	1312	1632	1861	1293	1113	1032	1238	1066	654	1303	1188	1113	1063	1046	1080
			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	2	0	0	0	0	0	0	0	0	0	0	
			Rumania	3	255	111	8	212	84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Russian Federation	0	0	0	0	948	29	0	0	0	0	0	4960	0	0	574	1441	461	16	79	316	259	52	368	1042	2293
			Senegal	463	2066	869	525	597	345	238	814	732	1012	1390	2213	948	286	545	621	195	182	484	729	1020	1154	2545	1768	2876
			Sierra Leone	10	10	10	10	4	6	0	0	0	0	0	0	0	11	245	44	0	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	
			St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	18	0	16	23	27	15	6	20
			Sta. Lucia	0	1	0	3	3	3	4	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
			Togo	245	400	256	177	172	107	311	254	145	197	197	197	197	0	0	0	0	1583	1215	2298	0	0	0	0	
			Trinidad and Tobago	0	0	0	0	0	0	17	703	169	266	220	30	117	117	56	452	188	280	81	7	16	38	68	68	68
			U.S.A.	130	90	278	299	469	498	171	128	116	156	182	76	83	142	120	139	44	70	68	40	97	47	50	46	67
			U.S.S.R.	1083	8882	7363	706	0	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	**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	**0**
			Ukraine	0	1385	985	0	0	25	0	0	0	342	2786	1918	1114	399	231	1312	30	0	0	0	0	0	0	0	
			Uruguay	0	0	0	0	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Venezuela	1020	1153	1783	1514	1518	1454	5	1661	1651	1359	1379	1659	1602	2	0	61	13	0	16	18	19	12	38	10	21
		MED	Albania	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Algerie	203	625	1528	1307	261	315	471	418	506	277	357	511	475	405	350	597	0	609	575	684	910	1042	976	1009	355
			Croatia	0	0	0	0	49	128	6	70	0	0	0	25	120	0	0	0	0	0	0	0	0	0	0	59	41
			EU.Bulgaria	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	14	0	10	10	6	4	3	0	0	0	0	
			EU.España	51	962	609	712	686	228	200	344	632	690	628	333	433	342	349	461	544	272	215	429	531	458	247	518	382
			EU.France	0	10	0	1	10	5	6	0	0	0	0	0	0	0	0	27	0	0	0	0	15	34	20	23	13
			EU.Greece	1848	1254	2534	2534	2690	2690	2690	1581	2116	1752	1559	945	2135	1914	1550	1420	1538	1321	1390	845	1123	587	476	531	810
			EU.Italy	2148	2242	1369	1244	1087	1288	1238	1828	1512	2233	2233	2233	4159	4159	4159	4579	2091	2009	1356	0	0	1323	1131	964	1197
			EU.Malta	0	0	0	0	0	0	0	0	0	2	7	2	2	1	0	0	0	0	0	0	2	7	5	6	1
			Egypt	35	17	358	598	574	518	640	648	697	985	725	724	1442	1442	1128	1128	0	0	0	0	0	0	0	0	
			Libya	0	0	0	0	0	71	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Maroc	127	108	28	69	69	31	25	93	37	67	45	39	120	115	5	61	85	78	38	89	87	142	131	57	12
			NEI (MED)	537	561	342	311	311	311	300	300	300	300	75	0	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	45	0	3	2	6	10	12	12	14	17	17	0	0	0	0	0	0	0	0	0	
			Tunisie	500	600	422	488	305	643	792	305	413	560	611	855	1350	1528	1183	1112	848	1251	0	0	0	0	0	0	
			Turkey	16793	17613	4667	14737	19151	8863	19548	10093	8944	10284	7810	24000	17900	12000	13460	6286	6000	5701	70797	29690	5965	6448	7036	9401	10019
			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.	62	36	98	79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BOP	TOTAL			564	1482	1116	473	608	641	630	791	703	2196	481	177	868	1207	1012	923	736	581	217	32	1047	533	449	289	375
		ATL		538	1474	1109	436	507	465	378	615	588	2064	254	47	651	1062	858	786	713	573	215	32	875	426	442	275	335
		MED		26	8	7	37	101	176	252	176	115	132	227	130	217	145	154	137	23	8	2	0	172	107	6	14	40

		ATL	Benin	1	2	1	1	1	1	1	1	1	1	3	1	1	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	5	3	1	2	11	23	7
			Maroc	487	1422	1058	369	486	423	348	598	524	2003	246	28	626	1048	830	780	706	503	132	0	634	391	273	199	213
			Mauritania	50	50	50	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Senegal	0	0	0	16	20	41	29	16	63	60	5	18	24	14	28	6	7	70	78	29	240	33	158	53	115
		MED	Algerie	0	0	0	0	87	135	198	153	92	119	224	128	216	135	145	128	0	0	0	0	0	0	0	0	9
			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.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
			Libya	0	0	0	0	0	40	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Maroc	26	8	7	37	14	1	14	23	23	13	3	2	1	10	9	9	20	7	1	0	172	107	6	14	30
			Tunisie	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	
BRS	TOTAL	A+M		6212	9510	10778	7698	8856	6051	8049	7161	7006	8435	8004	7923	5754	4785	4553	7750	5137	3410	3712	3587	2253	3305	2681	2871	2776
			Brasil	4741	5063	5927	2767	1437	1149	842	1149	1308	3047	2125	1516	1516	988	251	3071	2881	814	471	1432	563	1521	1042	1281	1162
			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	1	1	1	0	0	0	0	0	0	0	0	0	0	
			Guyana	0	0	0	0	0	0	0	0	0	211	571	625	1143	308	329	441	389	494	521	377	277	312	141	92	116
			Trinidad and Tobago	0	2704	2864	2471	2749	2130	2130	2130	1816	1568	1699	2130	1328	1722	2207	2472	1867	2103	2720	1778	1414	1472	1498	1498	1498
			Venezuela	1471	1743	1987	2460	4670	2772	5077	3882	3882	3609	3609	3651	1766	1766	1766	1766	0	0	0	0	0	0	0	0	
CER	TOTAL	A+M		392	219	234	225	375	390	450	490	429	279	250	250	0	3	5	1	2	1	1	1	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	1	0	0	0	0	0
			Dominican Republic	48	57	59	50	45	79	50	90	29	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			EU.France	344	162	175	175	330	310	400	400	400	250	250	250	0	0	0	0	0	0	0	0	0	0	0	0	0
			St. Vincent and Grenadines	0	0	0	0	0	1	0	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	3	5	1	2	0	1	0	0	0	0	0	
FRI	TOTAL	ATL		21193	20573	16411	16738	10356	6367	12678	8407	7535	13809	14954	14197	13004	12905	12762	11627	4521	5451	4247	5009	4080	4051	5698	4359	6493
			Angola	115	20	70	28	1	0	4	6	21	29	12	31	2	38	38	38	0	0	0	0	95	0	46	23	35
			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	3	6	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Brasil	1260	1904	700	592	746	291	608	906	558	527	215	162	166	106	98	1117	860	414	532	603	202	149	313	204	347
			Cape Verde	2	86	105	75	135	82	115	86	13	6	22	191	154	81	171	278	264	344	167	404	197	832	1707	744	672
			Curaçao	0	0	0	0	0	0	0	0	0	590	1157	1030	1159	1122	989	710	505	474	0	150	106	485	364	0	235
			Côte D'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	170	135	0	0	0	3
			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	4538	3938	1877	2240	541	228	362	297	386	947	581	570	23	17	722	438	635	34	166	73	278	631	1094	950	869
			EU.Estonia	0	0	0	0	198	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			EU.France	3392	3392	3008	3872	0	121	63	105	126	161	147	146	0	91	127	91	0	168	47	6	98	24	24	91	147
			EU.Latvia	0	0	0	0	243	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			EU.Lithuania	0	0	0	0	290	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			EU.Portugal	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	6	0	26
			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	4689	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	151	0	0	0	0	
			Grenada	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	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	98	74	81	78	48
			Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	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	
			Maroc	465	194	599	1045	1131	332	274	122	645	543	2614	2137	494	582	418	441	184	542	61	48	135	179	9	19	862
			Mixed flags (FR+ES)	1526	1525	1350	1728	3633	4017	9674	3107	1919	7177	6063	6342	8012	9864	9104	7748	1623	1722	1527	1739	1072	614	1131	873	1002
			NEI (ETRO)	17	381	155	237	1	4	32	68	70	180	120	309	491	291	420	186	71	180	297	149	140	0	0	0	
			Panama	0	0	0	0	243	57	118	341	328	240	91	0	0	0	0	0	0	394	975	970	1349	411	439	425	339
			Rumania	15	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	1078	627	150	405	456	46	500	761	477	0	0	300	50	56	63	6	1	12	113	270	912
			S. Tomé e Príncipe	0	23	32	35	41	39	33	37	48	79	223	197	209	200	200	200	200	234	215	290	0	275	282	290	286
			Senegal	0	810	784	1084	311	201	342	319	309	0	0	0	7	0	4	0	13	288	151	83	119	315	15	177	202
			Trinidad and Tobago	0	0	0	0	0	0	17	0	56	199	368	127	138	245	0	0	0	414	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	
			U.S.S.R.	2905	5638	5054	2739	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	0	0	0	0	0	0	0	36	48	0	43	0	0	0	0	0	0	0	0	
			Venezuela	2264	2654	2670	3037	1762	368	886	2609	2601	3083	2839	2164	1631	210	444	32	113	182	42	165	52	48	54	215	508

KGM	TOTAL	A+M		13792	14331	12153	10420	13241	14691	16331	14777	14930	17782	19660	16394	17717	16161	15360	17258	15863	12830	11766	8185	17936	7344	12533	9742	11145
			Antigua and Barbuda	0	0	0	0	0	0	1	0	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	2173	2029	2102	2070	962	979	1380	1365	1328	2890	2398	3595	3595	2344	1251	2316	3311	247	202	316	33	0	0	1	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	36	35	2	0	0	0	0	0	0	0	0	0	
			Dominican Republic	0	20	29	33	34	47	52	0	0	0	589	288	230	226	226	226	0	0	0	0	0	0	0	0	
			Grenada	0	0	0	0	0	0	0	0	0	2	4	28	14	9	4	5	0	0	0	0	0	0	0	0	
			Guyana	0	0	0	0	0	0	0	0	0	0	270	440	398	214	239	267	390	312	245	168	326	174	91	59	75
			Jamaica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48	0	0	0	0	0	0	0	0	
			Mexico	3067	3100	2300	2689	2147	3014	3289	3097	3214	4661	4661	3583	4121	3688	4200	4453	4369	4564	3447	4201	3526	3113	3186	3040	3130
			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	7	9	0
			Sta. Lucia	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	82	752	541	432	657	0	1192	0	471	1029	875	746	447	432	410	1457	802	578	747	661	567	1043	1001	1001	1001
			U.S.A.	7530	7100	5681	4127	8213	9344	9616	7831	7360	7058	8720	7373	6453	6780	6603	6061	6991	7129	7123	2837	13482	3013	8247	5630	6939
			UK.British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
			Venezuela	940	1330	1500	1069	1228	1308	801	2484	2558	2140	2139	340	2424	2424	2424	2424	0	0	0	0	0	0	0	0	
KGX	TOTAL	A+M		261	491	105	131	225	266	301	508	512	824	156	251	1	229	48	0	15	0	1	26	16	0	2	20	16
			Barbados	159	332	68	51	45	51	55	36	42	49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Brasil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
			Colombia	102	159	37	25	7	12	21	148	111	539	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	236	0	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	5
			EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	26	16	0	2	20	7
			Gabon	0	0	0	0	0	0	0	140	145	79	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	0	0	0	0	0	0	0	0	0	0	0	0	
			Jamaica	0	0	0	0	0	0	0	0	0	0	155	0	0	44	48	0	0	0	0	0	0	0	0	0	
			Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Puerto Rico	0	0	0	0	0	53	84	86	134	106	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	14	0	0	0	0	15	0	0	0	0	0	0	0	
			St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	1	1	1	1	138	0	0	0	0	0	0	0	0	0	0	1
			Sta. Lucia	0	0	0	55	79	150	141	98	80	50	0	0	0	48	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	
			Ukraine	0	0	0	0	94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LTA	TOTAL			20759	26182	30791	12622	11214	22045	16562	14182	11701	14257	15099	15750	15382	16483	15347	18392	13747	15785	12188	8849	17354	12323	11618	15891	13519
		ATL		18335	23777	28756	10005	8891	20289	15296	12977	9799	12138	13495	12836	12506	13189	12484	15750	13065	14347	11148	7248	15668	10064	9513	13721	11051
		MED		2424	2405	2035	2617	2323	1756	1266	1205	1902	2119	1604	2914	2875	3294	2863	2642	682	1438	1040	1602	1686	2259	2104	2170	2468
		ATL	Angola	1345	1148	1225	285	306	14	175	121	117	235	75	406	118	132	132	132	0	0	2	0	4365	0	1644	822	1233
			Argentina	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Benin	14	7	43	66	61	49	53	60	58	58	196	83	69	69	69	69	0	0	0	0	0	0	0	0	
			Brasil	187	108	74	685	779	935	985	1225	1059	834	507	920	930	615	615	615	0	320	280	0	0	0	0	0	22
			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	14	1	18	65	74	148	17	23	72	63	86	110	776	491	178	262	143	137	40	160	348	518	855	402	134
			Cuba	55	53	113	88	63	33	13	15	27	23	23	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	0	0	0	0	0	9	0	0	0	0	0	0	38	38
			Côte D'Ivoire	5300	38	4900	2800	100	142	339	251	253	250	114	108	0	108	0	0	0	0	270	298	404	1677	1041	1359	5
			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	11	7	11	55	81	1	0	0	10	55	27	110	6	2	22	8	1	489	50	16	0	38	35	136	165
			EU.Estonia	0	0	0	0	66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			EU.France	0	0	195	0	74	13	8	54	59	22	215	21	696	631	610	613	0	10	27	12	0	1	50	35	5
			EU.Germany	0	0	0	38	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	0	0	0	0	0	
			EU.Latvia	0	0	0	0	65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			EU.Lithuania	0	0	0	0	9	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	14	69	8	0	18
			EU.Poland	6	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	21	86	91	2	61	73	45	72	72	218	320	171	14	50	0	2	16	19	21	24	43	10	6	5	14
			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	7	15	23

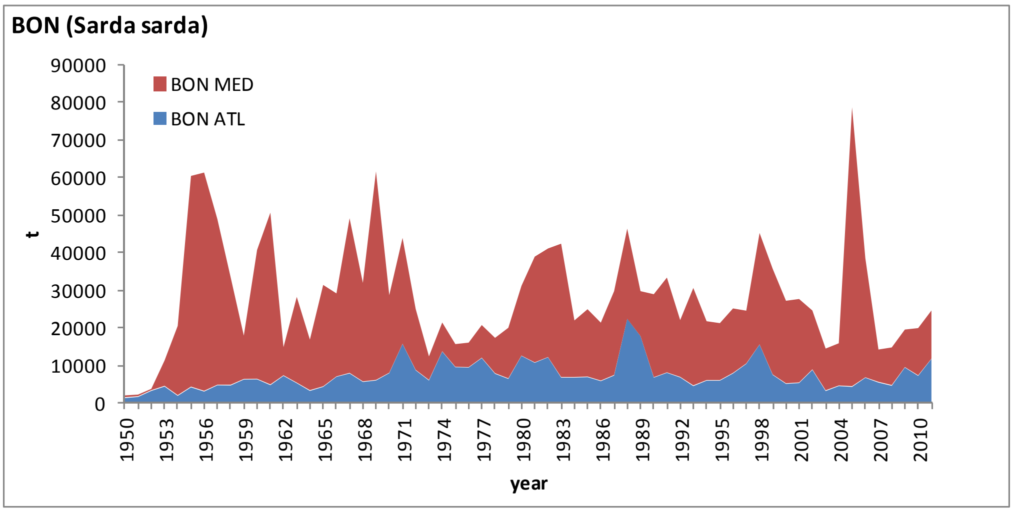
			Gabon	0	0	0	0	0	0	0	0	0	182	0	18	159	301	213	57	173	0	0	0	0	0	0	0	
			Germany Democratic Rep.	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Ghana	5551	11588	12511	323	201	11608	359	994	513	113	2025	359	306	707	730	4768	8541	7060	5738	216	4449	3188	1497	2343	2031
			Israel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Maroc	108	49	14	367	57	370	44	43	230	588	195	189	67	101	87	308	76	91	33	0	40	2	63	5	57
			Mauritania	50	50	50	50	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Mixed flags (FR+ES)	1017	1017	900	1152	2422	2678	4975	2071	1279	3359	2836	2936	3846	4745	4238	3334	1082	1148	1018	1159	715	410	1181	795	988
			NEI (ETRO)	0	0	0	0	0	0	0	8	20	0	0	0	0	0	0	33	2	0	22	0	0	0	0	0	
			Panama	0	0	0	0	0	0	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Rumania	7	88	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	617	306	265	189	96	49	0	88	0	0	0	74	13	0	0	0	0	0	0	268	11
			S. Tomé e Príncipe	0	30	36	52	46	48	41	40	43	40	50	39	37	33	33	33	33	178	182	179	0	183	188	193	191
			Senegal	2985	6343	6512	1834	1603	1854	4723	4536	2478	1972	2963	2910	1607	1746	1857	1806	1430	3507	2694	3825	3885	2972	1691	6180	4910
			South Africa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	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	2	2	2	0	1	10	1	0	0	1	0	0	0	0	
			U.S.A.	118	204	129	173	228	597	1286	1142	1312	2230	2015	1546	1623	1209	1451	1366	1492	1382	765	1351	1401	963	1244	1120	1194
			U.S.S.R.	61	1707	543	667	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			UK.Bermuda	13	17	14	8	10	11	5	6	6	7	6	5	4	2	1	5	4	5	7	5	5	4	3	4	5
			Venezuela	1467	1236	1374	1294	1963	1409	1889	2115	2115	1840	1840	2815	2247	2247	2247	2254	50	0	0	0	0	30	0	2	8
		MED	Algerie	0	0	0	0	522	585	495	459	552	554	448	384	562	494	407	148	0	158	116	187	96	142	119	131	98
			Croatia	0	0	0	0	2	3	2	15	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	28
			EU.Cyprus	25	41	20	23	25	21	11	23	10	19	19	19	16	19	19	19	0	0	0	0	6	5	4	0	
			EU.España	0	5	0	0	0	0	0	0	15	18	9	15	0	8	82	32	0	41	262	116	202	212	86	299	193
			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	42
			EU.Greece	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	132	0	0	112	69	72	183	148	165	206
			EU.Italy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	24	38	34	0	0	486	243	365	304
			EU.Malta	0	0	0	0	8	1	8	8	8	3	3	0	0	0	0	0	0	0	0	0	1	5	8	7	5
			Israel	273	135	124	129	108	126	119	119	215	119	119	119	119	119	119	119	0	0	0	0	0	0	0	0	
			Libya	0	0	0	0	0	0	0	0	0	0	45	52	0	5	4	4	0	0	0	0	0	0	0	0	**0**
			Maroc	0	12	0	16	0	0	0	0	1	0	1	14	8	0	0	3	1	0	9	0	331	19	24	1	**0**
			NEI (MED)	200	200	200	200	200	200	200	200	200	200	200	200	200	0	0	0	0	0	0	0	0	0	0	0	
			Palestina	0	0	0	0	0	0	0	0	0	90	59	61	60	60	60	129	0	0	0	0	0	0	0	0	
			Serbia & Montenegro	0	0	0	0	5	0	28	21	35	22	18	20	18	16	16	0	0	0	0	0	0	0	0	0	
			Syria Rep.	121	99	121	127	110	156	161	156	155	270	350	417	390	370	370	330	0	0	0	0	193	133	163	148	155
			Tunisie	1803	1908	1566	2113	1343	664	242	204	696	824	333	1113	752	1453	1036	960	657	633	0	0	0	0	0	0	
			Turkey	0	0	0	0	0	0	0	0	0	0	0	500	750	750	750	750	0	568	507	1230	785	1074	1309	1046	1437
			Yugoslavia Fed.	2	5	4	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MAW	TOTAL	A+M		1799	3921	2938	6626	4160	3648	2741	2070	3414	2829	2249	2001	1397	1995	1236	1927	1072	528	824	389	845	281	399	337	854
			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	17	13	334	211	214	202	214	194	188	188	362	511	205	205	205	205	0	0	0	0	0	0	0	0	
			EU.Estonia	0	0	0	0	49	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	0	0	0	0	0	2	
			EU.Latvia	0	0	0	208	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			EU.Lithuania	0	0	0	0	52	4	0	0	0	0	0	0	0	0	0	298	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	1	1	0	10
			Gabon	0	0	0	0	0	0	0	0	0	0	0	85	0	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	0	1457	1457	1500	2778	899	466	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Russian Federation	0	143	195	1032	0	0	19	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
			S. Tomé e Príncipe	0	6	4	6	5	3	5	6	6	8	7	8	5	6	6	6	6	21	12	13	0	91	94	96	95
			Senegal	1754	2159	753	2429	1028	2450	2038	1870	3220	2633	1880	1397	1187	1763	1025	1376	1054	506	812	375	845	189	304	239	749
			U.S.S.R.	28	143	195	1240	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	90	0	0	0	0	0	0	0	21	0	42	12	0	0	0	0	0	0	0	
SSM	TOTAL	A+M		14461	12671	13845	12782	15318	16285	16317	14490	13697	16571	15403	8641	9837	8220	8383	9414	9793	8119	10470	6282	6102	5900	6197	5974	5931
			Colombia	72	151	112	76	37	95	58	69	69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Cuba	1606	803	746	665	538	611	310	409	548	613	613	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	0	0	0	0	0	0	0	0	0	0	0	
			Dominican Republic	1321	1415	1401	1290	728	735	739	1330	2042	2042	231	191	125	158	158	158	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	9
			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	265	0	0	0	0	0	0	0	0	
			Grenada	0	0	1	3	0	0	1	2	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
			Mexico	6461	5246	7242	8194	8360	9181	10066	8300	7673	11050	11050	5483	6431	4168	3701	4350	5242	3641	5723	3856	3955	4155	4251	4128	4026
			Sta. Lucia	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.	5001	5056	4343	2554	5655	5663	5143	4380	3363	2866	3509	2968	3282	3893	4524	4613	4552	4477	4747	2425	2147	1746	1946	1846	1896
WAH	TOTAL	A+M		1235	1635	1527	1498	1721	1834	2670	2143	2408	2515	3085	2488	2957	2020	2296	2202	2049	2580	1692	1611	2201	2046	2152	1758	1876
			Antigua and Barbuda	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Aruba	90	80	80	70	60	50	50	125	40	50	50	50	50	50	50	50	0	0	0	0	0	0	0	0	
			Barbados	159	332	51	51	60	51	91	82	42	35	52	52	41	41	0	0	34	45	26	41	36	27	17	30	29
			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	133	58	92	52	64	71	33	26	1	16	58	41	0	0	0	0	405	519	449	111	75	76	70	19	357
			Cape Verde	306	340	631	458	351	350	326	361	408	503	603	429	587	487	578	500	343	458	45	537	454	811	745	470	418
			Curaçao	260	280	280	280	250	260	270	250	230	230	230	230	230	230	230	230	0	0	0	0	0	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	0	0
			Dominica	0	0	0	38	43	59	59	59	58	58	58	58	50	46	11	37	10	6	8	15	14	16	10	13	13
			Dominican Republic	0	1	3	6	9	13	7	0	0	0	325	112	31	35	35	35	0	0	0	0	0	0	0	0	
			EU.España	9	32	18	23	28	32	22	20	15	25	25	29	28	32	38	46	48	305	237	110	66	38	73	53	86
			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	4
			EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	0	4	3	9	8
			Grenada	54	137	57	54	77	104	96	46	49	56	56	59	82	51	71	59	44	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	1	0	
			Maroc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	76	**0**
			Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	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	91	240	120	86	111	99
			S. Tomé e Príncipe	0	23	20	28	34	27	36	39	46	80	52	56	62	52	52	52	52	94	88	76	0	131	235	241	238
			Saint Kitts and Nevis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	6	7	0	0	0	0	0	
			Senegal	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	4	4	28	33	33	41	28	16	23	10	65	52	46	311	17	40	60	0	241	29	24	31	40	31
			Sta. Lucia	0	0	0	77	79	150	141	98	80	221	223	223	310	243	213	217	169	238	169	187	0	171	195	199	197
			Trinidad and Tobago	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.	57	128	110	82	134	203	827	391	764	608	750	614	858	640	633	846	789	712	558	89	1123	495	522	358	241
			UK.Bermuda	43	61	63	74	67	80	58	50	93	99	105	108	104	61	56	91	87	88	83	86	124	117	101	81	100
			UK.British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	1
			UK.Sta Helena	18	18	17	18	12	17	35	26	25	23	0	0	0	0	0	0	0	0	0	0	0	0	29	19	31
			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	**0**
			Venezuela	106	141	101	159	302	333	514	542	540	487	488	360	467	4	17	13	9	7	16	13	33	9	25	28	23

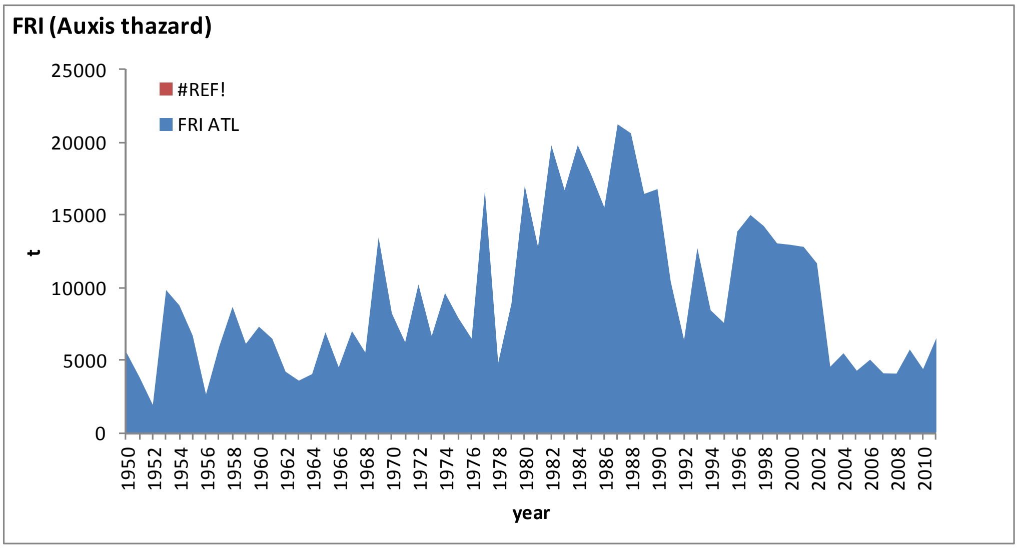


SMT-Figure 1. Estimated landings (t) of small tunas (combined) in the Atlantic and Mediterranean, 1950-2011. The data for the last three years are incomplete.

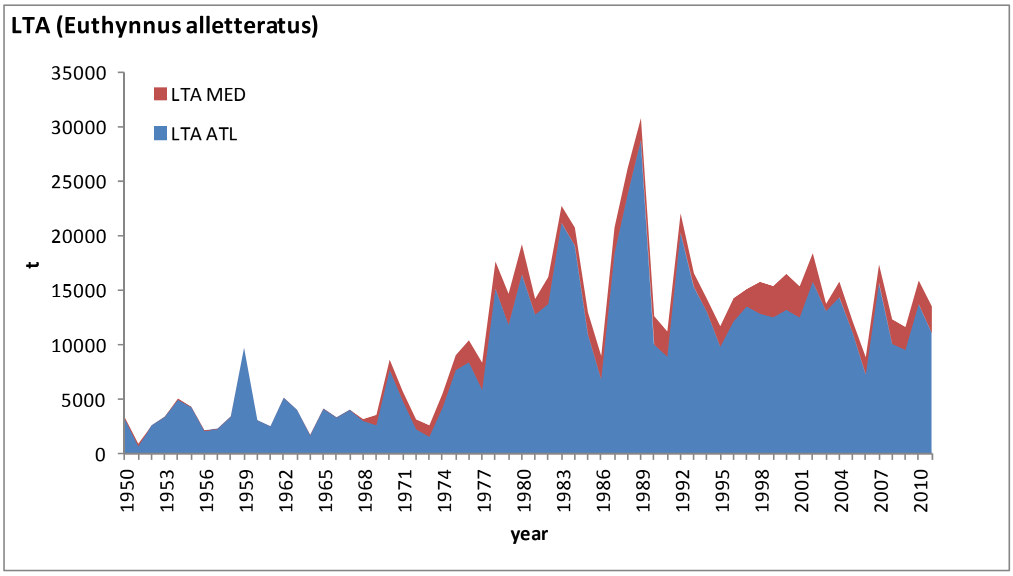
a)



b)

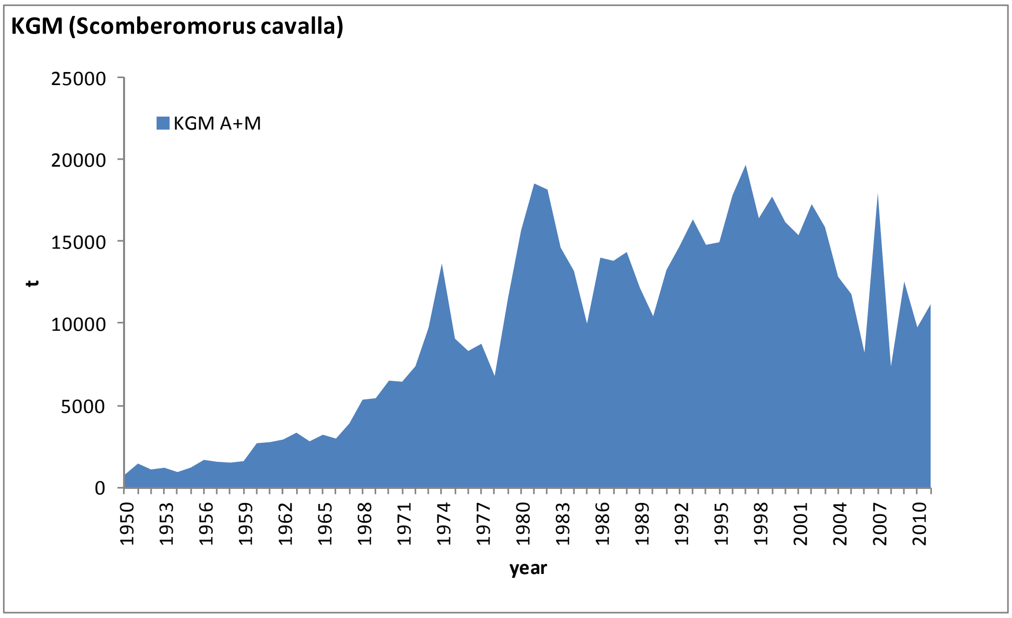


c)

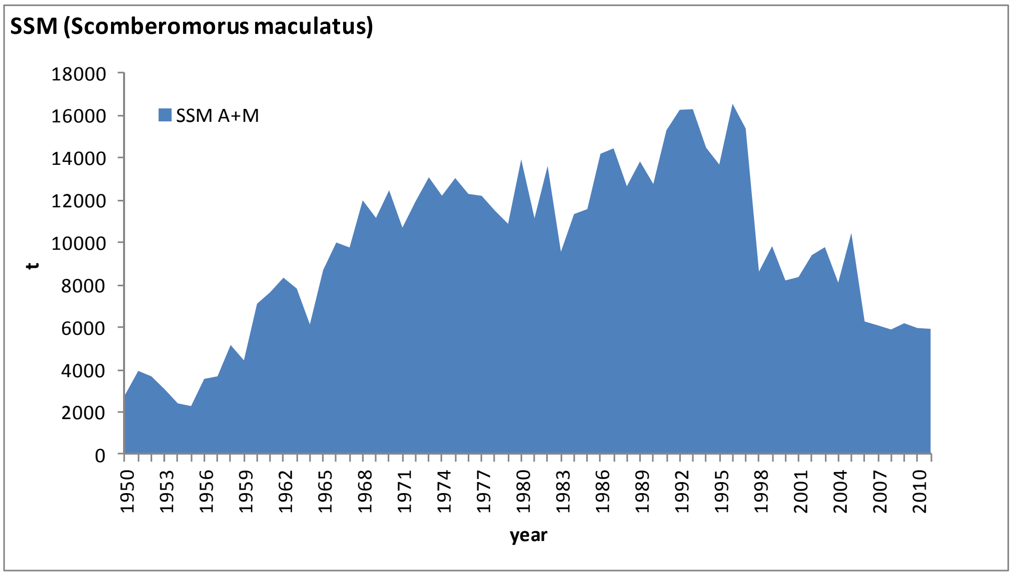


SMT-Figure 2. Estimated landings (t) of the major species of small tunas in the Atlantic and Mediterranean, 1950-2011. The data for the last years are incomplete.

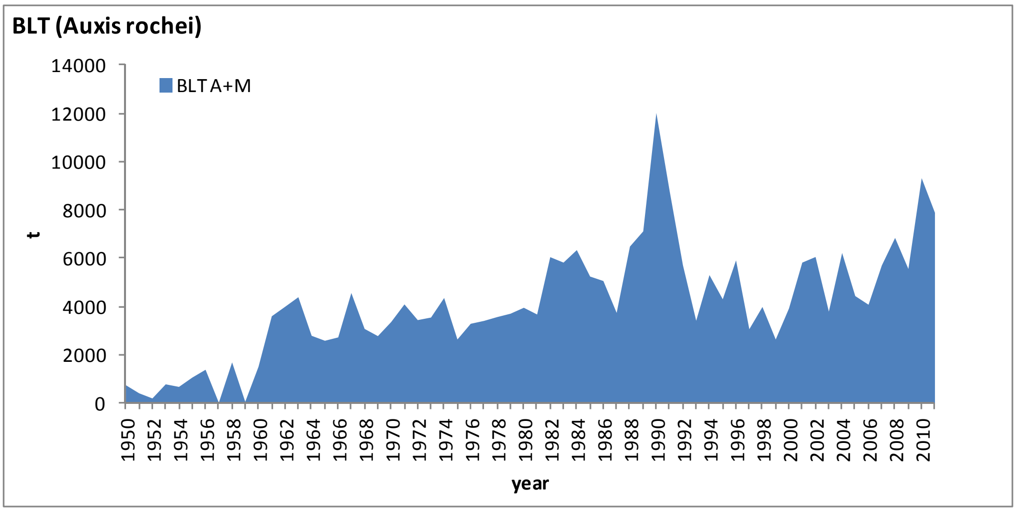
d)



e)

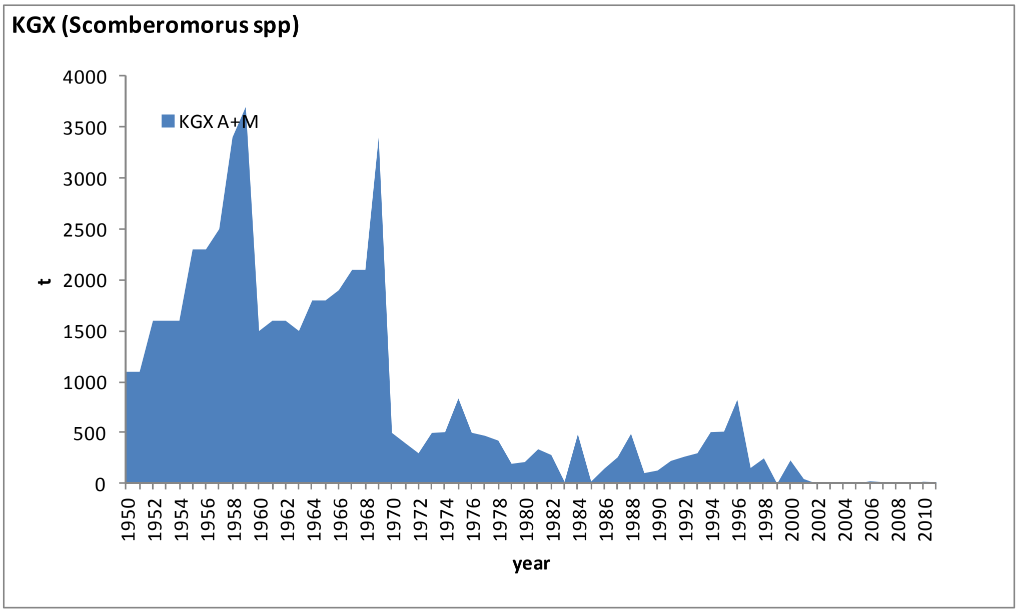


f)

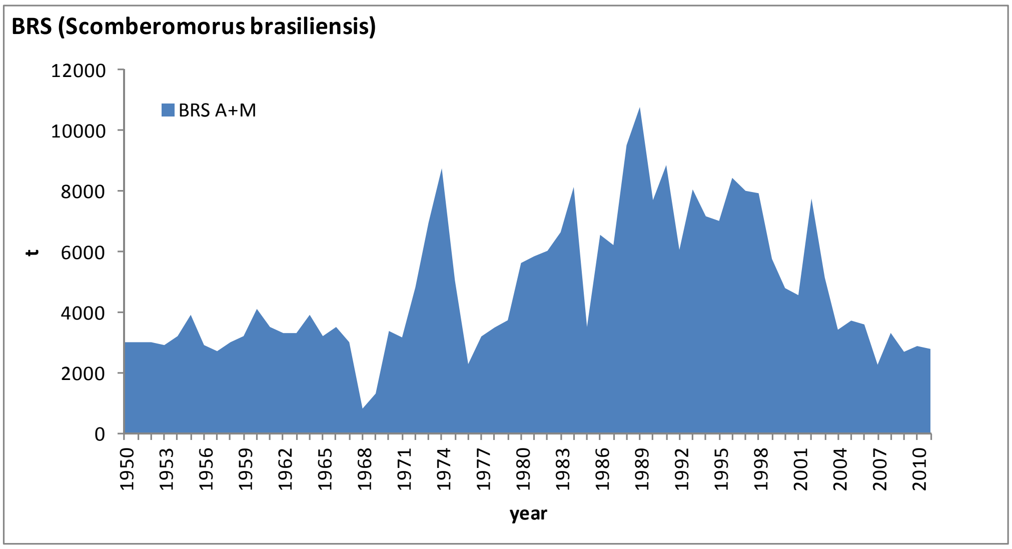


SMT-Figure 2. Estimated landings (t) of the major species of small tunas in the Atlantic and Mediterranean, 1950-2011. The data for the last years are incomplete.

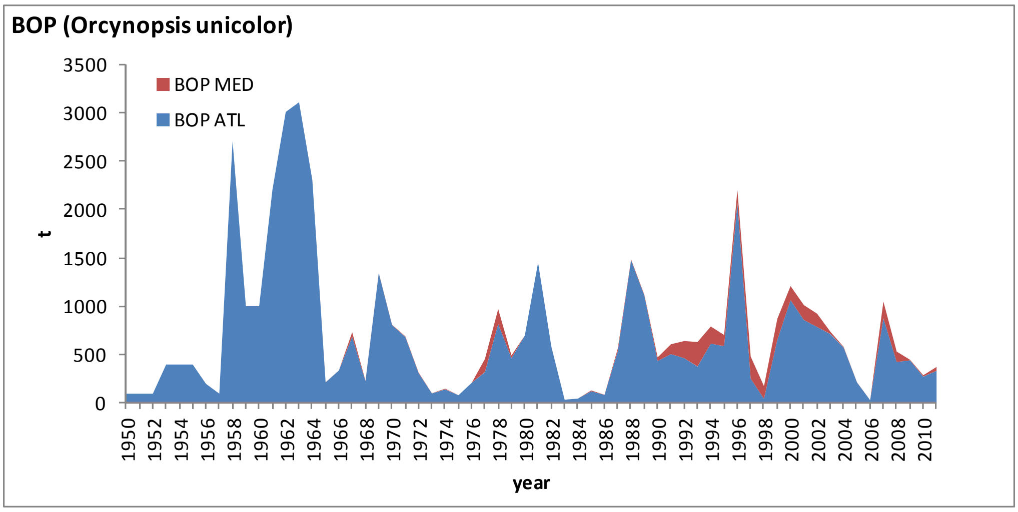
g)



h)

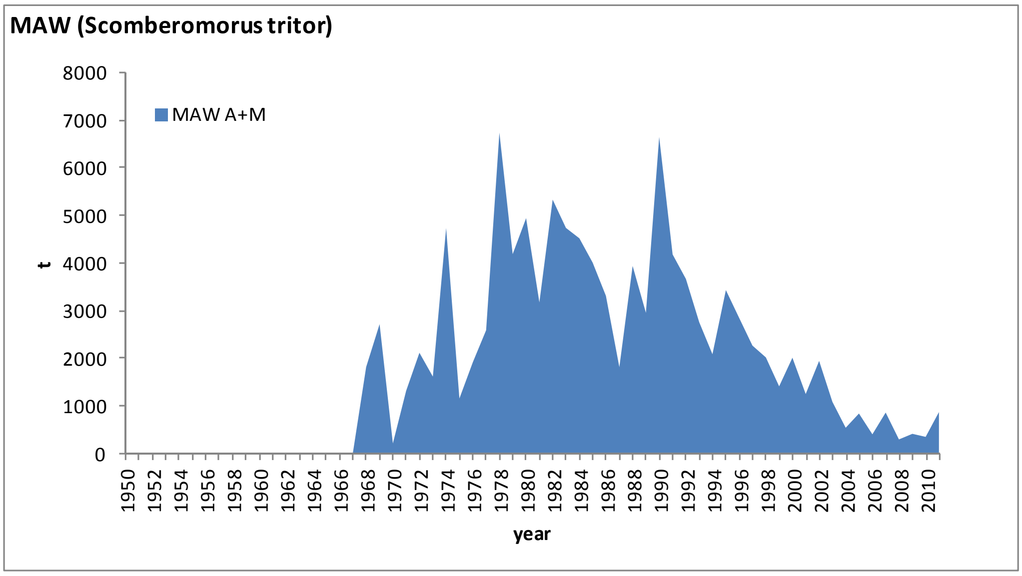


i)

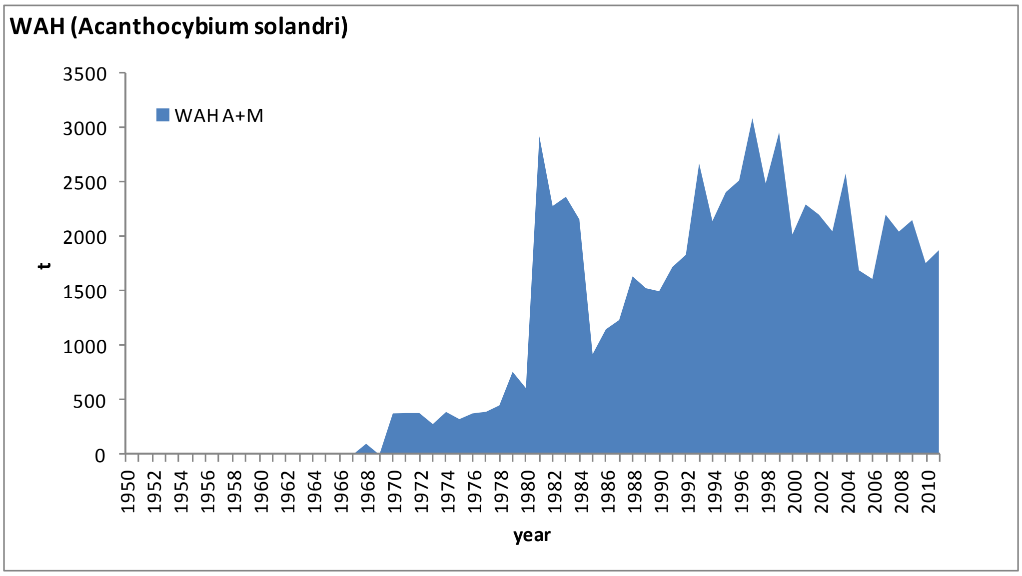


SMT-Figure 2. Estimated landings (t) of the major species of small tunas in the Atlantic and Mediterranean, 1950-2011. The data for the last years are incomplete.

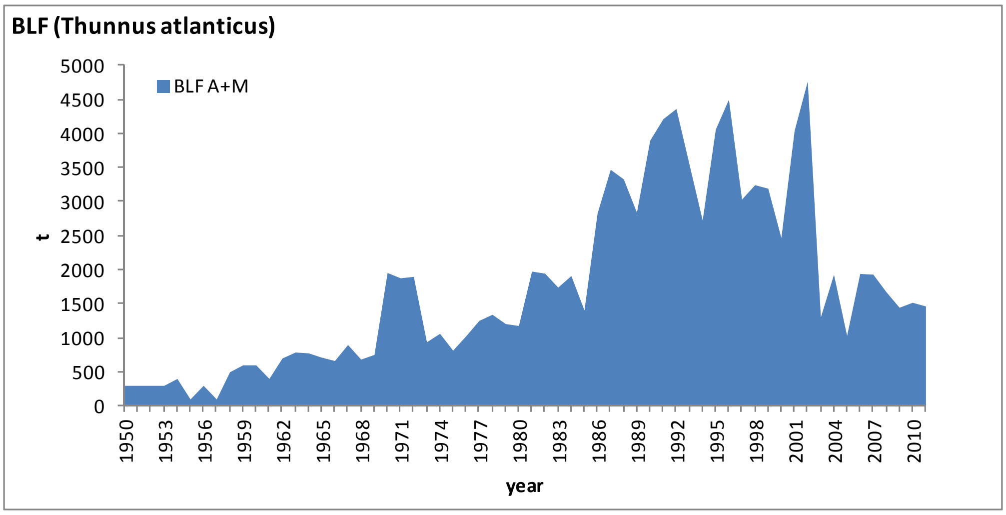
j)



k)



l)



SMT-Figure 2. Estimated landings (t) of the major species of small tunas in the Atlantic and Mediterranean, 1950-2011. The data for the last years are incomplete.

8.13 SHK - SHARKS

During 2012, a meeting was held to conduct a shortfin mako stock assessment, in response to ICCAT's Recommendation Rec. 10-06. An Ecological Risk Assessment was also conducted for 16 shark species (20 stocks), which is detailed in document SCRS/2012/167. Information about the status of the blue shark (*Prionace glauca*) and porbeagle (*Lamna nasus*) stocks is available in the SCRS 2010 report from the 2008 assessment of those species (Anon. 2009c).

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, and great white sharks.

Blue shark, shortfin mako and porbeagle are large pelagic sharks that show a wide geographic distribution; the first two from tropical to temperate waters worldwide, while the porbeagle has a distribution associated with cold-temperate waters. Shortfin mako and porbeagle have an ovoviviparous reproductive system, which increases the probability of survival of their young. The blue shark have an average litter size of 35 individuals, while the shortfin mako has an average litter size of around 12 and the porbeagle has a litter size of just a few individuals. Although high uncertainty regarding their biology remains, available life history traits (slow growth, late maturity and small litter size) indicate that they are vulnerable to overfishing. A behavioural characteristic of these species is their tendency to segregate temporally and spatially by size-sex, during feeding, mating-reproduction, gestation and birth processes. Tagging studies have suggested that they exhibit large-scale migratory behaviour and periodic vertical movement, but the lack of information on some components of the populations precludes a complete understanding of their distribution/migration pattern by ontogenetic stages and in some cases identifying their pupping/mating grounds. 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 **SHK-Figures 1 to 2**.

A number of standardized CPUE data series for blue shark were presented in 2008. The Committee placed emphasis on using the series that pertained to fisheries that operate in oceanic waters over wide areas. **SHK-Figure 3** presents the central tendency of the available series for the two stocks of this species. During the 2012 shortfin mako stock assessment, different standardized CPUE series were presented, both for the south and north stocks. For both stocks, the series were conflicting and did not coincide with the catch tendencies (**SHK-Figures 4-5**). The Committee noted that the increase in the CPUE series could be due to an increase in abundance, an increase in catchability, in the fishing strategy or in data reporting for this species.

During the porbeagle assessment in 2009 (Anon. 2010c), 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 may not 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 the Japanese longline fleet on the CPUE of shortfin mako and porbeagle was presented.

With regard to the 16 species (20 stocks) included in the 2012 ERA, the Committee believes that, in spite of existing uncertainties, results are more robust than those obtained in the 2008 ERA. With this information the

Committee considers it easier to identify those species that are most vulnerable to prioritize research and management measures **(SHK-Table 2)**. These ERAs are conditional on the biological parameters used to estimate productivity as well as the susceptibility values for the different fleets. The committee highlights the higher participation of scientists from diverse CPCs, who provided valuable data for this ERA.

SHK-3. State of the Stocks

The results of the stock assessments and the 2012 ERA carried out for elasmobranchs within the ICCAT Convention area are summarised below. To date, these assessments have focused only on Atlantic stocks, and not on shark stocks in the Mediterranean Sea stocks. Nevertheless, it should be noted that two Mediterranean-specific measures relevant to sharks species of interest were adopted during 2012. First, 10 elasmobranch species were strictly protected under Annex II of the Barcelona Convention (under the Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean). These species include shortfin mako (*Isurus oxyrinchus*), porbeagle (*Lamna nasus*), smooth hammerhead (*Sphyrna zygaena*), scalloped hammerhead (*Sphyrna lewini*), great hammerhead (*Sphyrna mokarran*), and tope (*Galeorhinus galeus*). Under Annex II protection, these shark species can no longer be captured or sold, and plans for their recovery should be developed.

The ERA conducted by the committee was a quantitative assessment consisting of a risk analysis to evaluate the biological productivity of these stocks and a susceptibility analysis to assess their propensity to capture and mortality in pelagic longline fisheries. Three metrics were used to calculate vulnerability (Euclidean distance, a multiplicative index, and the arithmetic mean of the productivity and susceptibility ranks). The five stocks with the lowest productivity were the bigeye thresher (*Alopias superciliosus*), sandbar (*Carcharhinus plumbeus*), longfin mako (*Isurus paucus*), night (*Carcharhinus signatus*), and South Atlantic silky shark (*Carcharhinus falciformis*). The highest susceptibility values corresponded to shortfin mako (*Isurus oxyrinchus*), North and South Atlantic blue sharks (*Prionace glauca*), porbeagle (*Lamna nasus*), and bigeye thresher. Based on the results, the bigeye thresher, longfin and shortfin makos, porbeagle, and night sharks were the most vulnerable stocks. In contrast, North and South Atlantic scalloped hammerheads (*Sphyrna lewini*), smooth hammerhead (*Sphyrna zygaena*), and North and South Atlantic pelagic stingray (*Pteroplatytrygon violacea*) had the lowest vulnerabilities. More detailed analyses of productivity and susceptibility of some species, as well as improvements in the method used to estimate the overall longline effort (EFFDIS) will be conducted in 2013. The Committee observed that the data regarding night shark distribution was considered to be incomplete and therefore the results with regard to this species should be considered preliminary and requiring revision before publication.

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. 2005), 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

The 2012 assessment of the status of North and South Atlantic stocks of shortfin mako shark was conducted with updated time series of relative abundance indices and annual catches. Coverage of Task I catch data and number of CPUE series increased since the last stock assessment conducted in 2008, with Task I data now being available for most major longline fleets. The available CPUE series showed increasing or flat trends for the finals years of each series (since the 2008 stock assessment) for both North and South stocks, hence the indications of potential overfishing shown in the previous stock assessment have diminished and the current level of catches may be considered sustainable.

For the North Atlantic stock, results of the two stock assessment model runs used indicated almost unanimously that stock abundance in 2011 was above B_{MSY} and F was below F_{MSY} (**SHK-Figure 8)**. For the South Atlantic stock, all model runs indicated that the stock was not overfished and overfishing was not occurring (**SHK-Figure 9)**. Thus, these results indicated that both the North and South Atlantic stocks are healthy and the probability of overfishing is low. However, they also showed inconsistencies between estimated biomass trajectories and input CPUE trends, which resulted in wide confidence intervals in the estimated biomass and fishing mortality trajectories and other parameters. Particularly in the south Atlantic an increasing trend in the abundance indices since the 1970s was not consistent with the increasing catches. The high uncertainty in past catch estimates and deficiency of some important biological parameters, particularly for the southern stock, are still obstacles for obtaining reliable estimates of current status of the stocks.

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. 2010b). 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 10**). 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 11**). 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.

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 12**). 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 was 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.

The SCRS welcomed the conservation and management measures adopted by the Commission in the past three years regarding the species ranked as the most vulnerable in the 2008 and 2010 Ecological Risk Assessments and for which almost no data have been submitted (bigeye thresher, oceanic whitetip, hammerhead sharks and silky shark).

Considering the need to improve stock assessments of pelagic shark species impacted by ICCAT fisheries, the committee recommends that the CPCs provide the corresponding statistics of all ICCAT and non-ICCAT fisheries capturing these species, including recreational and artisanal fisheries. The Committee considers that a basic premise for correctly evaluating the status of any stock is to have a solid basis to estimate total removals.

During the 2008 porbeagle assessment, both porbeagle stocks in the northwest and northeast Atlantic were estimated to be overfished, with the northeastern stock being more highly depleted. In addition, porbeagle received a high vulnerability ranking in the 2008 and 2012 ERAs. 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 recommends that the Commission work with countries catching porbeagle, particularly those with targeted fisheries, and relevant RFMOs (e.g., NAFO, CCSBT) 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 the Commission adopt measures that allow scientific observers to collect biological samples (vertebrae, tissue, reproductive tracts, and stomachs) from species whose retention is prohibited by current regulations and which are already dead at haul-back. For all of these species, biological knowledge is severely lacking therefore the committee strongly recommended that these samples be collected.

The Committee reiterates that the CPCs explore methods to estimate catches of sharks in purse seine and artisanal fisheries. Management measures should be applied to these sectors where catches of shark species are determined to be significant. Methods for mitigating shark by-catch by these fisheries also need to be investigated and applied.

Taking into consideration the continued high vulnerability ranking in the ERA, results from the modeling approaches used in the assessment, the associated uncertainty, and the relatively low productivity of shortfin mako sharks, the committee recommends, as a precautionary approach, that the fishing mortality of shortfin mako sharks should not be increased until more reliable stock assessment results are available for both the northern and southern stocks.

NORTH ATLANTIC BLUE SHARK SUMMARY

Provisional Yield (2011)		11.548 t[2]
2007 Yield		61,845 t[1]
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]
Overfished 2007 (Y/N)		No
Overfishing 2007 (Y/N)		No

[1] Estimated catch used in the 2008 assessments (Anon. 2009c).
[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

Provisional Yield (2011)		17.812 t[2]
2007 Yield		37,075 t[1]
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]
Overfished 2007 (Y/N)		No
Overfishing 2007 (Y/N)		No

[1] Estimated catch used in the 2008 assessments (Anon. 2009c).
[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

Provisional Yield (2011)		2.154 t[1]
Relative Biomass	B_{2010}/B_{MSY}	1,15-2,04[2]
	B_{2010}/B_0	0,55-1,63[2]
Relative Fishing Mortality	F_{MSY}	0,029-0,104[2]
	F_{2010}/F_{MSY}	0,16-0,92[2]
Overfished 2010 (Y/N)		No[3]
Overfishing 2010 (Y/N)		No[3]
Management Measures in Effect:		[Rec. 04-10], [Rec. 07-06], [Rec. 10-06]

[1] Task I catch.
[2] Range obtained from BSP.
[3] The Committee considers that the results present a high level of uncertainty.

SOUTH ATLANTIC SHORTFIN MAKO SUMMARY

Provisional Yield (2011)		1.700 t[1]
Relative Biomass	B_{2010}/B_{MSY}	1,36-2,16[2]
	B_{2010}/B_0	0,72-3,16[2]
Relative Fishing Mortality	F_{MSY}	0,029-0,041[2]
	F_{2010}/F_{MSY}	0,07-0,40[2]
Overfished 2010 (Y/N)		No[3]
Overfishing 2010 (Y/N)		No[3]
Management Measures in Effect:		[Rec. 04-10], [Rec. 07-06], [Rec. 10-06]

[1] Task I catch.
[2] Range obtained from BSP.
[3] The Committee considers that the results present a high level of uncertainty.

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]
Domestic management measures in effect		TACs of 185 t and 11.3 t[5]
Overfished (Y/N)		Yes
Overfishing (Y/N)		No

[1] Estimated catch allocated to the Northwest stock area. Not updated as area boundaries have not been formally defined.
[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]
Overfished (Y/N)		Yes
Overfishing (Y/N)		No
Management Measures in Effect:		None

[1] Estimated catch allocated to the southwest stock area. Not updated as area boundaries have not been formally defined.
[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]
Overfished (Y/N)		Yes
Overfishing (Y/N)		No
Domestic 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. Not updated as area boundaries have nt been formally defined.
[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.

			1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
TOTAL			1614	1835	1810	3028	4307	3643	9577	9562	9634	9560	37610	33809	35093	39101	34447	32735	35572	36304	43071	40351	47044	53900	58840	65208	29362
	ATN		1614	1835	1810	3028	4299	3536	9566	8084	8285	7258	29053	26510	25741	27965	21022	20037	22911	21740	22357	23215	26925	30722	35196	37178	11548
	ATS		0	0	0	0	8	107	10	1472	1341	2301	8409	7238	9332	11091	13378	12682	12650	14438	20642	16957	20068	23097	23459	27814	17812
	MED		0	0	0	0	0	0	0	6	8	2	148	61	20	44	47	17	10	125	72	178	51	82	185	216	2
Landings	ATN	Longline	0	0	0	1387	2257	1583	5734	5880	5871	5467	27618	25288	24405	26473	20013	18426	21936	20304	21033	22090	25966	30443	34429	36284	9837
		Other surf.	1088	1414	1330	900	1270	1768	2696	1632	1793	1086	1255	1030	1228	1355	904	1543	975	1372	1258	1080	905	150	664	727	593
	ATS	Longline	0	0	0	0	8	107	10	1472	1341	2294	8398	7231	9305	11091	13376	12678	12645	14339	20638	16898	19998	22708	23453	27800	17421
		Other surf.	0	0	0	0	0	0	0	0	0	0	6	4	27	0	1	4	6	99	3	59	10	375	6	14	391
	MED	Longline	0	0	0	0	0	0	0	6	8	2	148	61	20	44	47	17	10	44	72	83	49	81	18	50	1
		Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	81	0	95	2	1	167	165	0
Discards	ATN	Longline	526	421	480	741	772	184	1136	572	621	602	180	170	104	137	105	68	0	63	66	45	53	129	102	167	1116
		Other surf.	0	0	0	0	0	0	0	0	0	103	0	22	4	0	0	0	0	1	0	0	0	1	1	1	2
	ATS	Longline	0	0	0	0	0	0	0	0	0	7	5	4	1	0	0	0	0	0	0	0	60	14	0	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	114	461	1039
		Brasil	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	
		Canada	147	968	978	680	774	1277	1702	1260	1494	528	831	612	547	624	581	836	346	965	1134	977	843	0	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	185	104	148	0	0	0	367	109	88	53	109
		Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	171	206	240	588	292	110	73	99	190
		EU.Denmark	0	0	2	2	1	1	0	1	2	3	1	1	0	2	1	13	5	1	0	0	0	0	0	0	**0**
		EU.España	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	67	91	79	130	187	276	322	350	266	278	213	163	399	395	207	221	57	106	120	99	167	119	84	122	115
		EU.Ireland	0	0	0	0	0	0	0	0	0	0	0	0	66	31	66	11	2	0	0	0	0	0	0	0	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	1	0	
		EU.Portugal	0	0	0	1387	2257	1583	5726	4669	4722	4843	2630	2440	2227	2081	2110	2265	5643	2025	4027	4338	5283	6167	6252	8261	6509
		EU.United Kingdom	0	0	0	1	0	0	0	0	12	0	0	1	0	12	9	6	4	6	5	3	6	6	96	8	10
		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	1	0	
		Japan	0	0	0	0	0	0	0	1203	1145	618	489	340	357	273	350	386	558	1035	1729	1434	1921	2531	2007	1763	1706
		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	537
		Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	254	892	613	1575	0	
		Senegal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	456	0	0	0	0	43	134	255	56	31
		Trinidad and Tobago	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.	874	355	271	87	308	215	680	29	23	283	211	255	217	291	39	0	0	7	2	2	1	8	4	9	65
		UK.Bermuda	0	0	0	0	0	0	0	0	0	0	1	2	0	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	9	26	10	18	7	71	74	117
	ATS	Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37	259	0	236	109	0	273	243
		Benin	0	0	0	0	0	0	0	0	0	0	6	4	27	0	0	0	0	0	0	0	0	0	0	0	
		Brasil	0	0	0	0	0	0	0	0	0	743	1103	0	179	1683	2173	1971	2166	1667	2523	2591	2258	1986	1274	1500	1980
		China P.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	565	316	452	0	0	0	585	40	109	41	131
		Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	521	800	866	1805	2177	1843	1356	1640	2096
		EU.España	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	1	0	0	0	
		EU.Portugal	0	0	0	0	0	0	0	0	847	867	1336	876	1110	2134	2562	2324	1841	1863	3184	2751	4493	4866	5358	6338	7642
		EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	239	0	0	14	0	
		Japan	0	0	0	0	0	0	0	1388	437	425	506	510	536	221	182	343	331	209	236	525	896	1789	981	1161	1424
		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	222	125
		Namibia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2213	0	1906	6616	0	0	1829	207	2352	2957
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	168	22	0	0	0	0	0	0	0	521	0	0	
		Russian Federation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	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	173
		South Africa	0	0	0	0	0	0	0	0	0	0	0	23	21	0	83	63	232	128	154	90	82	126	119	125	318
		U.S.A.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	0	0	0	0	0	0	0	
		Uruguay	0	0	0	0	8	107	10	84	57	259	180	248	118	81	66	85	480	462	376	232	337	359	942	208	725
	MED	EU.Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	3	6	5	0	0	0	0	0	
		EU.España	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	1	0
		EU.Italy	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	1	1	1	0	0	0	0	0	0	0	0	1	0	2	2	2	1	1
		EU.Portugal	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	5	7	1	1	0	0	0	0	0	1	1	2	0	0	2	0	0	
Discards	ATN	U.S.A.	526	421	480	741	772	184	1136	572	618	704	180	192	100	137	106	68	0	65	66	45	54	130	103	167	1118
		UK.Bermuda	0	0	0	0	0	0	0	0	3	1	0	0	8	0	0	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	60	14	0	0	
		U.S.A.	0	0	0	0	0	0	0	0	0	7	5	4	1	0	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.

			1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
TOTAL			1028	1562	1648	1349	1326	1446	2966	2972	4870	2778	5570	5477	4097	4994	4654	5361	7324	7598	6618	6330	6911	5440	6143	6653	3855
	ATN		766	1014	1011	785	797	953	2193	1526	3109	2019	3545	3816	2738	2568	2651	3395	3895	5174	3472	3370	4075	3559	4109	4181	2154
	ATS		262	548	637	564	529	493	773	1446	1761	759	2019	1652	1355	2422	1996	1964	3426	2423	3130	2951	2834	1880	2034	2470	1700
	MED		0	0	0	0	0	0	0	0	0	0	6	8	5	4	7	2	2	2	17	10	2	1	1	2	1
Landings	ATN	Longline	295	214	321	497	573	660	1499	1173	1633	1770	3369	3648	2645	2254	2424	3129	3792	4755	3172	3105	3901	3367	3551	3552	1561
		Other surf.	462	795	681	278	213	254	670	331	1447	248	177	168	91	313	227	266	104	418	300	264	168	183	538	627	564
	ATS	Longline	262	548	637	564	519	480	763	1426	1748	744	1997	1642	1345	2413	1979	1949	3395	2347	3116	2907	2792	1798	2027	2470	1638
		Other surf.	0	0	0	0	9	13	10	20	13	15	23	10	10	9	18	15	31	76	14	43	30	82	7	1	62
	MED	Longline	0	0	0	0	0	0	0	0	0	0	6	8	5	4	7	2	2	2	17	10	2	1	1	2	1
		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	9	5	9	10	11	38	24	21	29	1	0	0	0	0	0	0	0	0	0	0	7	9	20	2	28
		Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0
	ATS	Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	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	23	28	69
		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	111	67	110	69	70	78	69	78	73	80	91	71	72	43	53	41	37
		China P.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	81	16	19	29	18
		Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	84	57	19	30	25	23	11	13	15
		EU.España	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	15	2	0
		EU.Portugal	0	0	0	193	314	220	796	649	657	691	354	307	327	318	378	415	1249	473	1109	951	1540	1033	1169	1432	1045
		EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	2	3	2	1	1	1	0	0	0	1	15	0	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	1	2	0	4	0
		Japan	218	113	207	221	157	318	425	214	592	790	258	892	120	138	105	438	267	572	0	0	82	131	98	116	85
		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	27
		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	420
		Mexico	0	0	0	0	0	0	0	0	10	0	0	0	0	10	16	0	10	6	9	5	8	6	7	8	8
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	49	33	39	0	
		Philippines	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	
		Senegal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	17	21	0	1
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	3	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	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	1	0	1	2	3	1	2	1	1	1	1	1	
		U.S.A.	540	896	795	360	315	376	948	642	1710	469	407	347	159	454	395	415	142	521	469	386	375	344	365	392	379
		UK.Bermuda	0	0	0	0	0	0	0	0	0	0	1	2	0	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	58	20	6	11	2	35	22	20
	ATS	Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	0	17	2	0	32	59
		Brasil	0	0	0	0	0	0	0	0	0	83	190	0	27	219	409	226	283	238	426	210	145	203	99	128	192
		China P.R.	0	0	0	0	0	0	34	45	23	27	19	74	126	305	22	208	260	0	0	0	77	6	24	32	29
		Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	626	121	128	138	211	124	117	137	201
		Côte D'Ivoire	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	1356	1141	861	1200	1235	811	1158	703	584	664	654	628	939	1192	
		EU.Portugal	0	0	0	0	0	0	0	0	92	94	165	116	119	388	140	56	625	13	242	493	375	321	502	336	409
		EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	11	0	
		Japan	234	525	618	538	506	460	701	1369	1617	514	244	267	151	264	56	133	118	398	0	0	72	115	108	103	121
		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	29	13
		Namibia	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	459	0	509	1415	1243	1002	295	23	307	377

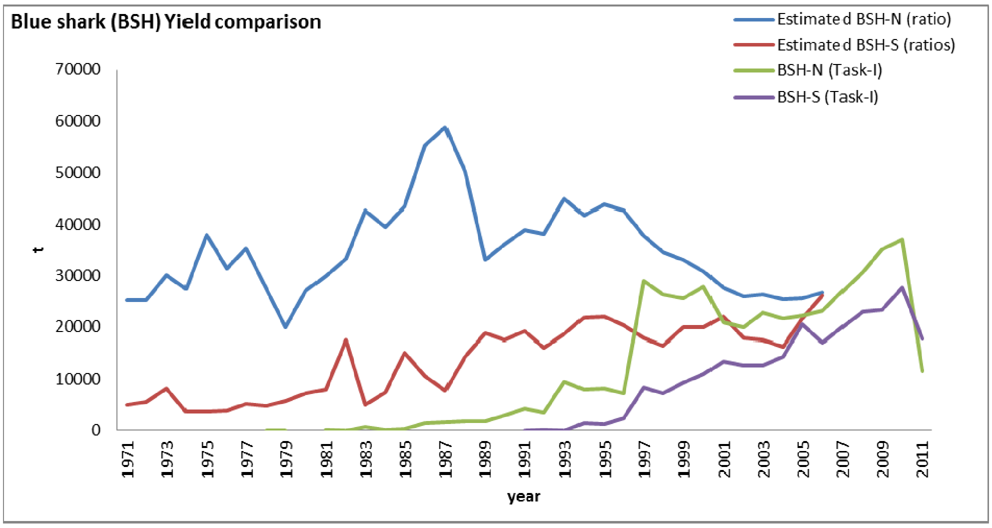
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	24	1	0	0	0	0	0	0	0	10	0	0	
		Philippines	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	
		Russian Federation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Senegal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
		South Africa	0	0	0	0	0	0	0	0	0	0	0	19	13	0	79	19	138	126	125	99	208	136	100	144	211
		U.S.A.	0	0	0	0	0	0	0	0	0	0	2	1	0	2	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	0
		Uruguay	28	23	19	26	13	20	28	12	17	26	20	23	21	35	40	38	188	249	146	68	36	41	106	23	76
		Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	52	12	13	1	0	0	0	
	MED	EU.Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1
		EU.España	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	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	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		U.S.A.	9	5	9	10	11	38	24	21	28	1	0	0	0	0	0	0	0	0	0	0	7	10	20	2	29
		UK.Bermuda	0	0	0	0	0	0	0	0	0	0	0	0	2	0	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	12	0	0	0	

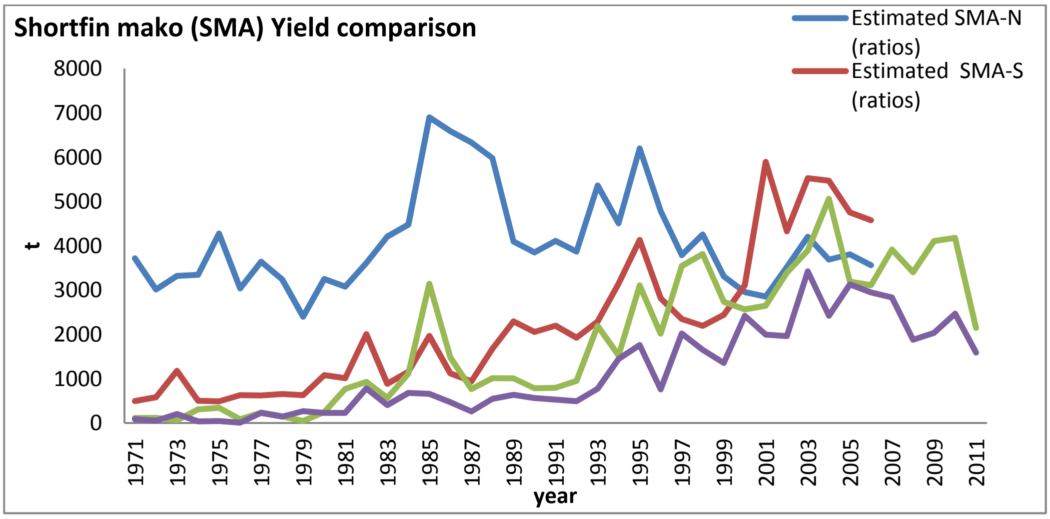
POR-Table 1. Estimated catches (t) of porbeagle (*Lamna nasus*) by area, gear and flag.

			1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
TOTAL			844	1025	1013	1309	1990	2603	1910	2729	2140	1560	1859	1469	1403	1469	999	848	648	745	571	507	515	600	475	134	94
	ATN		844	1024	1013	1309	1990	2603	1909	2726	2136	1556	1833	1451	1393	1457	998	838	604	725	539	470	502	513	412	119	72
	ATS		0	1	0	0	0	0	1	2	3	3	26	17	10	11	1	11	43	17	31	37	13	85	62	14	21
	MED		0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	0	0	3	2	1	0	2	1	1	0
Landings	ATN	All gears	844	1024	1013	1309	1990	2601	1909	2725	2136	1556	1833	1451	1393	1457	998	838	604	725	539	470	502	512	412	117	71
	ATS		0	1	0	0	0	0	1	2	3	3	26	16	9	11	1	11	43	17	31	37	13	85	62	14	21
	MED		0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	0	0	3	2	1	0	2	1	1	0
Discards	ATN		0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1
	ATS		0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	
Landings	ATN	Canada	59	83	73	78	329	813	919	1575	1353	1051	1334	1070	965	902	499	237	142	232	202	192	93	124	62	83	30
		EU.Denmark	56	33	33	46	85	80	91	93	86	72	69	85	107	73	76	42	0	0	0	0	0	0	0	0	**0**
		EU.España	30	69	42	26	47	15	21	52	19	41	25	25	18	13	24	54	27	11	14	34	8	41	77	0	
		EU.France	280	446	341	551	300	496	633	820	565	267	315	219	240	410	361	461	303	413	276	194	354	311	228	0	2
		EU.Germany	0	0	0	0	0	0	0	0	0	0	0	0	0	17	1	3	0	0	0	0	0	0	0	0	
		EU.Ireland	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	0
		EU.Portugal	3	3	2	2	1	0	0	0	0	0	0	0	0	7	4	10	101	50	14	6	0	3	17	7	0
		EU.Sweden	5	3	3	2	2	4	3	2	2	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	
		EU.United Kingdom	3	3	15	9	0	0	0	0	0	0	0	1	6	8	12	10	0	0	24	11	26	15	11	0	0
		Faroe Islands	381	373	477	550	1189	1149	165	48	44	8	9	7	10	0	0	0	0	0	0	0	0	0	0	0	
		Iceland	0	0	0	0	0	1	3	4	6	5	3	4	2	2	3	2	1	1	0	1	0	1	0	1	**0**
		Japan	0	0	0	0	0	0	0	0	0	5	4	0	0	0	0	0	0	0	0	0	12	10	13	13	18
		Norway	25	11	25	43	32	41	24	24	26	28	17	27	32	22	11	14	19	0	8	27	0	0	0	12	11
		U.S.A.	1	0	2	2	5	1	50	106	35	78	56	13	3	1	1	1	0	1	0	0	0	1	1	1	11
	ATS	Benin	0	0	0	0	0	0	0	0	0	0	4	0	4	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	2
		Chile	0	0	0	0	0	0	0	1	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	0	0	0	0	0	0	0	0	0	0	2	2	2	7	1	2	9	4	0	3	5	4	13	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.Poland	0	0	0	0	0	0	0	1	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	4	2	0	0	0	0	0	
		Falklands	0	0	0	0	0	0	0	0	0	0	0	1	0	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	1	0	0	0	0	1	0	0	3	14	0	1	0	0	0	0	0	0	0	5	41	34	8	7
		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	3	0	5	13	2	4	0	8	34	8	28	34	3	40	14	6	12
	MED	EU.Italy	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	1	0	1	0	1	1	0	0	0	1	0	0	0	1	0	0
Discards	ATN	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	0
		U.S.A.	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1
	ATS	Uruguay	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	

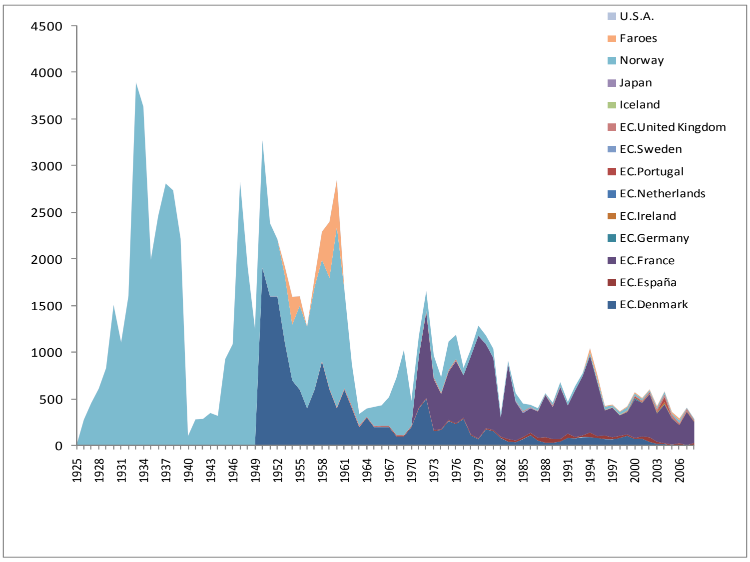
SHK-Table 2. Vulnerability ranks for 20 stocks of pelagic sharks calculated with three methods: Euclidean distance (v1), multiplicative (v2), and arithmetic mean (v3). A lower rank indicates higher risk. Stocks listed in decreasing risk order according to the sum of the three indices. Red highlight indicates risks scores 1-5; yellow, 6-10; blue, 11-15; and green, 16-20. Productivity values ranked from lowest to highest.

Stock	v_1	v_2	v_3
BTH	3	1	1
LMA	5	3	2
SMA	1	8	2
POR	2	7	4
CCS	11	4	5
FAL SA	12	5	6
CCP	15	2	6
OCS	4	13	8
FAL NA	8	11	8
ALV	9	14	11
BSH NA	6	19	10
DUS	17	6	12
SPK	14	10	13
BSH SA	7	20	14
TIG	10	16	15
PLS SA	18	9	16
SPL NA	16	12	16
SPZ	13	17	18
SPL SA	19	15	19
PLS NA	20	18	20

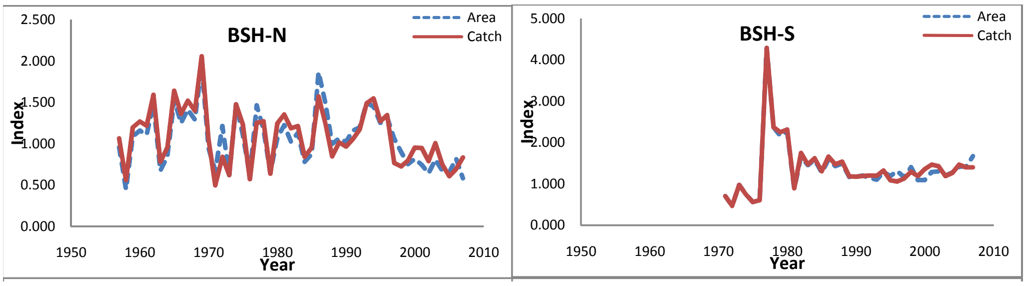




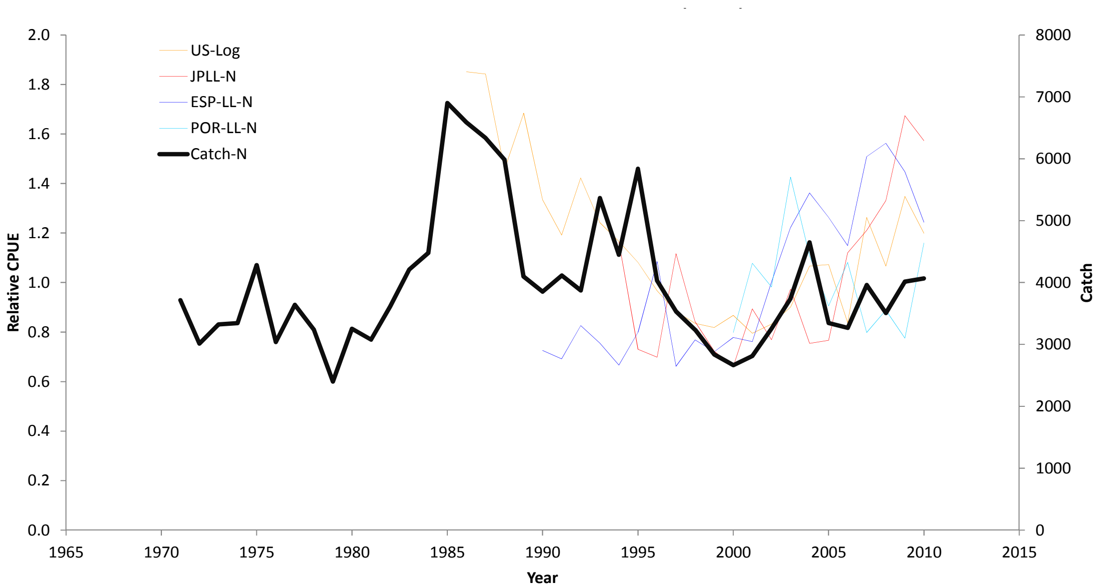
SHK-Figure 1. Blue shark (BSH) and shortfin mako (SMA) catches reported to ICCAT (Task-I) and estimated by the Committee. (2011 landings are considered provisional).



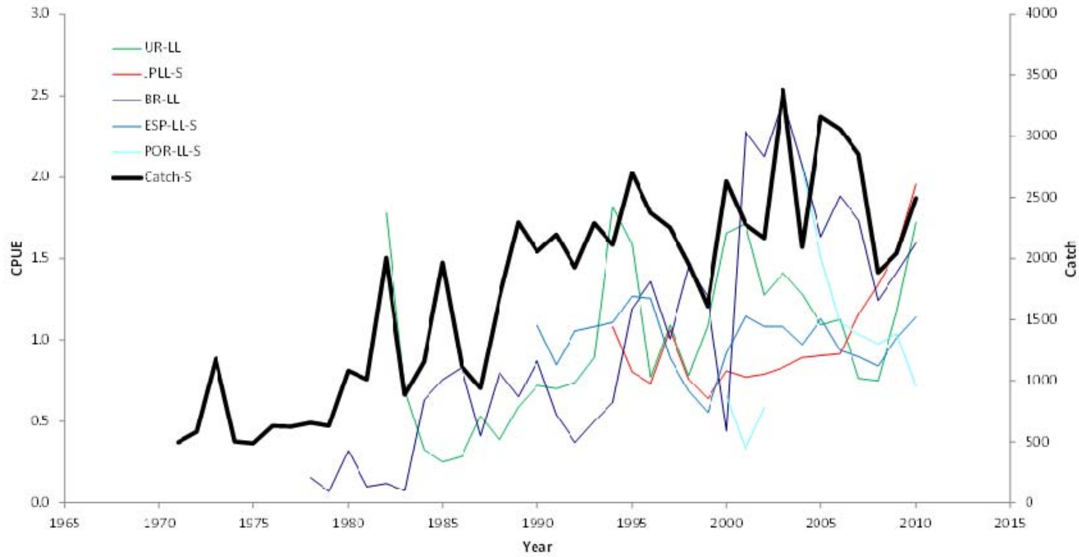
SHK Figure 2. Catch by flag of porbeagle sharks from the northeastern Atlantic used in the assessment. While these catches are considered the best available, they are believed to underestimate the pelagic longline catches for this species.



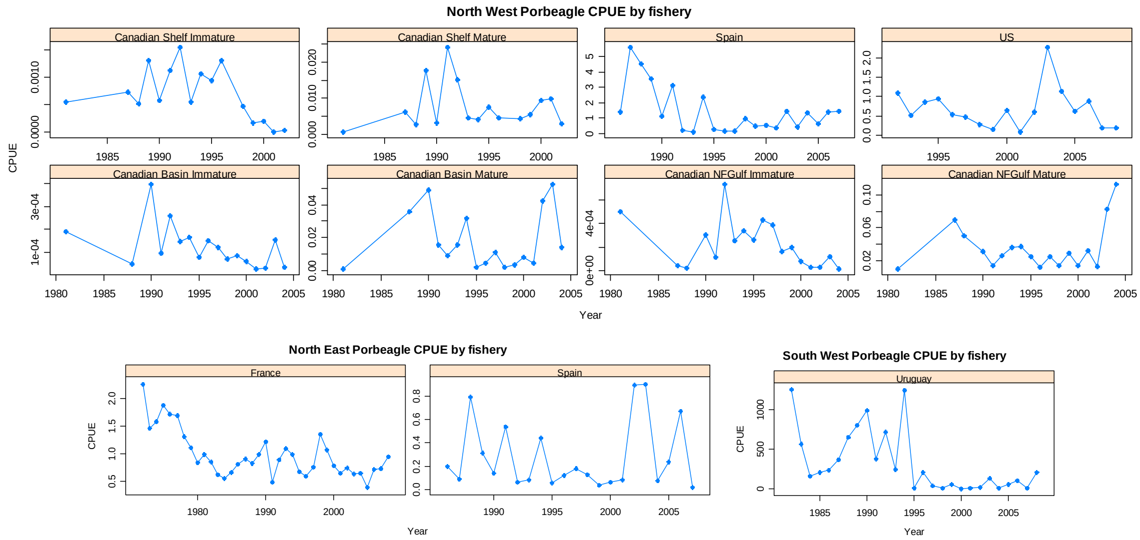
SHK-Figure 3. Average trends in the CPUE series used in the assessments of blue shark (BSH). The averages were calculated by weighting the available series either by their relative catch or by the relative spatial coverage of the respective fisheries.



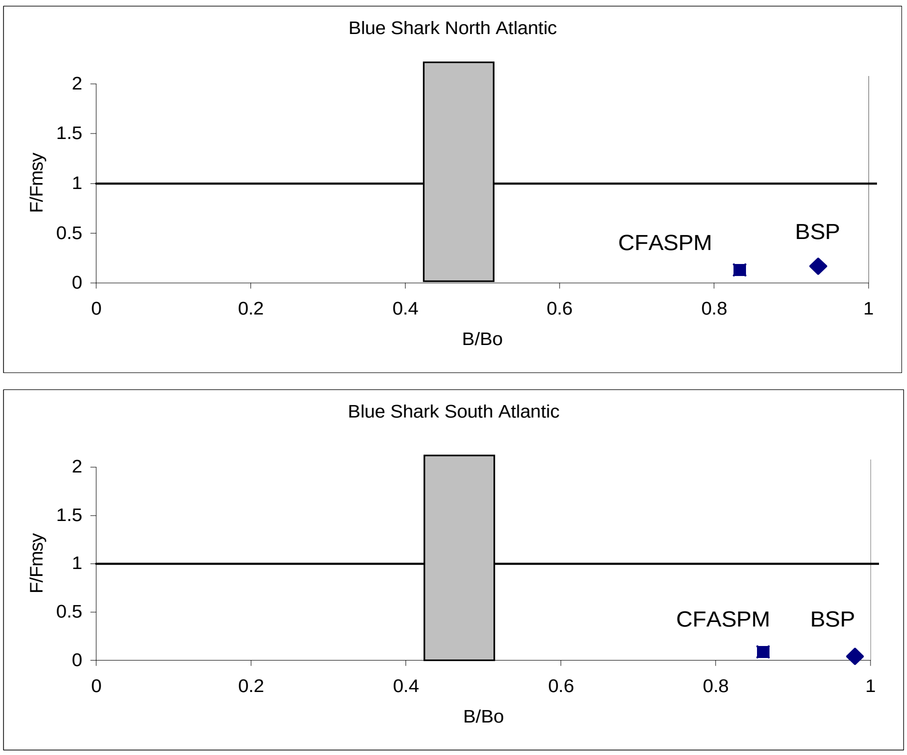
SHK-Figure 4. Indices of abundance for North Atlantic shortfin mako shark, along with total catches input into the BSP model.



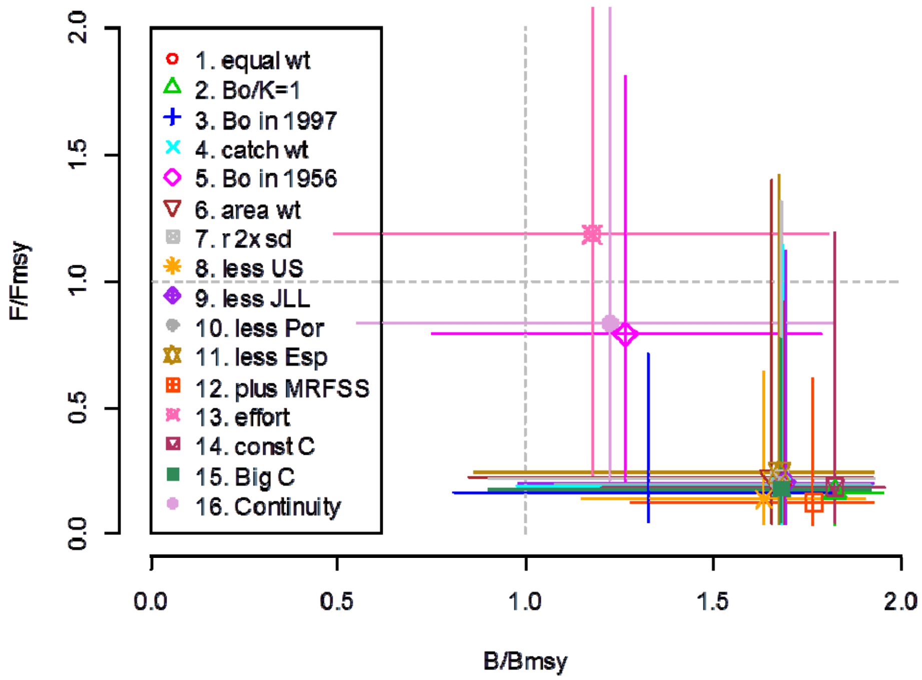
SHK-Figure 5. South Atlantic catches and indices of abundance input to the BSP model.



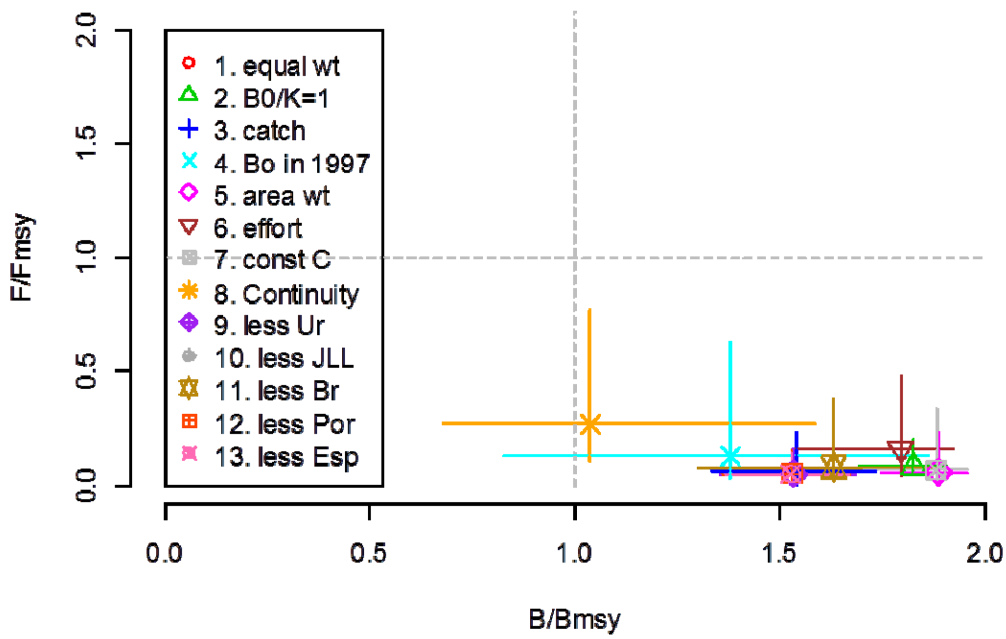
SHK-Figure 6. CPUE series for the porbeagle used in the last assessment NW stock (upper figures), NE stock (lower left figures) and SW stock (lower right figure).



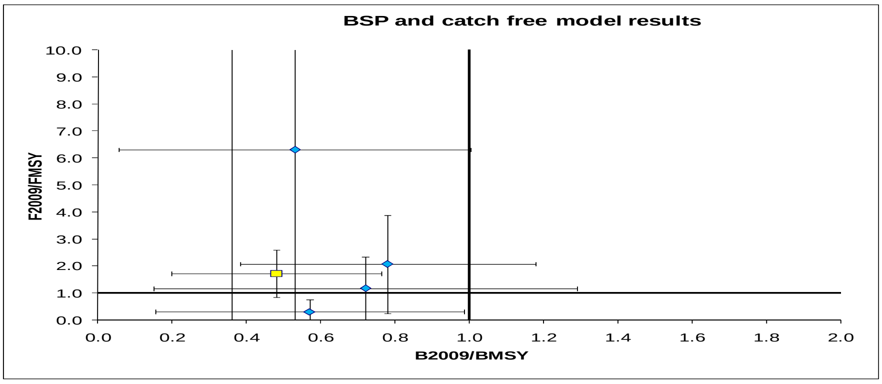
SHK-Figure 7. Phase plots summarizing base scenario outputs for the current stock status of blue shark (BSH). BSP=Bayesian surplus production model; CFASPM=catch-free, age-structured production model. The shaded box represents the area at which the biomass at MSY is estimated to be reached. Any points 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.



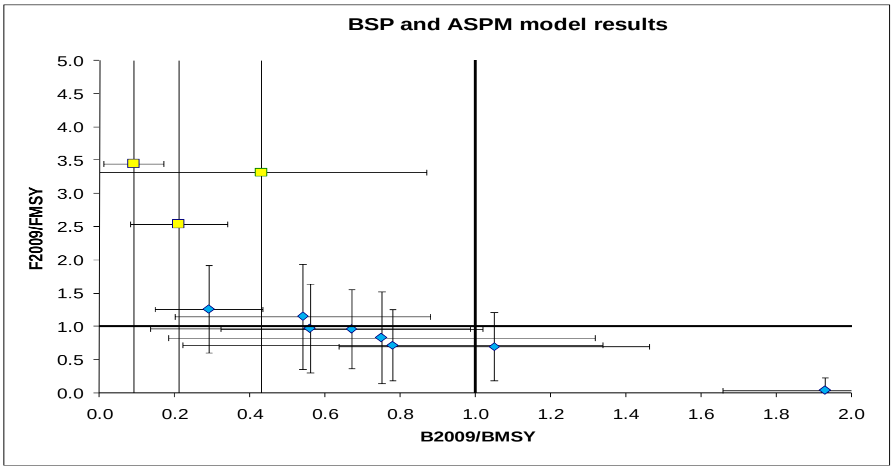
SHK-Figure 8. For North Atlantic shortfin mako sharks, median biomass relative to B_{MSY} and median fishing mortality rate relative to F_{MSY}, with 80% credibility intervals, from BSP model.



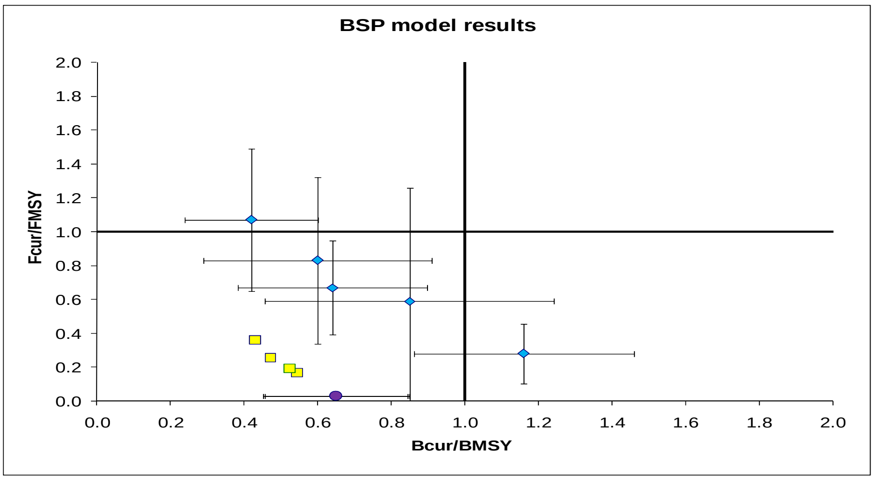
SHK-Figure 9. For South Atlantic shortfin mako sharks, median biomass relative to B_{MS}y and fishing mortality rate relative to F_{MSY}, with 80% credibility intervals.



SHK-Figure 10. 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 11. 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 12. 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 (circle), 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 2012 were presented. The following meetings were presented:

9.1 Meeting of the ICCAT Working Group on Stock Assessment Methods

The Working Group on Stock Assessment Methods met in Madrid, April 16-20, 2012 (SCRS/2012/011). The Goup discussed the following points related to CPUEs; investigation of GLMtree model for CPUE standardisation especially for by-catch species and generic methods for combining and standardising multiple CPUE series for assessments and the development of generic protocols for inclusion or use of CPUE series in assessment models.

Other topics were the investigation of methods for monitoring and evaluating recreational fisheries and the generating of simulated data sets for testing generic assessment techniques and methods.

Discussion

It was agreed that the way uncertainty is considered within the Kobe advice framework is extremely important and it was pointed out that this is a topic that is being addressed by the t-RFMO Technical Working Group on Management Strategy Evaluation (MSE). Other areas of collaboration are with ICES, for example by formal collaboration by the Methods Working Groups of ICES and ICCAT, where areas of joint interest include for example development of target and limit reference points and recreational fisheries. The SISAM initiative was also discussed; this is a global initiative on stock assessment methods in which ICCAT is actively involved.

The protocol for reviewing CPUEs for inclusion within stock assessment was agreed to be a useful innovation but it was also agreed that care should be taken to ensure that it did not discourage CPCs from submitting CPUE series. An important area for research is how to reconcile conflicting indices when they may be from different areas and represent different stock components.

Finally the peer review process was discussed. It was pointed out that if a reviewer also participated in the meeting then their views may be given more emphasis than the Working Group members. The peer review process will be discussed further under item 14.

9.2 Tropical Tunas Species Group Inter-sessional Meeting

The Inter-sessional Meeting of the Tropical Tunas Species Group met in Madrid, Spain, April 23-27, 2012 (SCRS/2012/011). The objectives of the meeting were to revise the biological parameters for yellowfin, bigeye and skipjack, and the CPUE standardized processes and methods used to combine indices.

A review of the current status of work conducted by the Working Group on the Improvement of Ghanaian Statistics was also conducted. The development of a port and associated on-board observer sampling plan aimed at collecting fishery data for bigeye tuna, yellowfin tuna and skipjack tuna was discussed. Finally a presentation of the results of the joint tuna-RFMOs meeting on the harmonization of the purse seine observer was given.

Discussion

It was recognised the effort made by the Group in applying the process defined by the Working Group on Stock Assessment Methods to evaluate CPUE indexes. This exercise has been a reference on how the protocol can be used and the potential problems related with its implementation. Problems related to Task I & II Ghanaian data since 1996 were also raised, e.g., missing data and biases in species and size composition. This is an issue that has been recognised for sometime; it was agreed that a work plan including a detailed description of the methodologies and assumptions used by the Ghanaian statistics Task Group will be draft for the next inter-sessional meeting to correct these problems. This will include validation and translation of the software, which will require collaboration between Ghana and the EU to identify how gaps in the data can be addressed.

9.3 White Marlin Stock Assessment Session

The White Marlin Stock Assessment Session was held in Madrid, May 21-25, 2012; a Data Preparatory Meeting had been held in 2011(Anon. 2012a) The objective of the meeting was to carry out an assessment of white marlin, estimate reference points, determine the time to rebuild the stock under different catch limits, and update management recommendations based on the Kobe II Strategy Matrix (K2SM). In addition, an external peer review was conducted of the stock assessment. Also, for the first time, a check list for the CPUEs, as recommended by the Working Group on Stock Assessment Methods (WGSAM) was completed. The detailed report of the meeting is presented as document SCRS/2012/012, the peer review. Following the work of the meeting the K2SM was completed at the Species Group.

Discussion

A main problem with the assessment is that Task I catch is an under-estimate of total removals, since recreational and artisanal fisheries are poorly sampled. It was noted that a committee on recreational catches is being established which is expected to improve future data. [Rec. 11-10] requires that discards be reported. However, it is unknown whether fish are discarded alive or dead. Problems with the CPUE series were also discussed, e.g., observed trends may not reflect stock trends due to changes in fish behaviour or targeting by fleets. It was agreed that there is a need to review how CPUEs series are standardised in order to take account of spatial and temporal changes.

The benefits of conducting data preparatory and stock assessment meetings in the same year were agreed.

9.4 Sharks Meeting to Apply Ecological Risk Assessment and Shortfin Mako Assessment

The Shark Species Group met in Olhao, Portugal, June 11-18, 2012, where the stock assessment of shortfin mako shark was conducted. An ERA was also presented and this was finalised at the Species Group meeting in Madrid (SCRS/2012/013).

Discussion

The high quality of the work conducted during the stock assessment and under the ERA was recognised. Problems in conducting assessment on sharks were discussed and the group recognised that recent increases in CPUE series may be a result of improved reporting due to improved monitoring by ICCAT.

The extensive work done to improve the ERA was recognised, particularly the increase in the number of species included. It was agreed that the distributions used in the ERA need to be updated. However, this issue only pertained to one out of the 20 species assessed, so the results were not expected to change significantly.

9.5 Inter-sessional Meeting of the Sub-Committee on Ecosystems

The Inter-sessional Meeting of the Sub-Committee on Ecosystems was held in Sète, France, July 2-6, 2012. During this meeting, the Sub-Committee discussed the following:

1) By-catch

- The data preparatory work and review of methodologies to assess the impact of ICCAT fisheries on sea turtles (Rec. [10-09]).
- A review of the form prepared by the Secretariat and the information provided by CPCs on scientific observer program information requested under ICCAT Rec. 10-10.
- The definition and coordination of the work of the restructured Sub-Committee which includes two section rapporteurs; one responsible for by-catch assessment and mitigation, and the second for ecosystem issues and issues related to Ecosystem Based Fisheries Management (EBFM).
- The continuation provision of results on research about the impacts of mitigation measures on catch rates of by-catch and target species.
- The definition of the strategy to evaluate the efficacy of the seabird by-catch mitigation measures defined under Rec. [11-09].

Discussion

It was confirmed that the Sub-Committee will be investigating the impact of ICCAT fisheries on sea turtles in 2013 and will not be conducting assessments of the species as the data for this is unavailable and there is no mandate. The Secretary of the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC) expressed the convention's support for the work to be conducted by ICCAT and agreed to co-operate and provide information as possible to facilitate the work to be conducted in 2013.

2) Ecosystems:
   - Work towards integrating EBFM into ICCAT

Discussion

Attention was drawn to the Sub-Committee's proposal to conduct an EBFM using a simple case study. The expansion of the oxygen minimum zone was also highlighted and studies conducted on this issue were discussed.

The Detailed Report of the meeting is presented as document SCRS/2012/014.

9.6 Bluefin Tuna Stock Assessment Session

The 2012 Bluefin Tuna Stock Assessment Session was held in Madrid, Spain, September 4-11 (SCRS/2012/015).

Both the eastern and western stock assessments were updates of the 2010 assessments in order to evaluate the effect of the management plans.

Discussion

It was recognised that the eastern stock has improved faster than expected, especially since 5 years ago the stock was under the threat of collapse. A major improvement has been seen in the amount and quality of data, e.g., from VMS and observers. However, as there is still great uncertainty, it may still be suitable to maintain catches at 13,500 t or less.

Changes in selection patterns, due to management measures, and the resulting impact on reference points, was discussed. This was recommended as an issue for the Working Group on Stock Assessment Methods to address. It was recognised that a major problem was the lack of fisheries independent data, especially since management measures have reduced catches of juveniles affecting CPUE series for these ages. Also the CPUEs used in the assessment only represent a small proportion of the catch. The value of the fishery independent (i.e., aerial) surveys was acknowledged and the benefits of extending these to cover a wider range of areas and ages was agreed.

The quality of size data and stock structure hypotheses was discussed. In the latter case, it is known that some individuals stay in the Mediterranean year round whilst others are only resident for a limited time. To improve biological knowledge and to better understand stock structure are two of the main objectives of the GBYP. Therefore, focus in the next few years will be on improving biological data used when providing management advice. It was noted out that in 2013 there will be two workshops looking at the new data and how to use these data in improved assessment methods.

It was also noted that there had been changes in the distribution of the stock, i.e., catches were now more common off West Africa. This presents a problem for some countries which are not members of the appropriate Commission Panel and so cannot report catches.

The results of the assessment had been leaked to the press after the assessment session preempting the Group's work. It was emphasized that everyone should respect the confidentiality of the report until it has been approved by the SCRS.

West bluefin tuna

Discussion focused on the length of the assessment time series, historic catches off the Brazilian coast and the consequences for estimating MSY based reference points. A main problem is that the VPA assessment time series only begins in 1970, when the stock biomass was at a peak. It is difficult, however, to extend the VPA assessment back in time since size composition data are lacking. Alternative methods therefore need to be explored. Catches were high in the 1960s partly due to fish being caught off the Brazilian coast; the origin of these fish is however unknown.

Key issues for the assessment are improved aging and reducing uncertainty about stock structure.

10. Report of Special Research Programs

10.1 Atlantic-wide Research Program for Bluefin Tuna (GBYP)

Dr. Antonio Di Natale, Program Coordinator, presented the report on the Atlantic-wide Bluefin Tuna Research Programme (GBYP) activities carried out in 2012, including the report of the GBYP Operational Meeting on tagging, biological and genetic sampling and analyses.

The Chair acknowledged the huge effort deployed by the Coordination team and the Secretariat, the very encouraging achievements obtained by the various actions of the Programme, even with regards to some preliminary results being gained in terms of fishery-independent data.

Several scientific delegations, namely Algeria, Turkey, Morocco, USA, Tunisia, Norway and the European Union commented on the main research activities already launched by GBYP in the first three Phases and those that are proposed for Phase 4, also acknowledging the impressive results accomplished so far. Although there is general satisfaction, it is recommended to have somehow a mid-term evaluation of the work already done in these first three Phases, during which it was necessary to make some adjustments, mainly due to: (1) budgetary constraints, which translated to suspending some research activities and empowering others, and (2) the lack of cooperation from some CPCs in providing the necessary support to access either their marine waters for tagging or air space for aerial surveys. Furthermore, some field operational difficulties have been reported.

Some delegations further supported continuing the efforts for collecting fishery-independent data, particularly on spawners. The general opinion is that it is necessary to prioritize the various GBYP activities, which are all useful for ICCAT to get a better scientific vision mainly based on fishery-independent data, according to funding and opportunities.

Aware of jeopardizing the funding procedure used so far, which is on a yearly-basis, and all the exhausting effort required to adapt this budgetary reality to the need of accomplishing the research tasks in the medium-term (through a process of calls for tenders, contracting, implementing and reporting, etc.), the SCRS highly recommends moving to a multi-year funding system, also keeping the original budget set by the Commission in 2009 but extending the activities over a longer period of years. The European Commission expressed its willingness to explore this possibility. Other funding opportunities were discussed (see item 15).

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 2013, was presented by the Program Coordinator, Dr. David Die.

The ICCAT Enhanced Research Program for Billfish continues to achieve its objectives of supporting the work of the SCRS in providing scientific advice on the status and outlook of Atlantic billfish stocks. During 2012 this program continued to support the collection of biological data and fishery statistics in selected fleets. During 2013 the program will continue such work but will also enhance its support for the collection and processing of genetic samples that aim to define the extent of misidentification of white marlin and spearfish species. The program depends for its functioning on the provision of Commission funds and the generous monetary and non-monetary contributions of others that have contributed to its success.

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

11. Report of the Sub-Committee on Statistics

Dr. Gerald Scott, Convener of the Sub-Committee on Statistics presented the Sub-Committee's report (**Appendix 7**) which held its session in Madrid, September 24 and 25, 2012. With regards to the official statistics submitted by CPCs (Task I and II) the following was noted:

a) Improvements in the report of Task I by CPCs, with more information on sharks and other by-catch species;

b) Improvement in timing of data submission; however the increase was noted in the number of preliminary data submissions with several reviews/updates throughout the year substantially increasing the Secretariat's work of updating the databases;

c) The current report cards have likely resulted in the compliance with statistical data submission; however, they are not necessarily reports on the quality of the data. It was noted that the new species catalogue (see Table 1 of Appendix 7) combining Task I and II and the proportion of the total catch, provides a better overview of the data gaps and deficiencies. However, data quality evaluation needs further consideration and specific recommendations were presented;

d) It was noted that the data on fleet characteristics (Task I FC) reports are incomplete and inconsistent. It is recommended that these data be crosschecked against other vessel lists available; and

e) In regards to tagging, most conventional and electronic tagging was done under the GBYP in 2011/12. However, the diminishing reporting of CPCs' national tagging programs was noted, particularly the lack of complete release data which greatly limit the usefulness of tagging data for stock assessments.

A summary of the ICCAT databases with confidential restrictions and their potential use for scientific purposes was discussed. Alternatives for SCRS to access and use these databases, either by signing a confidentiality agreement or by providing algorithms and guidance to the Secretariat for their use, were discussed. The second option was deemed less optimal for scientific objectives. Under this confidential category, a preliminary analysis of the ICCAT VMS has confirmed the potential scientific value, in addition of revealing the decrease of time between VMS signals to an average of 2-3 hours, as recommended by the SCRS in the past.

The Sub-Committee also highlighted the development of the framework to host the ICCAT database documentation and help files. It was noted, however that the proposal of a four-year time frame to complete the documentation work was too long, and the importance of this task and the allocation of human resources to accomplish the task in shorter time frame was stressed.

As regards data quality and the impact on stock evaluations, the Sub-Committee presented a plan to define, in conjunction with the Species Groups, methods and protocols to evaluate the impact of lack of data. It was also proposed to seek external expertise; the Chair will coordinate the work to define the terms or reference for these analyses. It was reiterated that given the lack of data, the Commission should take a more conservative approach towards management of fish resources.

In response to the Commission Rec. [10-10] and Rec. [10-04], this Sub-Committee concluded that the limited response to the questionnaires on national observer programs and bluefin national observer programs precluded any conclusion.

The Sub-Committee and the SCRS expressed their satisfaction for the improvements in the infrastructure and logistics of the Secretariat meeting rooms. It was also positively noted that the efforts by the Secretariat to compile, organize and make immediately available most of the ICCAT statistical information through the web and during the SCRS meetings enhanced the work of the Committee. It was further noted that among the t-RFMOs, the availability of data on the ICCAT web site was amongst the best, adding to the transparency of the organization. Nonetheless, some improvement is still needed in the type and amounts of data regularly updated and made available were noted. For instance, the Committee agreed that regular updating of catch at size (CAS) every year for the main species, such as is done by the IOTC, would further enhance the work of the Committee. In response, it was noted that the estimation of CAS requires cooperation from the CPCs, guidance from the Species Groups and increased resources at the Secretariat. Regarding CPCs, it was agreed that the submission of well documented CAS, in addition to size data, will be fundamental to obtain updated CAS on a regular basis.

Finally, the Sub-Committee reiterated the standing recommendation for increasing the human resources at the Secretariat, especially for the Statistics Department. The Executive Secretary reminded that there were limitations for personnel hiring pending approval of the budget by the Commission.

12. Report of the Sub-Committee on Ecosystems

Drs. Shannon Cass-Calay and Alex Hanke, Co-Conveners of the Sub-Committee on Ecosystems, presented the report of the inter-sessional meeting held in Sète (France), July 2 to 6, 2012 (SCRS/2012/014).

Information on the meeting contents and the SCRS discussions are detailed in section 9.5.

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 the implications of the "Future of ICCAT" meeting in Madrid in May

The Third Meeting of the Working Group on the Future of ICCAT met in Madrid, Spain, May 28-31, 2012.

Issues discussed related to the scientific management framework of ICCAT included the Precautionary Approach, ecosystem considerations and the scope of the Convention, in particular, with regards to shark conservation and management. In addition, the contribution scheme, capacity building and assistance, non-party participation, strengthening the SCRS and the decision making processes were discussed.

14. Review of the SCRS peer review system

The peer review system is intended to ensure the Implementation of Best Science (SCRS/2012/42) within the SCRS and the Terms of Reference was discussed at the Working Group on Stock Assessment Methods in 2012.

The original procedure was agreed in 2002 and peer reviews have been conducted of ICCAT stock assessments in the past and the intention is to conduct reviews of at least two stocks per year. These will provide advice for improvements in stock assessments. The first priority is for reviews of species groups that are implementing new assessment methods. A review of a stock should be conducted within a 5 year period with additional reviews at intervals of about every 2-3 assessments.

A pool of potential reviewers has been identified and from this pool, the SCRS Chairman, the Species Group rapporteur and the Secretariat will select reviewers. The heads of national scientific delegations and Species Group rapporteurs will be advised of the outcome of this process.

Prior to the meeting, the external reviewer(s) will be given access to previous reports of the working group and will fully participate in the discussions of the appropriate analyses to be conducted at the meeting.

The peer review conducted for white marlin in 2012 identified several areas of improvement. Recommendations for improvements to the review process included, for example, that the independent reviewer also attend any data preparatory meeting. Decisions on the stock assessment data inputs are fundamental and not allowing the reviewer to have input to this part of the process would be a significant flaw in the independent review model.

The outcome of the review would be the adequacy of the conclusions of the assessment and recommendations for the next stock assessment and/or other research.

It was proposed to proceed in 2013 with the current system in place and the Terms of Reference would be reviewed again by the Working Group on Stock Assessment Methods in 2013 as part of the SCRS Science plan.

The stocks being reviewed in 2013 will be North and South Atlantic albacore and any reviewer should participate in both the data preparatory and stock assessment meetings.

Discussion

A potential problem was that when a reviewer actively participates in a meeting, he/she will also have part ownership of the results from the meeting. For example, by participating in a data preparatory meeting reviewers will have had responsibility for inputs into the assessment. This means that they will then be reviewing their own work, particularly if there is an absence of critical mass in the group. It was agreed that if there is a capacity problem then there is a need to strengthen the stock assessment teams and not rely on a peer reviewer to provide missing expertise.

A problem with inconsistence in advice was also discussed i.e., when there are different peer reviewers from one assessment to another.

The SCRS welcomed the peer review process as being a positive process.

The Terms of Reference for any reviews in 2013 were agreed to be based on the existing guidelines.

The Committee agreed that an external peer review would be conducted for North Atlantic albacore assessment in 2013.

15. Consideration of modalities of a potential scientific quota

The Secretariat made a brief presentation of alternative scientific quota programs from other t-RFMOs. The discussion centered on the following three main topics:

1. Scientific research programs in fisheries science is an investment for the future with clear returns in terms of medium and long-term sustainable management of fish resources. More science, more certainty and better management recommendations which will translate in increased revenues for CPCs. Therefore, a Scientific Quota must be included as part of the management plan for eastern bluefin tuna. It is clear the Atlantic-wide Research Program for Bluefin Tuna (GBYP) cannot be assumed by individual countries or dependent on voluntary financial support. It was pointed out that research plans for tunas and tuna-like species require medium to long-term (5+) years of continuous support to accomplish scientific objectives, especially for developing fishery-independent surveys. It was stressed that the current GBYP funding scheme does not guarantee medium-term research activities, such as aerial surveys or tagging projects, to be completed, which could result in a waste of effort and resources, including economic ones.

2. A Scientific Quota should require having a specific plan of action for the allocation, administration and control of the financial resources generated. To do so, different options are possible, among others, for example auction(s) or hiring a charter boat. These different options need to be further reviewed and discussed. The Scientific Quota program established and managed by Morocco in its bluefin tuna fishery in 2012 was mentioned as an example.

3. It was concluded that priority should be given to the research for bluefin tuna. In particular, for the ICCAT Atlantic-wide Research Programme for Bluefin Tuna (GBYP) currently in place, under the possibility of suspended funding for upcoming years. It was stressed that stopping the current projects will hinder any research objectives approved by the Commission. It was noted that current indicators show a reverse in the decline of eastern bluefin tuna. However, there is great uncertainty in the speed and capacity of recovery of this stock in the near and mid-term future, as well as in the key biological/ecological factors, such as stock delimitations and productivity. Thus, there is an imperative need to continue the current scientific monitoring and research programs, and to assure continued financial support for these activities with a Scientific Quota allocation.

Further to item 3 above, it was proposed that the SCRS Chair, in collaboration with the Secretariat, prepare a Recommendation proposal similar to that presented in 2011 to the Commission [Rec. 11-06] for its consideration of a Scientific Quota for eastern bluefin tuna at the level of current GBYP funding, i.e., about 2.5 million €/year. According to the current market price, a quota of 250 to 300 tonnes/year should cover GBYP research activities in 2013 and in following years.

16. Consideration of plans for future activities

16.1 Establishing guidelines to develop the 2014-2020 SCRS Science Strategic Plan (including Quality Assurance and Capacity Building)

In [Res. 11-17] it was agreed to take measures to improve communication between CPCs, the Commission and the SCRS, strengthen data collection programmes (including those on by-catch), support the work of the SCRS and ensure participation of scientists from all CPCs.

To do this, different levels of action were identified, from the collection of raw data to the formulation of advice. This requires a robust quality control policy developed and implemented at all levels.

Steps to be taken include the adoption of standards for data formats, procedures for the approval of stock assessment methods, control of preparatory analysis, e.g., procedures used in the standardisation of CPUE and the assessment process and the periodic review of assessments.

Several quality assurance initiatives have already been put in place but without a clear systematic development. It is therefore proposed, starting in 2013, to develop a draft Strategic Science Plan which will be considered at an *ad hoc* meeting of the SCRS. This will be peer reviewed before approval by SCRS and adoption by the Commission.

Discussion

The importance of the plan and its development was agreed.

16.2 Annual Work Plans

The Rapporteurs summarized the 2013 Work Plans for the various Species Groups. These Plans were adopted and are attached as **Appendix 4**.

Regarding the Swordfish Species Group proposal of evaluating newer stock assessment approaches which more fully incorporate biological data and provide more complete representations of uncertainties in stock status, the Committee agreed to use ICCAT funds to pay for external support for development of such new methods.

Under the assessment of the impact of ICCAT fisheries on sea-turtles, the issue of assessing the impact on non-ICCAT fisheries was raised. It was recognised that this was potentially very broad. Therefore, the Sub-Committee would consider such impacts only where data were readily available.

16.3 Inter-sessional meetings proposed for 2013

Taking into account the assessments mandated by the Commission and the Committee's recommendations for research coordination, the proposed inter-sessional meetings for 2013 are shown as in **Table 16.3**. 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 March 2013, the Sharks Species Group and the Albacore data preparatory meetings in April, the bluefin meeting on biology in May, the swordfish data preparatory and the albacore assessment meetings in June, the Sub-Committee on Ecosystems inter-sessional meeting and the bluefin assessment methods in July, and the swordfish stock assessment in early September. The European Union expressed its wish to host the following SCRS meetings: Bluefin tuna inter-sessional meeting on biological information (Tenerife, Spain), Atlantic albacore stock assessment (Sukarrieta, Spain) and the Atlantic swordfish stock assessment (Olhão, Portugal). Cape Verde also expressed its wish to host the inter-sessional meeting of the Shark Species Group.

Table 16.3. Proposed calendar of ICCAT scientific meetings in 2013.

ICCAT MEETINGS 2013																																					
	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	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			
																	ICCAT-ICES MSE*																				
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			
																	TRAINING SS3																				
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
																	METHODS							TROPICALS													
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					
										SHARS														ALB DATA PREP.													
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		
											BFT BIOLOGY																										
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
										SWO DATA PREP.														ALB ASSESSMENT													
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-ECOSYSTEMS														CONF. SA METHODS							BFT METH.													
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
										SWO ASSESSMENT																					Species Groups						
Oct			30	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					

* Provisional dates for the course

SCRS meetings

16.4 Date and place of the next SCRS Meeting

The next meeting of the Standing Committee on Research and Statistics (SCRS) will be held in Madrid, Spain, September 30 to October 4, 2013; the Species Groups will meet from September 23 to September 27, 2013 at the ICCAT Secretariat.

17. General recommendations to the Commission

17.1 General recommendations to the Commission that have financial implications

Albacore

- The Committee acknowledged the on-going need for research on life history, movements and basic ecology of albacore. However, it was determined that the need to improve basic statistics as well as the participation of experts in the stock assessment process was the highest priority for the upcoming year. Several countries with important albacore fisheries were not represented in the last stock assessment meeting hence limiting the ability of the group to properly revise the data, to replicate earlier assessments and to ensure continuity on the formulation of the management advice, and/or to apply alternative modeling approaches. To overcome this, the Committee recommends that CPCs make additional efforts to contribute and participate in the working group meetings.

Eastern and western Atlantic bluefin tuna

- The Commission adopted Recommendation 11-06 concerning the Atlantic-wide Research Programme for Bluefin Tuna (GBYP). The SCRS recommends that all CPCs concerned support these provisions, in particular, by ensuring regular funding and providing assistance for the necessary permits concerning the GBYP activities in their territorial waters or airspace.

- The Commission should reconsider the merits of a research TAC set aside to fund the GBYP. A research allocation of 250 to 300 t would fully support the current GBYP research enterprise and secure the future of long term research activities such as aerial surveys and scientific tagging programs (which is not the case under the current funding mechanism).

- The next assessment for bluefin tuna, which will employ new methods and new information, is scheduled for 2015. The Committee recommends an inter-sessional meeting in early 2013 to evaluate the new biological information (growth, ageing, maturity, reproduction) coming from GBYP and other on-going research projects. This meeting should also evaluate the reliability of existing and historical information. A follow-up meeting that will focus on incorporating the new information into appropriate stock assessment models will be held in 2014. The Committee recommends that CPCs make the necessary arrangements to ensure the presence of their national scientists at both meetings. There will also be a need for several external experts to assist with the interpretation of those data, particularly the principal investigators of several key studies.

North and South Atlantic swordfish

- A more detailed stock assessment for North and South Atlantic is planned for 2013, entailing two separate meetings dealing with data and methods, and the stock assessment. While the Swordfish Species Group considered that most of the work requirements could be met with strong inputs from national and Secretariat scientists, there will likely be a need for one or two external experts to assist with development of approaches that the Group is less familiar with (i.e., Bayesian Surplus Production Models, Stock Synthesis).

- Participation in the Swordfish Species Group has been problematic in recent years. For example, after the 2009 stock assessment, the Group expressed concern that one of the longest CPUE time series was submitted by correspondence, without the author or another scientist familiar with the analyses being present at the meeting. This made it difficult to evaluate the suitability of the time series. The Committee recommends that CPCs that can make valuable contributions to the assessments make the necessary arrangements to ensure the presence of their national scientists at those meetings. This is especially important in 2013, when a major assessment is planned. The SCRS will transmit this requirement to the Commission during the 2012 annual meeting.

Tropicals

- Côte d'Ivoire informed the Tropical Tuna Species Group that detailed statistics on tunas, billfishes, sharks and other species from its artisanal fishery has been collected since 1985 but are not entered yet in a database. Côte d'Ivoire has expressed its desire to obtain assistance to develop a database and data processing system with the aim to elaborate Task I and Task II on the species caught by this fleet. The Committee recommends that special funds from ICCAT be provided to this important data rescue task.

- Due to the uncertainty on biological parameters needed to conduct accurate stock assessments, the Committee recommends an intersession meeting devoted to the review of objectives of the Atlantic tropical tagging program. The meeting should also consider how the tagging program can generate information on residence time and/or mixing rates necessary to evaluate the current time/area closures.

- Considering the recent increase in the catches of skipjack, the expansion of the purse seine fleet to new fishing areas and the need to update the biological and statistical information, the Committee recommends that the skipjack stock be assessed in 2014.

Billfishes

- The Committee strongly supports the Enhanced Billfish Research Program (EBRP) and the continued acquisition of new biological information for genetic species identification and non-industrial fishery information as well as to investigate new and original approaches to reduce marlin mortality. 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 Committee recommends that the Commission and all CPCs concerned reaffirm their commitments to EBRP by funding the 2013 budget in full.

Sharks

- The Committee recommends developing a special research program for sharks that focuses on the reduction of the major sources of uncertainty in la formulation of scientific advice. The program will be defined in 2013 and included in the SCRS's strategic science plan envisaged for the period 2014-2020. The Committee considers that this is a priority matter, since this program could resolve many questions/problems that have been raised in the Species Group during the assessment session.

Small tunas

- Set up an ICCAT Year Research Program for small tuna species; the details of this program are attached to the Small Tunas Work Plan;

- The CPCs should make the necessary arrangement to ensure a large participation of their national scientists to ICCAT small tuna species group meeting.

Sub-Committee on Ecosystems

- To expedite the completion of the national observer program database and reporting forms, the Committee recommends that a Call for Tender be developed to hire a technical expert to assist the Secretariat on a short-term basis. The expert would, under the direction of the by-catch coordinator and the Secretariat, develop a flexible and fillable data form for the submission of National Observer Program data. The Committee expects that this task could be completed within a six-month time frame, and should begin no later than spring 2013.

- Recognizing the importance of external support in the work of the Sub-Committee, it is recommended that a group comprised of the Secretariat, the Sub-Committee on Ecosystems and the SCRS Chairs be convened to identify individuals with appropriate regional and technical expertise, and solicit nominations for participation in the Sub-Committee as required.

Sub-Committee on Statistics

- The Sub-Committee discussed the possibility of applying the data recovery methods used by the GBYP (SCRS/2012/141) to other species. It was suggested that for species such as albacore this may be useful as it is a major species and data collection is normally carried out, but for species such as small tunas, this may be more complicated, as the quality of recorded data is often lower. Existing procedures could be used to assist developing economies to collate and submit their information. With fully developed economies, this is more complicated.

- The Sub-Committee recommends that methods should be pursued to recover this important data on species of interest to ICCAT, including Mediterranean albacore. The Sub-Committee made a recommendation to re-table the data recovery proposal to the Commission and should this not be possible to utilize existing capacity building and data collection funds to recover information.

- The four-year time frame to finalise database documentation is the recommended absolute limit that should be considered as this work is critical to protecting access, extraction, and understanding of the data most critical to the workings of ICCAT. It was also reiterated that adding staff (or broader use of fixed-term contracts) should be sought to accelerate this process. The steep learning curve required to become familiar with the database structure and how it functions was again acknowledged and thus significant time may be required to bring new staff/contracted experts up to speed with the processes.

- This recommendation has been made for a number of years and while an additional database management support position should have been included in the 2012 Budget of the Secretariat, it was not included because the proposed budget was already circulated in July 2011. It was reiterated that the timing between preparation of the Budget and the identified needs of the SCRS needs to be better coordinated and that until such a position can be identified within the budget, fixed-term contracts should be utilized.

- In 2011 the Sub-Committee agreed that additional characterisation of the quality of data is required above simply describing whether the data was submitted on time. A description of the suitability of the data for scientific requirements is needed. It was suggested to the Sub-Committee that external expertise may be required to quantify the quality of information and that a Terms of Reference for a contract should be developed to assess the databases ICCAT possess. The Convener of the Sub-Committee volunteered to draft, in consultation with the SCRS Chair and other SCRS Officers, the Terms of Reference for such an activity inter-sessionally, after which a request for bids should be advertised.

Working Group on Stock Assessment Methods

- Develop a form to obtain information on the nature of the recreational/sport fisheries and details of the data being collected.

17.2 Other recommendations

Albacore

- The Committee recommends revising all standardized CPUEs for North and South Atlantic albacore, in the light of the new requirements developed by the Working Group on Stock Assessment Methods (WGSAM), in order to improve the selection of appropriate CPUE indices used in the assessments. Specifically, and considering that several fleets (e.g., Chinese Taipei, Brazil, and Uruguay) fisheries have faced changes in targeting and/or fishing strategies relative to albacore tuna, it is recommended to properly document these, and incorporate as much information as possible in the standardization process.

- The Committee considered it was important to undertake the data revisions for Mediterranean albacore identified in Section 9.1 of Report of the Sub-Committee on Statistics (**Appendix 11)**. The Committee recommends that these CPCs address these problems and report the data revisions to ICCAT before the 2013 SCRS meeting.

- The Committee recommends continuing the work towards integrating the various studies relating life history parameters and ecology for Mediterranean albacore.

- The Committee also recommends pursuing studies towards better characterizing the effect of environmental variation in catch rates and spatial dynamics of albacore tuna.

Eastern and western Atlantic 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 (many fisheries remain poorly sampled). 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.

Mediterranean swordfish

- As Recommendation 11-3 does not correctly reproduce the weight conversion factors that have been adopted for the Mediterranean stock and appear under the "Conversion Factors" headings in the ICCAT web-site, SCRS recommends that the phrase defining the minimum landing sizes in terms of weight should be modified as follows: "....weighing less than 10 kg of round weight or 9 kg of gilled and gutted weight, or 7.5 kg of dressed weight (gilled, gutted, fins off, part of head off)".

- In order to avoid future confusion in weight conversions, SCRS recommends that the *ICCAT Manual* should harmonize the weight definitions according to the terminology that appears under the heading "Conversion Factors" of the ICCAT web-site. This particularly refers to the acronym GWT which should be stated as "gilled and gutted" weight and not simply "gutted".

Tropicals

- The Committee recommends that a detailed description of the methodologies and assumptions used by the Ghanaian statistics task-force group be submitted in advance to the Tropical Species Group inter-sessional meeting in 2013.

Billfishes

- The Committee notes the misidentification problems between white marlin, roundscale and longbill spearfishes need to be resolved in order for our billfish assessments to improve. It recommends conducting an Atlantic-wide survey of WHM-RSF-SPF distribution and abundance with the collaboration of CPCs that have fleets covering the entire Atlantic, particularly in the eastern and southwestern Atlantic fishing areas.

Sharks

- Considering the need to improve the stock assessments of pelagic sharks affected by the ICCAT fisheries, the Committee recommends that the CPCs provide data corresponding to all the ICCAT and non-ICCAT fisheries that catch these species, which also includes the artisanal and recreational fisheries. The Committee considers that a basic principle to correctly assess the state of any stock is to rely on a solid base to estimate the total extractions.

Sub-Committee on Ecosystems

- Sea turtle assessment

  - Recognizing that other t-RFMOs are undertaking assessment of sea turtle by-catch in their fisheries, the Committee recommends that, when available, the proposed ICCAT sea turtle methodology be circulated to other t-RFMO working groups for information, and encouraged the ICCAT By-catch Coordinator to liaise with other t-RFMOs on this matter.

  - The Committee recognized that it would be valuable to collate and assemble density distribution maps for sea turtles, for example making use of and contributing data to seaturtlestatus.org, seaturtle.org. Also, it is advisable to collaborate with the Inter-American Convention for the Protection and Conservation of Sea Turtles.

  - The Committee recommends that the cooperation, including data exchange, between ICCAT and the Inter-American Convention for the Protection and Conservation of Sea Turtles be strengthened by means of a Memorandum of Understanding between both organizations.

- The Committee encourages CPCs to conduct research on sea turtle population genetics.
- The Committee recommends that when CPCs provide standardized indices of BPUE that they include diagnostics and conform to the guidance developed by the Working Group on Stock Assessment Methods (WGSAM) (2012 report).

Working Group on Stock Assessment Methods

- The Committee recommends that data preparatory meetings should be held in the same year as the assessment.
- The Committee recommends that CPUE protocols be used and feedback provided.
- The Committee also recommends that the Species Groups use the new templates for the detailed report and executive summary.

18. Responses to the Commission's requests

18.1 Advise the Commission on the creation of sanctuaries for bluefin, [Rec. 10-04]

Information about the location and timing of bluefin spawning in the Mediterranean (and Gulf of Mexico) has been gathered over a number of decades. In 2010, the SCRS gave advice to the Commission based on VMS data from purse seine (and other) vessels targeting bluefin in the Mediterranean during the spawning period (mid-May through mid-July). The 2008-2009 purse seine VMS data were used to identify spawning locations for which the GBYP aerial surveys of the bluefin spawning stock were conducted in 2010. At that time, six main areas have been identified, i.e., the Balearic islands, the southern Tyrrhenian Sea (North of Sicily), Malta and western part of Gulf of Syrta, eastern part of the Gulf of Syrta, North and South (restricted) parts of the Levantine basin.

These areas were consistent with scientific knowledge from the extensive past literature available to the SCRS. Spawning is, however, also known to have occurred outside of these general areas. A recent study (Druon *et al* 2011) estimated potential bluefin tuna (feeding and) spawning habitats in the Mediterranean Sea from satellite data between 2003 and 2009. This study identified, among other things, the same spawning locations as past studies and, more interestingly, large year-to-year variations (30% to 60%) in these spawning habitats due to changes in oceanographic conditions.

A complete synthesis will require further investigation in order to compare historical knowledge with more contemporary observations and fisheries information. Nonetheless, current knowledge that has been partially summarized in SCRS/2012/149 indicates that bluefin tuna spawning locations are probably wider than often assumed in the past and could cover more than half of the whole Mediterranean Sea surface (mostly in the southern part). Furthermore, the locations and timing of bluefin tuna spawning is likely to substantially vary from year-to-year. Consequently, the implementation of a sanctuary aimed at protecting bluefin spawning should be large enough to be really efficient at a population level and would necessitate an integrative approach (through modeling) to evaluate the optimal design in terms of size, location(s) and time/season.

Supplemental recommendations [Rec. 10-03] were made by ICCAT concerning the western Atlantic bluefin tuna rebuilding program. One of these recommendations (Rec. 10-03, paragraph 20) centered on the requirement of the SCRS to investigate the identification of spawning areas for western Atlantic bluefin tuna. The majority of spawning activity has been reported only in the Gulf of Mexico and the Mediterranean Sea. However, western Atlantic bluefin tuna are highly migratory and capable of moving large distances throughout the entire North Atlantic Ocean. Muhling *et al*. (2011) reported that in early April 2009, low numbers of very small bluefin tuna larvae were collected within and south of the Yucatán Channel, and along the western boundary of the Loop Current, northeast of Campeche Bank. Measurements of *in situ* current velocity showed that these larvae were collected in northward flow regimes, suggesting that they may have been spawned outside of the Gulf of Mexico in the Caribbean Sea.

Also, SCRS/2012/157 reported on dispersal patterns of small to medium-sized (150-185 cm) western Atlantic bluefin tuna released from New England and Canadian foraging grounds from 2002-2011 with PSATS. It was reported that most of the individuals retaining tags until the following April-June did not enter the Gulf of Mexico, their aforementioned presumed spawning ground. However, some of these fish may not be matured.

Spatial and environmental information returned by the tags suggest that some western Atlantic bluefin tuna spawn elsewhere, possibly in late winter or spring, near the Gulf Stream margin, the Bahamas, and Caribbean Sea. Most of the fish utilizing the Gulf of Mexico during the observed period were larger (i.e., >185 cm CFL), and did so between February and March. None of the smaller (*i.e*., 150-<185cm CFL) tagged individuals entered the Gulf of Mexico, but were at times located in oceanographic conditions similar to known spawning areas (e.g., SST from 22-26°C; (see Muhling *et al*. 2010). Also, SCRS/2012/157 reported that dispersal patterns exhibited by mature western Atlantic bluefin tuna are consistent with life history models that predict smaller or younger fish should reproduce in areas closer to foraging grounds than larger individuals.

These types of confirmations of the reproductive activity of bluefin tuna in the Atlantic are very important to obtaining an accurate assessment of spawning stock biomass for western Atlantic bluefin tuna. Therefore, the Committee recommends to the Commission that the CPCs support the continuation of these studies in order to properly identify and characterize spawning grounds of western Atlantic bluefin tuna, and also improve the standardized abundance indices (based on larval abundance) for the next western Atlantic bluefin tuna stock assessment or intersessional meetings.

18.2 The BFT national observer programmes conducted by CPCs including advise on future improvements, [Rec. 10-04]

Due to inadequate response rates, the 2011 SCRS recommended that CPCs transmit as soon as possible all scientific information of the 2011 national observer programmes called for under [Rec. 10-04] to 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 for the 2012 Bluefin Tuna Work Plan. No new specific information has been provided. However, the data collection form for national observer programmes included some information regarding bluefin tuna observer programmes and a few flag states provided comments. The Sub-Committee recommended that the CPCs should respond to [Rec. 10-04] and provide information on their national observer programmes.

18.3 Evaluate the national observer programmes conducted by CPCs to report to the Commission and to provide advice on future improvements [Rec. 10-10]

Recommendation 10-10 indicated that CPCs shall provide a preliminary report to SCRS by 31 July 2011 on the structure and design of their domestic observer programs to be followed by an updated report on 31 July 2012.

In 2011, twelve CPCs submitted information to the Secretariat: Chinese Taipei, Ghana, Korea, Iceland, Japan, Tunisia, Mexico, Namibia, United States, Canada, Uruguay and EU France.

The Commission also recommended [Rec. 10-10, paragraph 6] that beginning in 2012 and every three years thereafter SCRS shall:

1) Report to the Commission on the coverage level achieved by each CPC by fishery;
2) Provide the Commission with a summary of the data and information collected and reported pursuant to this Recommendation and any relevant findings associated with that data and information;
3) Review the minimum standards established for CPC observer programs as set out in this recommendation; and
4) Make recommendations as necessary and appropriate on how to improve the effectiveness of observer programs in order to meet the data needs of the Commission, including possible revisions to this Recommendation and/or with respect to implementation of these minimum standards by CPCs.

In 2012, Canada, China, Chinese Taipei, EU France, Malta, Mexico, Portugal, Russia, Tunisia, Turkey, United States and Uruguay submitted reports on national observer programs using the supplied forms (Appendix 2 of the "Secretariat Report on Statistics and Coordination of Research in 2012"). In addition, Algeria, Brazil, Egypt, Ghana, EU Greece, Iceland, EU Italy, Japan, Korea, Mauritania, Namibia and South Africa also submitted information regarding their national observer programs, but in a different format so they do not appear in Appendix 2 of the Secretariat's Report.

Information provided to the Secretariat in 2011 and 2012 was submitted using different formats which limit the utility of this information and the Committee's ability to respond to the Commission. To correct this, the

Secretariat and the Committee have developed a list of components to be collected by the national observer programme data collection form (**Table 18.3**) for the submission of information from national observer programs. This form was developed to be consistent with the objectives and recommendations of the Kobe Process and the Joint t-RFMO By-catch Technical Working Group (e.g. interoperability across t-RFMOs) and national data confidentiality requirements. This form will facilitate CPCs to submit national observer program data to the Secretariat using a consistent format beginning in 2014. CPCs who prefer to provide raw observer program data to the Secretariat may exercise that option. Regardless of how the data are submitted, the Secretariat will protect the confidentiality of the data either through aggregation or by assigning new vessel and trip identifiers as per the CPCs' instructions.

Table 18.3. Summary of proposed components to be collected by the national observer programme data collection form.

Categorisation of data submitted	*Vessel information*	*Trip information*	*Fishing activity*	*Harvest details*	*Biological information*	*Tagging*
- Aggregated data - Disaggregated - By-catch species only - All species	For disaggregated data submissions - Vessel identifiers - Vessel characteristics - Equipment	Information will vary according to level of aggregation - Flag States - Areas fished - Dates - Effort information (fishing days, hooks etc.) - Observer information	- Vessel - General gear - Dates - Positions For disaggregated - Detailed gear info - Haul and set identifiers	- Target species catches (if applicable) by number or weight - Discards dead - Discards alive - By-catch by species or main grouping by number or weight	- Species - Lengths - Weights - Units of length and weight - Condition	- Haul/set/trip - Date - Species - Length - Weight - Location

18.4 Develop a Port Sampling Plan aimed at collecting fishery data) for bigeye, yellowfin, and skipjack tunas that are caught in the geographical area of the area/time closure [Rec. 11-01]

Table 18.4 shows information on the surface fleets currently fishing in the equatorial area. Information includes: flag, gear, landing port as well as the number of vessels. By gear, purse seine is the most important surface gear fishing tropical tuna in the area, although a Ghanaian baitboat fleet is also operating fishing mainly in association with purse seine vessels. Purse seine fleets include 9 flags that can be classified in three main styles: European style fleet (EU-FR, EU-SP, Cape Verde, Panama, Guatemala, Curaçao and one boat from Belize), Ghanaian style fleet and other styles (Belize, Guinea (Rep. of), Cape Verde and Côte d'Ivoire). Regarding landing ports, Abidjan (Côte d'Ivoire) and Tema (Ghana) are the main landing ports for these fleets, although sporadically landings in other ports occur. Abidjan is the main landing port for the European and associated fleets as well as for the majority of "Others" fleets component of the Ghanaian fleet. Tema is the port landing for the Ghanaian and Belize fleets.

Currently, sampling programs exist in Abidjan for sampling and monitoring the European and associated fleets and in Tema for the component of the Ghanaian fleet landing in this port.

Sampling programs in place are multispecies, with the double objective of estimating size distribution and species composition of the catch, stratified by time and, in the case of Abidjan, by area and fishing mode (FADs and free school). This multispecies sampling scheme has been considered by the SCRS as the best approach to correct bias in the species composition of the catch declared on the logbooks.

Based on this information, the Committee developed the Port Sampling Plan as follows:

Size and species composition

- Multi-species sampling: In this scheme, the sample is taken randomly from the entire catch without any sorting by species. Sample size should be 500 fish for small fish (<10 kg.) and 50 fish large fish. For small fish while all yellowfin tuna and bigeye tuna should be measured, skipjack tuna and other small tuna species should be measured until the mode in the size distribution appears and then they will only be counted (for more details on the method see Annex 2 to Chapter 4 in *ICCAT Manual*).
- Stratified by:
  - Time (month)
  - Area (areas should be defined as homogeneous as possible regarding sizes and species composition); the area affected by the time/area closure should be considered as stratum.
  - Fishing mode (FADs vs. Free school)
  - Size category (<10 kg. =>10 kg.)
- Sampling coverage: 1 fish by t (minimum coverage)
- Type of measure: FL for small fish and LD1 for large fish

Weight and biological sampling

- Weight information can be obtained through the length/weight relationship adopted by the SCRS (see *ICCAT Manual*, Chapter 2).
- In addition weight information can be obtained as part of a biological sampling that includes genetic, maturity, sex ratio and other biological parameters. To reduce the cost, this biological sampling can be implemented through specific agreements with the canneries. Samples should be taking following the procedure defined in Chapter 4 of the *ICCAT Manual* for biological sampling.

In order to implement the sampling plan it is fundamental:

- To reinforce the sampling teams working in Abidjan and Tema.
- To ensure that all vessels from any flag landing in each landing port are sampled according with the established sampling scheme.

- To do that, it is fundamental that the sampling teams can access all vessels landing at port, independently of their flag and including cargo vessels. Vessels should facilitate sampling and should provide the sampling teams with all the information needed to accomplish the sampling plan (logbooks, well's plan, etc.) catch,

Table 18.4 Number of surface vessels existing in 2012 in the ICCAT record of vessels and fishing in the Equatorial area by flag, gear and main landing port. This table does not include supply or cargo vessels.

Gear	*Flag*	*No. boats*	*Landing port*	
PS	Belize	5	Tema	Abidjan
	Côte d'Ivoire	1		Abidjan
	Cap-Vert	2		Abidjan
	Curaçao	3		Abidjan
	Ghana	15	Tema	Abidjan
	Guinee Rep.	3		Abidjan
	UE_France	10		Abidjan
	UE_Spain	15		Abidjan
	Guatemala	2		Abidjan
	Panama	2		Abidjan
	Total PS	58		
BB	Ghana	22	Tema	
	TOTAL	**80**		

18.5 Review the content of FAD Management Plans developed by CPCs, [Rec. 11-01]

18.5.1 Review of FAD Management Plans

Paragraph 25 of the 2011 *Recommendation by ICCAT on a Multi-Annual Conservation and Management Program for Bigeye and Yellowfin Tunas* [Rec. 11-01] requires the Secretariat to report the content of FAD Management Plans, prepared in accordance with Annex 2 of the Recommendation, to the SCRS (and to the Compliance Committee), for review at each annual meeting. The guidelines for preparing the Management Plans have a mandatory component (number of FADs to be deployed per vessel; description of FAD characteristics; and FAD markings), and an optional component (including reporting of catches from FAD sets, and other elements such as by-catch mitigation efforts, institutional arrangements, etc.).

Appendix 1 of the "Secretariat Report on Statistics and Coordination of Research in 2012" shows that only six flag States submitted FAD Management Plans and only two of these included the mandatory information, such as the number of FADs to be deployed per vessel.

Besides being incomplete, the information received in these Management Plans does not appear to be useful for stock assessment or for improving the Committee's ability to advise the Commission.

18.5.2 Improving the information on FADs to be collected and reported for scientific purposes

For scientific purposes, there are two primary types of information that should be collected and reported: (i) an inventory of FADs and FAD activity ("FAD logbook": FAD markings, deployment, retrievals, etc.), and (ii) a record of encounters of fishing (and supply) vessels with the FADs (i.e., visits to FADs and results from sets made on the FADs). These two types of information should be linked through the FAD id or marking.

Paragraph 17 of [Rec. 11-01] requires vessels to record daily catches in logbooks in accordance with Annex 1 of the Recommendation, which includes whether catches were made on FAD sets. However, there is no requirement to identify individual FADs. This logbook data need to be made available to the SCRS, according to paragraph 19 of the Recommendation.

Paragraph 18 of [Rec. 11-01] requires vessels to record in a logbook any deployment and retrieval of FADs, as well as the position, date, FAD identification and the results of the set. However, there is no requirement to make these data available to the SCRS.

Given the points above, it is likely that the FAD-related information to be received in the future will be of limited use. It should be noted that such information of FAD deployments, retrievals and visits could be gathered by observers; however, ICCAT does not require 100% observer coverage on purse seiners except during the two months indicated in paragraph 20 of [Rec. 11-01].

For the reasons stated above, and considering the level of information on FAD fishing collected by other tuna RFMOs for scientific purposes, the Committee recommends that the Commission revisit the requirements for FAD monitoring included in the [Rec. 11-01] (paragraphs 17-19 and Annexes 1 and 2 of the Recommendation). Doing so would be useful in order to improve the Committee's ability to assess the catch rates associated to objects/FADs at an accurate spatio-temporal scale.

For achieving this, the following information should be made mandatory to be collected and reported in a FAD logbook under the management plan:

- On a quarterly basis, the number of FADs deployed, retrieved and lost by type (e.g., equipped/not with electronic equipment) by each purse seiner and each supply vessel;
- Number of associated support vessels (i.e., supply vessels);
- FAD design characteristics (a description) on a yearly basis;
- FAD/buoy markings and identifiers (a unique number could be useful).
- Any deployment and retrieval of a FAD (including by a supply vessel);

Additionally, the following fishing activities in association with objects, including FADs, need to be recorded in logbooks (partially covered in paragraphs 17 and 18 of Rec. 11-01):

- The position, date, identification of the aggregating device and results of the set;
- Catch reporting from FAD sets.

Noting that some of the above data would be at the operational level, it is recommended that the data be treated in accordance with the “Rules and Procedures for the Protection, Access to, and Dissemination of Data Compiled by ICCAT” (ICCAT, 2011a).

18.6 Analyze the potential benefits and applicability of the use of time/area closures as a tool for marlin conservation, [Rec. 11-07]

In general, time-area closures can be an effective fisheries management tool. For example, the U.S. has successfully implemented time-area closures to regulate the U.S. pelagic longline fleet, in order to reduce bycatch, including billfish and juvenile swordfish mortality. There is the potential that such measures could also be effective for other Atlantic pelagic longline fleets that have historically accounted for the vast majority of marlin mortalities. It should be noted that the evaluation of time-area closure strategies should consider the potential impacts on targeted catches, the effect of effort shifted elsewhere, the ability to monitor the compliance with any measure, and the anticipated effect on the ability to monitor stock status. The Committee was unable to fully address this issue in 2012 due to its focus on completing the white marlin stock assessment. However, the Committee will in the future evaluate the available data and potential analyses in order to provide further guidance on this issue.

18.7 Response to the Commission on sharks data collection improvement plans submitted by CPCs, [Rec. 11-08]

The Committee noted that few CPCs have submitted plans for improving their data collection for sharks on a species specific level. The Committee urges those CPCs that are required to submit such plans in accordance to [Rec. 11-08] to do so as these plans are an essential element to improve the data needed to evaluate the status of the shark stocks.

18.8 Establish common standard for the Detailed and Executive Reports, [Res. 11-14]

The Committee discussed ways to streamline the presented report and to incorporate the requirements of [Res. 11-14]. Despite the need to standardize all SCRS reports, it was recognized that flexibility was needed to accommodate the particular nature of the data preparatory and assessment meeting reports. The major differences in the reports prepared by the different SCRS Working Groups were mostly due to the amount of information included in each section and not on the structure of the reports. The Committee developed a template for SCRS detailed reports that should be adopted by all Working Groups and it includes instructions on the information to be included in the different sections, following [Res. 11-14] (Appendix 4 of the 2012 Report of the Working Group on Stock Assessment Methods). The current template of the Executive Summaries was also reviewed and the new requirements incorporated (Appendix 5 of the 2012 WGSAM report). These templates have not been utilized by the majority of the Working Groups in 2012, but it is advised that they should be followed starting in2013. The Working Groups are reminded that the Executive Summaries should reflect a synthesis of the essential elements to be communicated to the Commission and the Working Groups should, therefore, make efforts to limit the number of pages of the Executive Summaries.

18.9 Evaluate sea-turtles data provided by CPCs and by-catch mitigation information [Rec. 10-09].

Information on turtle by-catch and by-catch mitigation measures was provided by CPCs and was evaluated by the SCRS. The Committee also reviewed available methodologies for assessing the impact of ICCAT fisheries on sea turtle populations. As directed by the Commission, the Committee plans to complete the analysis and prepare a response to the Commission in 2013.

18.10 Explore 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 Bluefin Tuna Species Group held in September 2011, four SCRS documents were presented on use of stereoscopic camera systems on board of Mediterranean cages (Ramfos et al 2012; SCRS/2011/189, Puig et al 2012; and Anon. 2012d). While a few technical difficulties still needed to be overcome, these studies confirmed the potential of stereoscopic cameras to recover the length composition of the fish that are transferred alive into cages. In 2011, the SCRS strongly encouraged the CPCs to carry on and complete these studies in 2012, so that stereoscopic camera systems could become operational as soon as possible.

Three additional SCRS documents were presented during the bluefin tuna stock assessment held in September 2012. Document SCRS/2012/052 used a stereoscopic camera to measure the length of fish in the cage and during the transfer to another cage through a gate. These observations compared favorably with subsequent measurements taken after the caged population was harvested. The authors affirmed the validity of utilization of the stereoscopic camera for counting and measuring bluefin tuna and made several suggestions for improving the procedure and equipment. Similar work was described in document SCRS/2012/136, where the stereoscopic camera was applied at the point of first transfer into the farm cage. A comparison of the measurements made by the camera with direct measurements of a subsample of the fish in the cage suggested that further work is required to further improve the accuracy of measurement with the stereoscopic camera and better define the mathematical models used to convert measured length to weight. Finally, SCRS/2012/133 presented an alternative approach where a video-camera and acoustical system were used in tandem during the transfer of bluefin tuna from one cage to another. The authors described the various different equipment options available for the application of this technique and practical considerations for improving the accuracy of the system.

The SCRS was encouraged by the progress made in the practical application of alternative techniques, in particular that of the stereoscopic camera, to the counting and measurement of fork length of caged bluefin tuna. It noted that a number of factors may affect the accuracy of the stereoscopic camera measurements, including lighting conditions, general weather conditions, distance from fish being measured and the angle of measurement in relation to the swimming of the fish. Fish may also suffer a drop in condition from the time of capture to the actual caging and additional field work will be needed to establish appropriate L-W relationships to convert the fork length determined by the stereoscopic camera to weight. Nevertheless, the Committee stressed that measurements made by stereoscopic cameras are possibly more precise than the current catch at size reported for the purse seine fleet. The Committee recommends moving beyond the pilot study phase and setting up a technical working group to establish procedures for implementing stereoscopic camera systems by 2013.

18.11 Provide guidance on a range of fish size management measures for western Atlantic bluefin tuna and their impact on yield per recruit and spawner per recruit considerations [Rec. 10-03]

From the *Supplemental Recommendation by ICCAT Concerning the Western Atlantic Bluefin Tuna Rebuilding Program* [Rec. 10-03]:

> *As part of its next assessment of western Atlantic bluefin tuna, the SCRS is requested to provide guidance on a range of fish size management measures for western Atlantic bluefin tuna and their impact on yield per recruit and spawner per recruit considerations. The SCRS should also comment on the effect of fish size management measures on their ability to monitor stock status.*

The Committee reviewed yield-per-recruit calculations using various selectivity patterns by gear-based on the 2010 assessment results and for decreased selectivity pattern by up to 40% for ages 1 to 6 for the whole fishery based on the 2012 assessment results. The Committee recognized that Y/R and SSB/R could be improved by changing the selectivity pattern (decreasing the selectivity of ages 1-6 by 40% resulted in only modest improvements), but these would imply allocation changes with implications beyond strict Y/R and SSB/R considerations. In addition, the Committee was concerned that such changes in selectivity would affect the availability and utility of indices of stock sizes currently used in the assessment. Furthermore, regulations to decrease the catches of ages 1 to 6 bluefin tuna may have unintended negative consequences such as increased discard mortality, which may be difficult to monitor, and changes due to reallocation of effort which may be difficult to predict.

19. Other matters

19.1 Cooperation between ICES ACOM and ICCAT SCRS

The Chair of the SCRS presented the on-going discussion to work more closely with other fisheries bodies such as ICES. This was welcomed as an important initiative, with much mutual benefit for both organisations.

The Secretariat also reported on SISAM, a worldwide initiative to help develop new stock assessment methods, which ICCAT is helping to organise.

19.2 Working Group on the Management Strategies Evaluation (MSE)

The Rapporteur of the Working Group on Stock Assessment Methods presented the progress made in the creation of the Joint Tuna Technical Working Group on MSE. This Working Group was set up following the recommendations made at Kobe III and is addressing three main topics: (i) a review of how uncertainty is included within the K2SM across stocks and t-RFMOs and how to improve the manner in which risk is communicated; (ii) the use of computational tools as part of MSE; and (iii) how to ensure the greater use of MSE within the t-RFMOs.

The Secretariat is also actively working with a range of organisations to improve methods used by SCRS. For example, in developing an SS3 workshop, working with SPC to develop Multifan-CL to allow it to be used to run a wide variety of scenarios as part of MSE, and testing harvest control rules.

19.3 FIRMS proposals

FIRMS is a global monitoring system that provides access to a wide range of information on the status and trends of marine fishery resources including their management. It draws together a unified partnership of international organizations, regional fishery bodies and, in the future, national scientific institutes, collaborating within formal agreements to report and share information on fisheries resources.

The Secretariat presented the proposal of incorporating indicators of the quality of the assessment results, discussed by the Steering Committee in its last meeting. It was agreed that this is an important initiative and the SCRS needs to look at the format and submit suggestions to the Secretariat.

19.4 Information on GEF project

The Secretariat presented the information provided by FAO on the development of a GEF Programme on Areas Beyond National Jurisdiction (ABNJ) for Tuna Project(s). This information was anticipated by FAO as a provisional draft of the final proposal that should be approved and circulated in the next days.

There are four main components related to the Sustainable Management of Tuna Fisheries and Biodiversity Conservation in the Areas Beyond National Jurisdiction (ABNJ) Project: (1) Improved management decision making, including the incorporation of HCR into t-RFMO management plans and showing how ecosystem benefits can be derived from alternative management scenarios; (2) Rights Based Management; (3) Strengthening and harmonizing monitoring, control and surveillance to address IUU fishing through measures such as the implementation of best practices or enhancing national and regional vessel registries and tools such as Satellite-based VMS; and (4) Reducing ecosystem impacts of tuna fishing.

Discussion

It was recognised that GEF was not just a partnership of the t-RFMOs but included a variety of other bodies and that the financial contributions would be grants to supplement additional work. The Committee agreed that there had been insufficient time to discuss the proposal, particularly given the complexity and extension of the project and the number of issues that need to be addressed. It was pointed out that the involvement of ICCAT requires the endorsement of the Commission. It was also considered necessary to consider how this initiative fits in with the Science Plan of the SCRS, which is under development.

The Committee agreed that this project might be potentially beneficial but it also has potentially controversial issues and therefore it needs time to be analysed. Unfortunately, the SCRS does not currently have sufficient information to assess the value of the project, but hopefully it will have this information in the future as it is of potential importance.

19.5 Recreational Working Group in the Caribbean area

The Secretariat informed that the Western Central Atlantic Fishery Commission (WECAFC) has invited ICCAT to participate in the Recreational Fisheries Group in the Caribbean area. This Working Group will have an expert workshop to develop an assessment methodology for the socio-economic impact of recreational fisheries in the Wider Caribbean Region, on 4 November in Santa Marta, Colombia -before the 65th GCFI annual conference, and a first workshop on the preparation of a billfish management and conservation plan for the Wider Caribbean Region. It was agreed that the Rapporteur of the Billfish Species Group will attend the meetings of this group and report back to the SCRS.

20. Election of the Chairman

The Committee recognized the excellent work conducted by the SCRS Chair and as a result Dr. Santiago was re-elected unanimously as SCRS Chairman for another two years.

21. Adoption of the report and closure

The Chair thanked the SCRS for its hard work this year and stressed the importance of the work to be conducted in the coming year, including the development of the Science Strategic Work Plan. Dr. Santiago thanked the Secretariat staff for all their excellent work and appreciated the professional attitude of all the staff.

Dr. Santiago then expressed thanks to the interpreters, and apologized for having made them work long hours.

The Executive Secretary closed the meeting and thanked the Chair for the trust he had placed in the Secretariat, and would like to know if there are shortcomings that need to be addressed. M. Meski then thanked the Secretariat staff for their efforts in supporting the SCRS work before and during the meeting He then stated that the Secretariat’s work does not end now as they need to prepare for the Commission. Mr. Meski thanked the interpreters for their hard work this week and wished everyone a safe journey home.

The Report of the 2012 SCRS meeting was adopted and the 2012 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, BILL-Billfish, SAI-Sailfish, SWO-Atl. Swordfish, SWO-Med. Swordfish, SMT-Small Tunas, SHK-Sharks

9. Report of inter-sessional meetings

   9.1 Meeting of the ICCAT Working Group on Stock Assessment Methods
   9.2 Tropical tuna species group inter-sessional meeting
   9.3 White marlin stock assessment session
   9.4 Sharks meeting to apply Ecological Risk Analysis and Shortfin mako Assessment
   9.5 Intersessional Meeting of the Sub-Committee on Ecosystems
   9.6 Bluefin stock assessment session

10. Report of Special Research Programs

    10.1 Atlantic Wide Research Programme for Bluefin tuna (GBYP)
        10.1.1 GBYP operational meeting on tagging, biological and genetic sampling and analyses
    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 "Future of ICCAT" meeting in Madrid in May
14. Review the SCRS peer review system
15. Consideration of modalities of a potential scientific quota
16. Consideration of plans for future activities

    16.1 Establishing guidelines to develop the 2014-2020 SCRS Science Strategic Plan (including Quality Assurance and Capacity Building)
    16.2 Inter-sessional meetings proposed for 2013
    16.3 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 Advise the Commission on the creation of sanctuaries for bluefin, [Rec. 10-04]
    18.2 Evaluate the BFT national observer programmes conducted by CPCs to report the Commission and to provide advice on future improvements, [Rec. 10-04]
    18.3 Evaluate the national observer programmes conducted by CPCs to report the Commission and to provide advice on future improvements, [Rec. 10-10]
    18.4 Develop a Port Sampling Plan aimed at collecting fishery data for bigeye, yellowfin, and skipjack tunas that are caught in the geographical area of the area/time closure, [Rec. 11-01]
    18.5 Review the content of FAD Management Plans elaborated by CPCs, [Rec. 11-01]
    18.6 Analyze the potential benefits and applicability of the use of time/area closures as a tool for marlin conservation, [Rec. 11-07].
    18.7 Evaluate the data collection improvement plans submitted by CPCs and, as necessary, make recommendations on how shark data collection can be improved, [Rec. 11-08]
    18.8 Establish common standard for the detailed and executive reports, [Res. 11-14].
    18.9 Evaluate sea-turtles data provided by CPCs and by-catch mitigation information, [Rec. 10-09].

18.10 Explore operationally viable technologies and methodologies for determining the size and biomass at the points of capture and caging [Rec. 10-04]
18.11 Provide guidance on a range of fish size management measures for western Atlantic bluefin tuna and their impact on yield per recruit and spawner per recruit considerations [Rec. 10-03]

19. Other matters
20. Election of the Chairman
21. Adoption of report and closure

Appendix 2

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Appendix 3

LIST OF 2012 SCRS DOCUMENTS

Number	*Title*	*Author(s)*
SCRS/2012/010	Report of the 2012 Meeting of the ICCAT Working Group on Stock Assessment Methods (Madrid, Spain - April 16-20, 2012).	Anonymous
SCRS/2012/011	Report of the 2012 Tropical Tuna Species Group Inter-sessional Meeting (Madrid, Spain - April 23-27, 2012).	Anonymous
SCRS/2012/012	Report of the 2012 White Marlin Stock Assessment Session (Madrid, Spain - May 21-25, 2012).	Anonymous
SCRS/2012/013	Report of the 2012 Sharks Meeting to apply Ecological Risk Analysis and Shortfin mako assessment (Olhao, Portugal - June 11-18, 2012).	Anonymous
SCRS/2012/014	Report of the 2012 Inter-sessional Meeting of the Sub-Committee on Ecosystems (Sète, France - July 2-6, 2012).	Anonymous
SCRS/2012/015	Report of the 2012 Bluefin Tuna Stock Assessment Session (Madrid, Spain - September 4-11, 2012)	Anonymous
SCRS/2012/021	Atlantic bonito (*Sarda sarda*) in Nordic waters: biology, distribution and feeding.	Nøttestad L., Tangen Ø, Tangen M. and Bjelland O.
SCRS/2012/022	Swordfish (*Xiphias gladius*) towards the Arctic Atlantic in climate change.	Sundby S., Nøttestad L., Myklevol S. and Tangen Ø
SCRS/2012/025	Pilot study of an electronic monitoring system on a tropical tuna purse seine vessel in the Atlantic Ocean.	Ruiz Gondra, J. et al
SCRS/2012/029	Aged catch analysis based on age for East Atlantic and Mediterranean bluefin tuna.	Kell L, Bonhommeau, S. and Fromentin J.M.
SCRS/2012/030	Length-based catch analysis based for East Atlantic and Mediterranean bluefin tuna.	Kell L, Bonhommeau, S. and Fromentin J.M.
SCRS/2012/033	Shortfin mako shark (*Isurus oxyrhincus*) in the catch from the Venezuelan pelagic longline fleet in the Caribbean sea and adjacent waters: period 1994-2011.	Arocha F., Silva J. and Marcano L.A.
SCRS/2012/034	A generic population simulator based on life history theory	Kell L and de Bruyn P.
SCRS/2012/035	Sensitivity of the Kobe II Strategy Matrix to life history assumptions.	Kell L and de Bruyn P.
SCRS/2012/036	The use of life history theory in stock assessment; An albacore example.	Kell L and de Bruyn P.
SCRS/2012/037	The tuna fishery along the Angolan coast.	Kilongo K., Jonico V. and Nsilulu H.
SCRS/2012/038	An exploratory data analysis of historical growth data recovered under the GBYP.	Justel A., Di Natale A., Idrissi M. and Kell L.
SCRS/2012/039	Identifying biologically implausible interannual variability in CPUE indices; with application to Atlantic yellowfin tuna.	Walter J.F and Cass-Calay S.L.
SCRS/2012/040	Enhanced monitoring of large pelagic fishes caught by the Venezuela artisanal off-shore fleet targeting tuna and tuna-like species in the Caribbean Sea and adjacent northwestern Atlantic waters: A preliminary analysis.	Arocha, F., Pazos, A., Larez, A., Marcano J., and Gutierrez, X.

SCRS/2012/041	Strengthening Ghanaian industrial purse seine fishery monitoring In the Gulf of Guinea.	Banerman P., Chavance P. & Gaertner D.
SCRS/2012/042	Implementation of Best Science in the SCRS.	Santiago, J., G.P. Scott & J. Pereira
SCRS/2012/043	An evaluation of the importance of the assumed biological parameters for management advice; Atlantic yellowfin	Kell L and de Bruyn P.
SCRS/2012/044	An evaluation of the importance of the assumed biological parameters for management advice; Atlantic bigeye.	Kell L and de Bruyn P.
SCRS/2012/045	An overview of yellowfin tuna growth in the Atlantic von Bertalanffy or multistanza growth?	Fonteneau A. and Chassot E.
SCRS/2012/046	Standardized catch rates of shortfin mako (*Isurus oxyrinchus*) caught by the Spanish surface longline fishery targeting swordfish in the Atlantic ocean during the period 1990-2010.	Mejuto J., García-Cortés B., Ramos-Cartelle A., De la Serna J.M. and González-González I.
SCRS/2012/047	A comparative analysis of Indian and Atlantic yellowfin and bigeye tuna size data.	Kell L and de Fonteneau A.
SCRS/2012/048	Standardized catch rates of white marlin (*Tetrapturus albidus*) caught by Brazilian tuna longline fleet (1978-2011).	Andrade H.A.
SCRS/2012/049	A review of fisheries within the ICCAT Convention area that interact with sea turtles.	Coelho R., Fernandez-Carvalho J., N. Santos M. at al.
SCRS/2012/050	A review of methods for assessing the impact of fisheries on sea turtles.	Coelho R., Fernandez-Carvalho J. and N. Santos M.
SCRS/2012/051	A review of sea turtle mitigation measures across the five tuna RFMOs and other fisheries management organizations.	Coelho R., Fernandez-Carvalho J. and N. Santos M.
SCRS/2012/052	Pilot study in a Turkish bluefin tuna farm to better estimate number and weight of caged e-BFT.	Turkey
SCRS/2012/053	Information note on sampling and alternative methods to be implemented at the time of capture and caging to better estimate number and weight of the caged eastern bluefin tuna (requirements of paragraph 87 of ICCAT Rec. 10-04).	Turkey
SCRS/2012/054	Aplicación de zero-inflated models sobre las tasas de captura de la aguja blanca (*Tetrapturus albidus*) a partir de datos de la pesquería española de palangre de superficie dirigida al pez espada en el Océano Atlántico.	Ortiz de Urbina J., García-Costés B., Ramos-Cartelle A. and Mejuto J.
SCRS/2012/055	How much we are learning about the production model's parameter when using standardized catch rates as input data?	Andrade H.A.
SCRS/2012/056	Standardized catch-rates of white marlin (*Kajikia albida*) for the Taiwanese distant-water tuna longline fishery in the Atlantic ocean, 1967-2010.	Sun C.L., Su N.J., and Yeh S.Z.
SCRS/2012/057	Length-based catch curve analysis for white marlin.	Kell L and Palma C.
SCRS/2012/058	An evaluation of the relative importance of the assumed biological parameters when providing management advice for white marlin.	Kell L and de Bruyn P.
SCRS/2012/059	A stock recruit meta-analysis for Scombridae, Istiophoridae and Xiphiidae	Kell L, Jordá M.J., Mosquera I., Harley S. and de Bruyn P.

SCRS/2012/060	White marlin (*Tetrapturus albidus*) and roundscale spearfish (*Tetrapturus georgii*) standardized catch rates from the U.S. pelagic longline fishery pelagic observer program in the northwest Atlantic and Gulf of Mexico 1992-2011.	Karnauskas M., Hoolihan J.P. and Walter J.F.
SCRS/2012/061	Estimates of the status of Atlantic white marlin using ASPIC and stock synthesis.	Schirripa M.J.
SCRS/2012/062	Review of size frequency samples of white marlin (*Tetrapturus albidus*) 1970-2010.	Ortiz, M.
SCRS/2012/063	An evaluation of the relative importance of biological parameters when providing management advice; A shortfin mako case study.	de Bruyn P. and Kell L.
SCRS/2012/064	The use of life history theory for elasmobranch stock assessment.	de Bruyn P. and Kell L.
SCRS/2012/065	Estimation of total mortality from size data; An example based on white marlin.	Kell L and Ortiz M.
SCRS/2012/066	The current status of the ICCAT Meta-database with regards to elasmobranch species, with suggestions for future development and activation.	de Bruyn P. and Kell L.
SCRS/2012/067	White marlin (*Tetrapturus albidus*) growth parameters estimated from capture-recapture data	Lauretta M.V. and Brown B.
SCRS/2012/068	A hierarchical framework for analysing multiple indices; A white marlin example.	Kell L and de Bruyn P.
SCRS/2012/069	Standardised diagnostics for stock assessment models.	Kell, L.T., De Bruyn, P. and Mosqueira I.,
SCRS/2012/070	Standardized catch rates of mako sharks from the pelagic longline logbook and observer programs using a generalized linear mixed model.	Cortés, E.
SCRS/2012/071	Preliminary observations on the biology and movements of porbeagle Lamna nasus around the British isles.	Bendall V.J., Ellis J.R., Hetherington S.J., McCully S.R., Righton D. and Silva J.F.
SCRS/2012/072	Standardized CPUE for the shortfin mako (*Isurus oxyrinchus*) caught by the Portuguese pelagic longline fishery.	Neves dos Santos M.
SCRS/2012/073	Observations on the catch-at-size of the shortfin mako (*Isurus oxyrinchus*) caught by the Portuguese pelagic longline fishery.	Neves dos Santos M.
	Standardized CPUE of shortfin mako (*Isurus oxyrinchus*) caught by the Japanese tuna longline fishery in the Atlantic Ocean.	Semba Y., Yokawa K. and Hiraoka Y.
SCRS/2012/075	Estimation of catches for shortfin mako (*Isurus oxyrinchus*) by the Japanese tuna longline fishery in the Atlantic Ocean from 1994 to 2010.	Semba Y. and Yokawa K.
SCRS/2012/076	Update of standardized catch rates of shortfin mako, *Isurus oxyrinchus*, caught by Uruguayan longline fleet (1982-2010).	Pons M and Domingo A.
SCRS/2012/077	Updated index of abundance for shortfin mako sharks from the U.S. marine recreational fisheries statistics survey.	Babcock B.
SCRS/2012/078	Building a consolidated database to crosscheck ICCAT Task I nominal catch, against EUROSTAT and FAO equivalent statistics.	Palma C., Ortiz M., De Bruyn P. and Kell L.
SCRS/2012/079	Productivity and susceptibility analysis: Application and suitability for data poor assessment of UK elasmobranchs.	McCully, S.R, Scott, F., Ellis, J.M. and Pilling, G.M

SCRS/2012/080	Standardized CPUE series of shortfin mako caught by Brazilian tuna longline fisheries in the equatorial and southwestern Atlantic Ocean (1978-2012).	Hazin, H. G., Hazin, F., Lucena, F. and Carvalho, F.
SCRS/2012/081	Observer coverage estimation in relation to management objectives.	Hanke A.
SCRS/2012/082	Progress towards an integrated ecosystem assessment for the Gulf of Mexico.	Schirripa M.J.
SCRS/2012/083	Improvement of bycatch data quality of Japanese scientific observer program.	Inoue Y.
SCRS/2012/084	The ICCAT Meta-database: current status, future developments and dissemination.	de Bruyn P. Kell L. and Cotter J.
SCRS/2012/085	Groupe Tortues Marines France bycatch group activities in French waters.	Claro F., Sacchi J. and Poisson F.
SCRS/2012/086	Update of standardized catch rates of loggerhead sea turtle, *Caretta caretta*, caught by Uruguayan and Brazilian longliners (1998-2010).	Pons M., Domingo A., Giffoni B., Sales G.. and Miller P.
SCRS/2012/087	Estimating total by-catch of loggerhead sea turtles, *Caretta caretta*, in the southwestern Atlantic ocean.	Pons M., Miller P., Giffoni B., Domingo A. and Sales G..
SCRS/2012/088	Mitigación de la captura incidental de aves marinas en palangre pelágico: actividades desarrolladas por Uruguay.	Jiménez S., Domingo A. and Abreu M.
SCRS/2012/089	Effects of hook and bait on turtles bycatch in a Southern Atlantic pelagic longline fishery.	Neves Santos M., Coelho R. and Fernandez Carvalho J.
SCRS/2012/090	Preliminary results on the use of 17/0 circle hooks and mackerel on sea turtles bycatch in a north-eastern tropical Atlantic swordfish longline fishery.	Neves Santos M., Coelho R. and Amorim S.
SCRS/2012/091	Impact of climate on Atlantic tunas and billfishes distribution: a meta-analysis.	Dufour F. and Arrizabalaga H.
SCRS/2012/092	Review of tuna regional fisheries management organisations longline scientific observer programmes.	Orea R. , Anderson J. and Small C.L.
SCRS/2012/093	Captura incidental de tortugas marina (*Caretta caretta* y *Dermochelys coriacea*) por las flotas de palangre pelágico de Brasil y Uruguay.	Giffoni B., Domingo A., Sales G., Pons M., Miller P., de Oliveira Junior N., de K e Britto M. and Maçaneiro L.R.
SCRS/2012/094	Simple MCMC diagnostics for stock synthesis model (SS3).	Kell L and de Bruyn P.
SCRS/2012/095	Characterization of interactions between marine mammals, whale sharks and tropical tuna purse seine fishery in the Indian and Atlantic Oceans.	Capietto A., Pianet R., Floch L., Damiano A., Chavance P. and Mérigot B.
SCRS/2012/096	Sea turtle incidental catch of Taiwanese longline fisheries in the Atlantic Ocean.	Huang H.
SCRS/2012/097	By-catch distribution and standardized CPUE of sea turtles using data from Japanese scientific observer program of longline fishery in the Atlantic.	Minami H., Matsunaga H., Inoue Y. and Ochi D.
SCRS/2012/098	EU purse seine fishery interaction with sea turtles in the Atlantic Ocean during 2003-2011.	H. Murua, P. Chavance, A. Delgado de Molina, J. Bourjea, S Clermont, J. Ariz, J. Ruiz
SCRS/2012/099	Does leaded swivels close to hooks affect the catch rate of target species in pelagic longline? The case study of the southern Brazilian fleet.	Gianuca, D., Sant'Ana, R., Peppes, F.V., César, J.H., and Neves, T
SCRS/2012/100	Standardized CPUE index of the Bay of Biscay baitboat fishery (1952-2011).	Santiago J., Arrizabalaga H. and Ortiz M.
SCRS/2012/101	Note on strong 2003 year class appeared in the Atlantic bluefin fisheries.	Suzuki Z., Kimoto A. and Sakai K.

SCRS/2012/102	Report of Japan's scientific observer program for the tuna longline fishery in the Atlantic Ocean in the fishing years 2010 and 2011.	Japan
SCRS/2012/103	Updated standardized joint CPUE index for bluefin tuna (*Thunnus thynnus*) caught by Moroccan and Spanish traps for the period 1981-2011.	Abid, N., Faraj, A. de la Serna, J.M., Macias, D., Saber, S., Ortiz de Urbina J.M.
SCRS/2012/104	Biometric relationships of Atlantic bluefin tuna (*Thunnus thynnus*) from the North-East Atlantic and Mediterranean Sea.	Rodriguez-Marin E., Ortíz de Urbina J.M., Abid N., Alot E., Deguara S., de la Serna J.M., Gómez M.J., Macias D., Quelle P., Rioja P., Ruiz M. and Saber S.
SCRS/2012/105	The size structure estimation of bluefin tuna (*Thunnus thynnus*) catches by Moroccan traps from biological scraps for 2011.	Abid N., Benchoucha S., Lamtai A. and El Fanichi C.
SCRS/2012/106	Revision and update of species description for white marlin, *Kajikia albida* (Poey, 1860).	Hoolihan, J.P.
SCRS/2012/107	Revision and update of species description for roundscale spearfish, *Tetrapturus georgii* (Lowe, 1841).	Hoolihan, J.P.
SCRS/2012/108	Revision and update of species description for longbill spearfish, *Tetrapturus pfluegeri* (Robins & de Sylva, 1963).	Hoolihan, J.P.
SCRS/2012/109	Have the Atlantic bluefin tuna management measures influenced the age composition of the Bay of Biscay baitboat catches?	Rodriguez-Marin E., Ruiz M., Perez B, Quelle P. and Luque P.L.
SCRS/2012/110	Economic optimization of the fishing period on the bluefin tuna (*Thunnus thynnus*) in the Mediterranean.	Franquesa, R.
SCRS/2012/111	Updated standardized CPUE of bluefin tuna (*Thunnus thynnus*) caught by Spanish traps for the period 1981- 2010.	Ortiz de Urbina J.,Rodríguez-Marín E. , de la Serna J.M., Macías D. , Rioja P.and Saber S.
SCRS/2012/112	Movements of Atlantic bluefin tuna as revealed by pop-up tags deployed in the Balearic spawning ground (western Mediterranean).	Medina A., Abascal F. J. and Aranda G.
SCRS/2012/113	Revisión de estadísticas históricas de Venezuela	Gutiérrez X.. and Marcano L. A.
SCRS/2012/114	Searching for the giant bluefin tuna.	Cort J.L., Deguara S., Galaz T., Mèlich B., Artetxe I., Arregi I., Neilson J., Andrushchenko I., Hanke A., Neves dos Santos M., Estruch M., Lutcavage M., Knapp J., Compeán Jiménez G., Solana Sansores R., Belmonte A., Martínez D., Picinetti C., Di Natale A., Kimoto A., Addis P., Velasco M., de la Serna J.M., Godoy D., Ceyhan T., López A., Ribalta O., Abid N., Idrissi M. and Nøttestad L.
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SCRS/2012/116	Review and preliminary analysis of size frequency samples of bluefin tuna (*Thunnus thynnus*) 1952-2010.	Justel A. and Ortiz M.
SCRS/2012/117	Análisis de la ratio de sexos por clases de talla del atún rojo (*Thunnus thynnus*) en el caladero mediterráneo occidental durante el periodo 2009-2012.	Mèlich B.
SCRS/2012/118	Indices of stock status obtained from the Canadian bluefin tuna fishery.	Hanke, Andrushchenko, Whelan, Neilson

SCRS/2012/119	Changing selectivity patterns in the western Atlantic bluefin tuna fishery.	Maguire J.J., Hanke A. and Neilson J.
SCRS/2012/120	Seguimiento de la Encomienda de la SGM al IEO para el estudio del atún rojo (*Thunnus thynnus*) del Atlántico Este (que incluye el Mediterráneo) utilizando las almadrabas como observatorios científicos durante 2012.	de la Serna J.M., Macías D., Ortiz de Urbina J.M. and Godoy D.
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SCRS/2012/122	Posible influencia sobre el comportamiento migratorio del atún rojo (*Thunnus thynnus*) de las distintas estrategias de marcado electrónico utilizadas en las almadrabas y en jaulas de engorde.	de la Serna J.M., Abascal F., Abid N. and Godoy M. D.
SCRS/2012/123	Spatial movements of bluefin tuna revealed by electronic tagging in the Mediterranean Sea and in Atlantic waters of Morocco in 2011.	Quílez-Badia G., Cermeño P., Tudela S., Sainz Trápaga S. and Graupera E.
SCRS/2012/124	Update of the index of abundance of juvenile bluefin tuna in the western Mediterranean Sea until 2011.	Fromentin J.M., Bonhommeau S. and Brisset B.
SCRS/2012/125	Preliminary analyses of the ICCAT VMS data 2010-2011.	Justel Rubio A., Parrilla A. and Ortiz M.
SCRS/2012/126	Size structure of northeast Atlantic and Mediterranean bluefin tuna (*Thunnus thynnus*, L. 1758) caught during the period 2001-2012 as revealed by Japanese daily fresh tuna market auction reports.	Mielgo Bregazzi R.
SCRS/2012/127	Northeast Atlantic and Mediterranean bluefin tuna (*Thunnus thynnus*, L. 1758) caught during the period 1998-2011 as revealed by international trade official statistics.	Mielgo Bregazzi R.
SCRS/2012/128	Quelques indices de la biologie du thon rouge (*Thunnus thynnus*) en Algerie.	Labidi N. and Nouar A.
SCRS/2012/129	Evaluation du stock de thon rouge (Thunnus thynnus) en Algerie.	Labidi N. and Nouar A.
SCRS/2012/130	Overview of the Japanese longline fishery for bluefin tuna in the Atlantic Ocean, up to 2011.	Kimoto, A., Itoh, T., Sakai, O. and Miyake, M.
SCRS/2012/131	Updated standardized bluefin tuna CPUE from the Japanese longline fishery in the Atlantic up to the 2011 fishing year.	Kimoto et al.
SCRS/2012/132	Use of Fulton's condition factor to filter out outliers from Atlantic bluefin tuna (*Thunnus thynnus*, L.) length-weight relationships.	Deguara, S., Cort, J.L., Galaz, T., Estruch, V.D., Belda Perez, E.J.
SCRS/2012/133	Bluefin tuna counting and biomass estimation during transfers through the combined use of optical and acoustical techniques.	Espinosa, V., Puig, V., Soliveres, E., Estruch, V.D., Adnreu, G., Atienza, V., Valiente, J.M., Lopez, F., Mèlich, B, de la Gándara, F. and Santaella, E.
SCRS/2012/134	Analysis and evaluation of the catch weights and growth factors of Atlantic bluefin tuna based on Bluefin Tuna Catch Documents (BCDs).	Ota, S., Kaneko, M., Iioka, M.
SCRS/2012/135	Comparison of the recent and historical information on the size composition of bluefin tuna (*Thunnus thynnus*) in the Adriatic obtained by purse seine fisheries.	Katavic, I., Ticina, V., Grubisic, L., Segvic Bubic, T., Franicevic, V.

SCRS/2012/136	Preliminary experiences in applying the stereoscopic system in bluefin tuna size estimates.	Grubisic, L., Katavic, I., Segvic-Bubic, T., Ticina, V., Mislov, K.
SCRS/2012/137	A comparison of initial statistical catch-at-age and catch-at-length assessments of eastern Atlantic bluefin tuna.	Butterworth, D.S. and Rademeyer, R.A.
SCRS/2012/138	A simulation tool to evaluate effects of mixing between Atlantic bluefin tuna stocks.	Kerr, L.A., Cadrin, S.X., Secor, D.H. and Taylor, N.
SCRS/2012/139	ICCAT-GBYP Atlantic-wide Research Programme for Bluefin Tuna 2012. GBYP Coordination detailed activity report on Phase 2 (last part) and Phase 3 (first part).	ICCAT Secretariat - GBYP
SCRS/2012/140	ICCAT-GBYP Aerial Survey: Spawners vs. juveniles. A SWOT analysis for both perspectives.	ICCAT Secretariat - GBYP (Di Natale A., Idrissi M.)
SCRS/2012/141	BFT catch and size historical data recovered under the ICCAT Atlantic-wide Research Programme for Bluefin Tuna (Phases 1 and 2).	ICCAT Secretariat - GBYP (Di Natale A., Idrissi M., Justel Rubio A.)
SCRS/2012/142	The mystery of bluefin tuna (*Thunnus thynnus*) presence and behavior in the central South Atlantic in recent years.	Di Natale A., Idrissi M., Justel Rubio A.
SCRS/2012/143	Preliminary information on GBYP pop-up tagging activities in Morocco in 2012.	Quílez-Badia G., Cermeño P., Sainz Trápaga S., Tudela S., Di Natale A., Idrissi M., Abid N.
SCRS/2012/145	Trade-based estimation of Bluefin tuna catches in the Eastern Atlantic and Mediterranean, 2005-2011.	Gagern A., Van den Bergh J. and Sumaila R.
SCRS/2012/146	Description of the Venezuelan pelagic longline observer program (VPLOP) sponsored by the ICCAT Enhanced Research Program for Billfish.	Arocha F. and Marcano J.
SCRS/2012/147	Preliminary report for the sampling training course in Tema, July 16 to 20, 2012.	Damiano A., Rojo V. and Barrigah S.
SCRS/2012/148	Analyses of connections between Atlantic bluefin tuna fisheries at both sites of the Atlantic comprising Balfego catch rates in Balearic spawning ground.	Gordoa A.
SCRS/2012/149	Eastern bluefin tuna (*Thunnus thynnus*, L.): reproduction and reproductive areas and seasons.	Piccinetti C., Di Natale A., Arena P.
SCRS/2012/150	Parametres de reproduction de Sconmberomorus tritor (Cuvier, 1831).	Diaha N.C., N'Da K. and Soro Y.
SCRS/2012/151	Good practices to reduce the mortality of sharks and rays caught incidentally by the tropical tuna purse seiners. EU FP7 project #210496 MADE.	Poisson F., Vernet A. L., Séret B., Dagorn L
SCRS/2012/152	Natal origin of bluefin tuna visiting the Bay of Biscay feeding area.	Fraile I., Arrizabalaga H. and Rooker J.
SCRS/2012/153	EU purse seine fishery interaction with marine turtles in the Atlantic and Indian oceans: a 15 years analyses.	Clermont S., Chavance P., Delgado A., Murua H., Ruiz J., Ciccione S. and Bourjea J.
SCRS/2012/154	Using Bayesian methods to evaluate the credibility of stock-recruitment relationships for western Atlantic bluefin tuna.	McAllister M.K.
SCRS/2012/155	Historical Atlantic bluefin tuna stock mixing within fisheries off the United States, 1976-2012.	Secor D.H. , Rooker J.R., Neilson J.D., Busawon D., Gahagan B., and Allman R.
SCRS/2012/156	Atlantic bluefin tuna stock mixing within the U.S. North Carolina recreational fishery, 2011-2012.	Secor D.H., Gahagan B. and Rooker J.R.
SCRS/2012/157	Predicting potential Atlantic spawning grounds of western Atlantic bluefin tuna based on electronic tagging results, 2002-2011.	Lutcavage M.E., Galuardi B., and Lam T.C.H.

SCRS/2012/158	Updated standardized catch rates of bluefin tuna, *Thunnus thynn*us, from the rod and reel/handline fishery off the northeast United States during 1980-2011.	Lauretta M.W. and Brown C.A.
SCRS/2012/159	Annual indices of bluefin tuna (*Thunnus thynnus*) spawning biomass in the Gulf of Mexico (1977-2011).	Ingram, G.W. Jr.
SCRS/2012/160	Standardized catch rates of bluefin tuna from the U.S. pelagic longline fishery in the Gulf of Mexico during 1987 to 2011.	Cass-Calay S.L.
SCRS/2012/161	New results on maturity status of western Atlantic bluefin tuna, *Thunnus thynnus*.	Knapp J.M., Heinisch G., Rosenfeld H., and Lutcavage M.E.
SCRS/2012/162	Scientific examination of western Atlantic bluefin tuna stock-recruit relationships.	Rosenberg A., Cooper A., Maunder M., McAllister M., Methot R., Miller S., Porch C., Powers J., Quinn T., Restrepo V., Scott G., Seijo J.C., Stefansson G. and Walter J.
SCRS/2012/163	Análisis de la captura incidental del atún aleta azul (*Thunnus thynnus*) por la flota palangrera mexicana en el Golfo de México, 1994-2011.	Ramírez-López K. and, Abad Uribarren A.
SCRS/2012/164	Development of indices of larval bluefin tuna (*Thunnus thynnus*) in the western Mediterranean Sea	Ingram, Jr. G.W., Alemany F., Alvarez D., and García A.
SCRS/2012/165	Interactions between marine mammals and European tropical tuna purse seine fishery in the Indian and Atlantic Oceans.	Capietto A., Pianet R., Delgado de Molina A., Murua H., Floch L., Damiano A., Chavance P. and Merigot B.
SCRS/2012/166	Interactions between whale sharks and the European tropical tuna purse seine fishery in the Indian and Atlantic Oceans.	Capietto A., Pianet R., Delgado de Molina A., Murua H., Floch L., Damiano A., Chavance P. and Merigot B.
SCRS/2012/167	Expanded Ecological Risk Assessment of pelagic sharks caught in Atlantic pelagic longline fisheries.	Cortés E., Domingo A., Miller P., Forselledo R., Mas F., Arocha F., Campana S., Coelho R., Da Silva C., Holtzhausen H., Keene K., Lucena F., Ramirez K., Santos M. N., Semba-Murakami Y., and Yokawa K.
SCRS/2012/168	Seamounts and tuna fisheries: tuna hotspots or fishermen habits.	Dubroca L.
SCRS/2012/169	Towards a common exchange format and a regional database for large pelagic fisheries.	Rodriguez C.
SCRS/2012/170	Statistics from the Spanish albacore (*Thunnus alalunga*) surface fishery in the north eastern Atlantic in 2011.	Ortiz de Zárate V. , Perez B. and Ruiz M.
SCRS/2012/171	Actividades desarrolladas en el programa de investigacion intensiva sobre marlines en Venezuela. Período 2010-2011.	Marcano L. A., Arocha F., Alío J., Vizcaino G. and Gutiérrez X.
SCRS/2012/172	Realisation of the large scale tropical tunas tagging programme recommended by SCRS in 2010: project for a strategy for its efficient funding and efficient realization.	Fonteneau A. and Gaertner D.
SCRS/2012/173	Update on the sex- and age-specific CPUE from the Canadian Swordfish longline fishery, 2002-2012.	Andrushchenko, Hanke, Neilson
SCRS/2012/174	Annual indices of skipjack tuna (*Katsuwonus pelamis*) larvae in the Gulf of Mexico (1982-2011).	Ingram, G.W. Jr.
SCRS/2012/175	Effect of thermic, saline and trophic parameters on daily albacore catches in the northeast Atlantic.	Didouan C., Goñi N., Arrizabalaga H. and Chifflet M.
SCRS/2012/176	Les captures d'espadon (*Xiphias gladius*) des pêcheries palangrière et artisanale au Sénégal.	Ngom, F and Ndaw S.

SCRS/2012/177	Données de requins capturés par la pêche artisanale de 1990 à 2011 au Sénégal.	Ngom, F
SCRS/2012/178	Progress of the ICCAT Enhanced Research Program for Billfish	Prince E.
SCRS/2012/179	preliminary analysis of catch rates of Atlantic bonito (sarda sarda) caught by Moroccan artisanal gill net fishery in the Atlantic, 2004-2010	Abid N., Faraj A., El Omrani F. and Ouakka K.
SCRS/2012/180	Statistics of the French purse seine fleet targeting tropical tunas in the Atlantic Ocean (1991-2011)	Floch L, E. Chassot, A. Damiano, I. Terrier, P. Chavance
SCRS/2012/181	The semi-pelagic longline, a gear of recent expansion in the Spanish Mediterranean. Is it really effective in reducing by-catch?	García Barcelona S., Aranguren C., Báez J.C., Saber S., de la Serna J.M., Ortiz de Urbina J.M. and Macías D.
SCRS/2012/182	Influencia del tiempo de permanencia del anzuelo en el agua en la captura accesoria del palangre semi-pelágico en el Mediterráneo occidental.	Acevedo D., Báez J.C., García-Barcelona S.,Benjumea M.E. and Macías D
SCRS/2012/183	By-catch of cory's shearwater in the commercial longline fisheries based in the Mediterranean and operating in East Atlantic waters: first approach to incidental catches of seabird in the area.	García-Barcelona S., Báez J.C., Ortiz de Urbina J.M., Gómez-Vives M.J. and Macías D.
SCRS/2012/184	Revision of historical U.S. recreational landings of shortfin mako for the period 2004-2011.	Brown C.
SCRS/2012/185	Report of the Sub-Committee on Ecosystems.	Anonymous
SCRS/2012/186	Projections for East Atlantic Mediterranean bluefin tuna.	Kell L., Bonhommeau S. and Fromentin J.M.

Appendix 4

WORK PLANS OF THE SPECIES GROUPS FOR 2013

Tropical Tunas Work Plan

During the 2010 meeting of the SCRS (ICCAT, 2011b), a tagging plan was developed that described a 5 year program. The Group proposes to update and develop this document to reflect current tagging objectives, the priorities and the budget. The Committee expressed appreciation for the voluntary contribution provided by the United States ($62,500) in support of the planned Tropical Tunas Tagging Program. These funds are intended to support the development of the detailed scientific design for the program necessary to achieve the objectives. The Tropical Tunas Working Group plans to meet in 2013, in part, to refine these study objectives of the Atlantic Ocean Tropical Tagging Program (AOTTP) and develop a focused Call for Tenders from experts in the field. The results from the Indian Ocean Tagging Symposium will also be reviewed to improve the ICCAT project.

The Group also expressed the need to obtain and evaluate a detailed description of the methodologies and assumptions used by the Ghanaian Statistics Task Group prior to adopting the recommendations of that report. Presuming that such a document is made available prior to the 2013 inter-sessional meeting, the Group recommended that these methodologies be fully evaluated and that adoption be reconsidered.

Albacore Work Plan

In 2013, the Albacore Species Group plans to assess the northern and southern Atlantic stocks, as well as improving basic statistics for Mediterranean albacore. The Commission also requested the development of a Limit Reference Point for North Atlantic albacore. Given the large amount of work envisaged for 2013, two inter-sessional meetings are envisaded: a data preparatory meeting (five days, possibly in late April) and the stock assessment meeting (8 days, possibly in late June).

North Atlantic Stock Work Plan

The intention is to update the Multifan-CL, VPA2-box and SS3 models, up to 2011, using the general procedures followed during the 2009 stock assessment (Anon. 2010c) and the 2007 data preparatory meeting (Anon. 2008b). Following is a list of actions, responsibilities and deadlines:

- Submit all 2011 T2 data. ***Deadline***: before end of 2012 SCRS meeting. ***Responsibility***: CPCs.
- Revise size data for Chinese Taipei longliners up to 2011. ***Responsibility***: Chinese Taipei. ***Deadline***: March 2013.
- Prepare T1, T2CE, T2Sz, CATDIS for North Atlantic albacore. ***Responsibility***: Secretariat. ***Deadline***: Data Preparatory meeting.

MULTIFAN-CL:

- Update catch statistics for each of the 10 fleets (Table 4 in the 2009 Assessment Report), by quarter (1950-2011). ***Responsibility***: Secretariat. ***Deadline***: Data Preparatory meeting.
- Update standardized CPUE series, by quarter, for Spanish baitboat, Irish MWT, Spanish troll, Japanese LL, Chinese Taipei LL. ***Responsibility***: CPCs. ***Deadline:*** 1 week before the Data preparatory meeting. Deliverable: SCRS documents, considering the guidelines/requirements of the WGSAM.
- Update standardized CPUE series, by quarter, for Fleets 5, 9 and 10, and update standardized fishing effort for all 10 fleets, by quarter (Table 11 in the 2009 Assessment Report). ***Responsibility***: Secretariat. ***Deadline***: Data Preparatory meeting. Deliverable: SCRS document.
- Update size time series for each fleet, by quarter. ***Responsibility***: Secretariat and CPCs. ***Deadline:*** Data Preparatory meeting.
- Update the MFCL base case scenario. ***Responsibility***: Secretariat. ***Deadline***: Stock Assessment meeting. Deliverable: SCRS document.

VPA2-BOX:

- Prepare CAS, CAA and WAA (total and by fleet): ***Deadline:*** Data preparatory meeting. ***Responsibility:*** ICCAT Secretariat. Deliverable: SCRS document or presentation, documenting substitution rules, comparison to previously used CAA, etc.
- Update (to 2011) the following yearly standardized CPUEs (see Table 10 of the 2009 assessment report). ***Deadline:*** Data Preparatory Meeting. Deliverable: SCRS document, following the standards provided by the WGSAM. ***Responsibility:*** CPCs.
  - Japanese longline
  - Chinese Taipei longline
  - US longline
  - Spanish troll
- Evaluate the indices against the standards provided by the WGSAM: ***Responsibility:*** ALB Chair and ICCAT Secretariat. ***Deadline:*** end of the Data preparatory meeting.
- Update the VPA model up until 2011, following the 2009 specifications. ***Responsibility:*** US. ***Deadline:*** Stock assessment meeting. Deliverable: SCRS document.

STOCK SYNTHESIS:

- Update the SS3 model runs up until 2011, following Schrippa (2010). ***Responsibility:*** US. ***Deadline:*** Stock assessment meeting. Deliverable: SCRS document.

Development of limit reference points: this work will be in coordination with the Swordfish Species Group, the Working Group on Stock Assessment Methods (WGSAM).

- Select candidate limit reference points (F based or B based, e.g., F_{MAX}, F_{CRUSH}, F_{MSY}, B_{MSY}) and harvest control rules (considering those proposed by the WGSAM, and considering Rec. 11-13).
- Develop an operating model, consistent with Multifan-CL datasets, and a Management Procedure, based on simpler models (e.g., production models or VPA).
- Use this simulation framework to evaluate the Limit Reference Points and Harvest Control Rules against predefined indicators (e.g., probability of being overfished, variability in yield, discount rate, etc.). ***Responsible:*** ICCAT Secretariat. ***Deadline:*** Data preparatory meeting, or WGSAM meeting. Deliverable: SCRS document.

South Atlantic Stock Work Plan

The intention is to, at a minimum, update the ASPIC and BSP models, up to 2011, following the procedures of the 2011 stock assessment. However, additional modeling efforts are welcome, as usual (e.g., the ASPM model was used in the past as a base case, and could be reconsidered in 2013). Following is a list of actions, responsibilities and deadlines:

- Submit all 2011 T2 data: ***Deadline:*** before end of 2012 SCRS. ***Responsibility:*** CPCs.
- Check availability of, and eventually complete, T2CE and T2size data for Brazil BB. ***Responsibility:*** Brazil. ***Deadline:*** March 2013.
- Prepare T1, T2CE, T2Sz, and CATDIS for South Atlantic albacore. ***Responsibility:*** Secretariat. ***Deadline:*** Data Preparatory meeting.
- Update (to 2011) the following yearly standardized CPUEs (see Table 9 of the 2011 Assessment Report) (Anon. 2012b). ***Deadline:*** Data Preparatory Meeting. Deliverable: SCRS documents, following the standards provided by the WGSAM. ***Responsibility:*** CPCs.
  - Uruguayan longline
  - Brazilian longline
  - Japanese longline (NB)
  - Chinese Taipei longline
  - South African baitboat
- Evaluate the indices against the standards provided by the WGSAM ***Responsibility***: ALB Chair and ICCAT Secretariat. ***Deadline:*** end of the Data preparatory meeting.

− Update the ASPIC and BSP models up until 2011. ***Responsibility:*** Secretariat and US. ***Deadline:*** Stock assessment meeting. Deliverable: SCRS documents.

Mediterranean Albacore Stock Work Plan for 2013

During 2013, the group will try to improve the "data poor" situation of this stock by focusing on the following tasks:

− Revision and completion of Task 1 and Task II series
− Update and, wherever 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)

Participation in the Albacore Species Group

Participation in the Albacore Species Group has been poor in recent years (see the 2011 assessment report). For example, during the 2011 stock assessment, only three CPCs directly involved with the southern stock attended the assessment meeting, and one of the critical CPUE time series was submitted by correspondence, without the author or another scientist familiar with the analyses being present at the meeting. This made it difficult to evaluate the suitability of the time series. Moreover, few of the participants of the previous assessments attended the meeting. The Group recommends that CPCs that can make valuable contributions to the assessments make the necessary arrangements to ensure the presence of their national scientists at those meetings. This is especially important in 2013, when a major assessment is planned ***Responsibility:*** SCRS to transmit this requirement to the Commission during the 2012 Annual Meeting.

Bluefin Tuna Work Plan

Recommendation 10-04 states: "In 2012, and thereafter every three years, the SCRS will conduct a stock assessment for bluefin tuna for the western Atlantic and eastern Atlantic and Mediterranean and provide advice to the Commission on the appropriate management measures, *inter alia*, on total allowable catch levels for those stocks for future years." Accordingly, the next assessment of bluefin tuna is currently slated for 2015. If the Commission desires a comprehensive assessment that employs new methods to take advantage of the new data being collect through the GBYP and other programs, then the next assessment must not be rescheduled prior to 2015.

The Bluefin Tuna Species Group plans to continue efforts 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. Scientists will also work 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 as an example. The overall approach would allow the Bluefin Tuna Species Group to focus on important or novel issues regarding data and models which will thus improve the quality and credibility of future assessments.

The Working Group proposes to conduct at least three preparatory meetings prior to the next assessment. The first inter-sessional meeting will be held in early 2013 to evaluate the new biological information (growth, ageing, maturity, reproduction) coming from the GBYP and other on-going research projects and to review basic biological assumptions and relationships. This meeting will also evaluate the reliability of existing and historical information. The Group recommends that CPCs make the necessary arrangements to ensure the presence of their national scientists at this meeting. There will also be a need for several external experts (e.g., in otolith microchemistry or genetics) to assist with the interpretation of those data, particularly the principal investigators of several key studies (which may require financial assistance from the Commission).

A second meeting, sponsored through the GBYP will be held later in 2013 to discuss modeling platforms that utilize new and existing information in the most appropriate way. A second meeting, also sponsored by the GBYP, will be held in 2014 to further refine these models and present the first applications on bluefin tuna data.

Billfish Work Plan

Background

Genetic analyses and model projections results reported by Beerkircher *et al.* (2009) indicated that historical catches of white marlin may inadvertently also include significant numbers of roundscale spearfish and some longbill spearfish. An inability to separate these catches required that the 2012 white marlin assessment was conducted on the information being reported as white marlin, including some unknown component of misidentified spearfish. To avoid this problem in the future, the Billfish Working Group agreed to direct a proportion of 2013 funding and effort toward separating white marlin and spearfishes in these catches.

Proposed work for 2013

Assemble and distribute genetic sampling kits to fleets. Arrange for return of genetic samples for processing to Dr. M. Shivji (NOVA University). This work will focus on areas where we have the least information (Brazil, EU-Spain, EU-France, Ghana, Japan, Uruguay, and Venezuela).

Distribute and implement the use of the billfish identification sheets to all fishing fleets that take billfish.

Enhance collection of species specific catch and effort data from artisanal fleets in the Atlantic that take an important catch of billfishes.

Document and present new catch estimates for blue marlin from FAD fisheries of Martinique and Guadalupe (EU-France), and incorporate into the Task I data base.

Prepare and present to the Billfish Working Group the analyses of basic life history parameters for sailfish, longbill spearfish and roundscale spearfish sampled by the Brazilian fleet.

Explore the estimation of mortality from ICCAT conventional tagging data.

Explore alternative stock structures for sailfish in preparation of the 2014 stock assessment.

Explore the development and compilation of the fine-scale historical Japanese longline catch rate index.

Continue the Atlantic-wide study on age and growth of blue marlin and longbill spearfish.

Continue to support research on the improvement of biological sampling of all billfish species.

Continue to support on sailfish reproduction off the West Africa and Atlantic coast of South America.

Swordfish Work Plan

Background – North and South Atlantic

An assessment of North and South Atlantic swordfish is planned by the SCRS for 2013.

Due to time constraints, recent sessions of the Swordfish Species Group have provided assessments for North and South Atlantic swordfish stocks that have updated past results using methods and approaches available at the time. These assessments have provided advice largely on the basis of production models and other relatively simple approaches. Such methods appear to have produced robust advice, as indicated by the consistent results that are obtained as new data become available, and with comparisons with other methods such as Virtual Population Analyses.

However, recent reports from stock assessments have recommended that more time be provided to evaluate newer stock assessment approaches which more fully incorporate biological data and provide more complete representations of uncertainties in stock status. To allow the Group time to explore such approaches and to assemble the data in advance of the stock assessment session, it was recommended that a working session be convened prior to the next assessment (both meetings to occur in 2013).

In this work plan, recent recommendations from the 2002, 2006 and 2009 reports of the stock assessments (Anon. 2003, 2007 and 2010d) are compiled, as well as more recent recommendations from the 2012 meeting of the Swordfish Species Group. Comments on the relative priority and responsibilities for the completion of the tasks are also given. Finally, given the scope of the work, a recommendation on the timing and duration of the Data/Methods Preparatory meeting is given.

Past Recommendations Relevant to the 2013 Stock Assessment

Data

a) *Landings Data*. Following the recommendations from the Sub-Committee on Statistics, the Rapporteurs should review the updated data catalogs to be prepared by the Secretariat and identify important gaps in the available Task I and II information. To the extent possible, Rapporteurs should contact the relevant CPCs and obtain the needed information. (***Responsibility:*** Rapporteurs for North and South Atlantic and Secretariat. ***Timeframe:*** Prior to the data/methods preparatory meeting).

b) *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. (***Responsibility:*** All countries participating in the assessment. ***Timeframe:*** Prior to the data/methods preparatory meeting).

c) *Effect of CPUE aggregation levels on biomass index*. As part of the meeting described above, national scientists should provide data for standardization of CPUE series at the lowest operational level of aggregation as possible, such as set by set (***Responsibility:*** **N**ational scientists contributing to biomass index, ***Timeframe:*** Prior to the data/methods preparatory meeting).

d) *Recruitment indices*. The swordfish Species 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. (***Responsibility:*** National scientists that have traditionally provided such indices should update their time series, as a matter of high priority. ***Timeframe:*** Prior to the data/methods preparatory meeting).

e) *Age assignments.* In previous assessments, the Secretariat has converted the catch at size data to catch at age using the AGEIT.FOR software, based on a unisex Gompertz growth curve. The Swordfish Species Group has noted that the computer codes used for ageing swordfish in the Atlantic should be updated. The newer sex-specific curves (Arocha *et al* 2003)) should be incorporated, and its impact in terms of the catch-at-age estimation, as well as their consistency with the tagging data should be evaluated before a new set of growth curves is formally adopted by the Swordfish Species Group. During review, it was noted that this work may have already done, and the code for the newer growth curves may be available from national scientists. (***Responsibility:*** Chair to check on the availability of the code for the newer growth curves, Secretariat to develop an alternate catch at age, and prepare tagging information for evaluation. ***Timeframe:*** Prior to the data/methods preparatory meeting).

f) *Biomass index*. The Swordfish Species Group noted that Canadian longline biomass index in the 1960s showed a rapid decreasing trend, which was not consistent with anecdotal information from the Japanese longline fishery which, during those years, was broadly distributed throughout the North Atlantic. Given the importance of the Canadian series in establishing the history of the population, it is recommended that the early data be re-validated, if possible**.** (***Responsibility:*** Canadian national scientists, ***Timeframe:*** Prior to the data/methods preparatory meeting).

Analyses

a) *CPUE*. The Swordfish Species Group has been concerned that many of the age-specific indices of abundance show strong year-effects. It was recommended that future CPUE analyses should focus on developing additional methods to explicitly incorporate environmental variability into the model.

Consideration should be given to aggregating the CPUE trends by sex ratio-at-size area (rather than the current method of aggregating by nation). Investigations of the appropriateness of obtaining age-specific indices of abundance from independent analyses should be conducted, CVs should be presented with the analyses, and model outputs should be made comparable (e.g., from random and fixed effects models). Some attempt should be made to use stock assessment methods that can reconcile the contradictory trends in the target and by-catch CPUE series for the south (e.g., age/spatially-structured models). For the South Atlantic, the Swordfish Species Group was informed that an inter-sessional meeting was planned between Brazilian and Uruguayan scientists to deal with the standardization of CPUE series and processing of data from their respective fleets. Also of note is that Uruguay has a new data series from a longline fleet with 100% observer coverage, but the time series is short as yet. (***Responsibility:*** All CPCs but especially South Atlantic. ***Timeframe:*** Prior to the data/methods preparatory meeting).

b) *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) was very strongly recommended in order to improve CPUE standardization. The recommendations made by the 2001 Meeting of the ICCAT Working Group on Assessment Methods (Anon. 2002) to look at diagnostics in this context should be followed. The Swordfish Species 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. Further, at-sea observers should collect detailed information on fishing strategy and target species. The Swordfish Species Group was informed that Brazilian scientists had recently made significant progress in methods to deal with targeting, and have developed a better approach than the cluster analysis method used previously. (***Responsibility:*** All CPCs but especially South Atlantic. ***Timeframe:*** Prior to the data/methods preparatory meeting).

c) *CPUE*. For the biomass indices, the influence of the level of aggregation of data should be examined. (***Responsibility:*** **all CPCs.** ***Timeframe:*** Prior to the data/methods preparatory meeting).

d) *Alternative stock assessment models.* Newer stock assessment approaches such at Statistical Catch at Age may be appropriate for swordfish because they reflect uncertainty in key parameters to a greater extent than the approaches traditionally used in the Swordfish Species Group. It was also noted that North Atlantic swordfish have relatively complete size information, therefore making the stock well suited for approaches using the Stock Synthesis Method. The Group cautioned, however, there is a steep learning curve with Stock Synthesis, has the capacity to run the analyses may be a concern in the future. The Group felt that the methods to be developed in 2013 should be viewed as a complement to existing relatively simple approaches, not necessarily as a replacement.

The developmental work discussed involved three main types of models i.e. Bayesian surplus production, and statistical catch-at-age and state space models. Bayesian methods have potential for providing an integrated Kobe advice framework, since they can show how improvements in knowledge can benefit management by reducing uncertainty consistent with the Precautionary Approach. Therefore, Bayesian Surplus Production models will be evaluated for use in the next assessment. However, the value of ASPIC is recognised, in that it is relatively simple to apply and understand, therefore it is intended to compare assessments conducted using ASPIC by the normal approach (i.e. maximum likelihood) with Bayesian estimation. North Atlantic swordfish is one of the more data rich ICCAT stocks and therefore more complex models such as statistical catch-at-age or state-space models may be appropriate. It has been proposed that a SS3 course be given for SCRS in 2013 and this may be a good opportunity to explore the use of such methods for swordfish. The approach of developing increasingly complex SS3 models in a stepwise manner was discussed, and the Group supported the approach. Finally, it was noted that SISAM (an ICES initiative) is evaluating a range of methods for different levels of data and this initiative may help in developing new approaches for swordfish stock assessments. However, these will not be ready for the assessment in 2013, but may be ready for Mediterranean swordfish assessment in 2014.
(***Responsibility:*** Chairman/Secretariat, ***Timeframe:*** Selection of external expert(s) to be made prior to the data/methods preparatory meeting).

Continuity assessment requirements

In addition to the work described previously which will enhance the assessment products of the Species Group, it will be necessary to update the results from the main assessment approaches used in 2009.

a) *Updating the ASPIC Model for the North Atlantic:* Countries (US, Canada, Japan, Spain, Morocco, and Portugal) contribute CPUE series that are aggregated into a single abundance index used as input for

ASPIC, which has provided the base case advice for the North Atlantic stock. The lead scientist who most recently developed the standardization procedures to combine the national data series was Dr. M. Ortiz, now with the ICCAT Secretariat. The Secretariat is requested to provide Dr. Ortiz's time for this task, or, if he is unavailable, to transfer the knowledge to another scientist, either from the Secretariat or from one of the CPCs (***Responsibility:*** Secretariat, CPCs. ***Timeframe;*** Prior to the data/methods preparatory meeting).

b) *Update the production/catch only models for the South Atlantic:* The management advice for the southern stock is also based on a production model, but due to concerns over the reliability of CPUE series, catch-only modeling was undertaken for the first time in 2009. To ensure continuity, it would be highly desirable to ensure that swordfish scientists from the South Atlantic who conducted the work in 2009 are able to attend the 2013 meetings. (***Responsibility:*** Rapporteur, South Atlantic, CPCs. ***Timeframe****:* Participation arrangements should be made well in advance of the data/methods preparatory meeting).

Other considerations for work planning

The Swordfish Species Group has been tasked to identify candidate limit reference points prior to the 2013 stock assessment (see Rec. 09-02). Largely through the efforts of Dr. M. Ortiz of the Secretariat, considerable progress was made and reported to the Commission in 2010, and some further progress was made in 2011. The Group will need to conclude this work and formulate a response to the Commission. It may be appropriate to do some simulations of implementing Rec. 11-13 with different probability levels and see how it performs for SWO-N. (***Responsibility:*** Working Group/Secretariat ***Timeframe:*** *C*ould be undertaken during the data/methods preparatory meeting).

Participation in the Swordfish Species Group

Participation in the Swordfish Species Group has been problematic in recent years. For example, after the 2009 stock assessment, the Group expressed concern that one of the longest CPUE time series was submitted by correspondence, without the author or another scientist familiar with the analyses being present at the meeting. This made it difficult to evaluate the suitability of the time series. The Group recommends that CPCs that can make valuable contributions to the assessments make the necessary arrangements to ensure the presence of their national scientists at those meetings. This is especially important in 2013, when a major assessment is planned ***Responsibility:*** SCRS to transmit this requirement to the Commission during the 2012 Annual Meeting.

Recommendations for meeting timing and durations

Considering that the scope of the work to be undertaken involves both the review of new methods and data preparation, it is proposed that the Swordfish Data/Methods Preparatory Meeting be 8 days in length. The timing of the meeting could be late May or early June.

Concerning the stock assessment meeting, a 9 day meeting should be sufficient. The timing of the meeting could be early in September (September 2-10 is proposed).

Background – Mediterranean

For the Mediterranean stock, the last assessment was conducted in 2010 using data up to 2008 (Anon. 2011d). The next assessment should take place in 2014 using data up to 2013 to allow at least preliminary evaluation of the imposed management measures after 2008.

Tasks

- *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 2013-2014

The following recommendations should be taken into account for improving Task I and Task II, as well as our knowledge on the biology and structure of small tuna populations. The improvement in the data would allow conducting assessment in the future 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 small tuna catches and try to classify them by species;
3. CPCs should ensure a large distribution of the ICCAT small tunas species identification sheets to improve their Task I statistics data;
4. Support the extension of the tagging project for tropical tunas to small tunas. The inclusion of small tunas will not significantly increase the budget and will provide an excellent opportunity to improve the current knowledge on the stock structure and biological parameters of the small tuna species.
5. Encourage studies on stock structure and species distribution;
6. Develop simple indicators of stock sustainability such as proportion of juveniles within the catch and trends in historical catches, effort and CPUE;
7. Collaborate, as much as possible through joint working groups, with RFOs (GFCM, CRFM, and CECAF) to improve and exchange basic fisheries data on small tunas;
8. Follow progress of blackfin tuna aquaculture experiments being performed by the University of Miami (United States).

A Proposal to Set Up an ICCAT Year
Research Program 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 (Anon. 2009a), it is now high time to establish an ICCAT Year Research Program for Small Tunas (SMTYP), whose 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.

January-December 2013:

Priority for the collection of historical 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, West African Spanish mackerel, frigate tuna, wahoo;
- Caribbean area: Blackfin tuna, king mackerel and Serra Spanish mackerel.

July 2014

An inter-sessional data preparatory meeting to analyse the collected data in the mains areas. The national scientists are responsible for submitting the data to the ICCAT Secretariat prior to the data preparatory meeting.

September -October 2014

Presentation of the preliminary results to the 2014 species group and SCRS meetings.

Potential participating countries in the SMT Year program and the estimated budget by area

Sampling area	*Participating CPCs*	*Species*	*Budget (€)*
East Mediterranean	Turkey Greece	Bullet tuna, Atlantic bonito, little tunny and plain bonito	**15,00000**
Central Mediterranean	Tunisia Italy	Bullet tuna, Atlantic bonito, little tunny and plain bonito	**15,000.00**
Western Mediterranean	Morocco Spain	Bullet tuna, Atlantic bonito, little tunny and plain bonito	**15,000.00**
West Africa	Morocco Mauritania Senegal Cape Verde Côte Ivoire Ghana Sao Tome	Atlantic bonito, little tunny and plain bonito, frigate tuna West African Spanish mackerel, Wahoo	**52,500.00**
Western Atlantic	Venezuela Brazil	Black fin tuna, Serra Spanish mackerel	**15,000.00**
TOTAL			**112,500.00**

Sharks Work Plan

General considerations

As previously reiterated, while the participation of scientists from CPCs that catch the species of interest has increased, it is still rather limited. This situation is not exclusive of this Group, and constitutes a problem that will have to be resolved based on a strong commitment from the Parties.

Work plan

During the meeting to conduct the 2012 Shortfin Mako Stock Assessment, the Working Group recommended the development of a “Special Research Program on Sharks” focused on the reduction of the main sources of uncertainty in the formulation of scientific advice including the improvement of data collection and reporting procedures.

The Group recommends holding an inter-sessional meeting in 2013 in order to develop the Special Research Program, which will be framed within the SCRS Science Strategic Plan foreseen for the period 2014-2020. The Group considers this a priority as this research program could resolve many of the issues/problems identified by the Group during the assessment sessions.

During the species meeting, a new Ecological Risk Assessment for 16 elasmobranch species was presented (document SCRS/2012/167). It was considered that it is possible to update part of the productivity and susceptibility data, and coordinate this work with the Methods Working Group in order to enhance the fishing effort data. This work is expected to be developed over the next year, together with the completion of the ERA before the SCRS Plenary Meeting.

2013 Work Plan for the Working Group on Stock Assessment Methods

1. Formalise appropriate assessment model diagnostics and their presentation – similar to protocols developed for CPUE series in 2012.

2. Revise and improve methodology for estimation of EFFDIS (overall longline effort distribution by month and 5 X 5 grid).

3. Development of limit reference points for ICCAT stocks - State of the art methods for developing and testing LRPs and possible applications to ICCAT stocks.

4. Methods to incorporate improved biological information in stock assessment advice – Management Strategy Evaluation.

5. Revise the Terms of Reference for the peer review system.

Working Plan Pertaining to By-catch

The Sub-Committee on Ecosystems concluded that the following by-catch related activities are important to complete during 2012 and 2013.

2012

1. A new call for sea turtle data will be circulated amongst CPCs. This will be drafted by the Sub-Committee on Ecosystems/By-catch Convener and the SCRS Chair, and will be reviewed, approved and circulated by the Secretariat. The data will be required no less than four months prior to the assessment meeting. The data request will include, for example:
   a) Estimates of BPUE for sea turtles (standardized if possible)
   b) Estimates of observer coverage
   c) Estimate of total extrapolated bycatch of sea turtles, if available
   d) Estimates of mortality at release

2. The Sub-Committee on Ecosystems/By-catch Convener will organize a subgroup to develop the required elements of an Ecological Risk Assessment/Productivity Susceptibility analysis, for example the Leslie Matrix parameters to estimate the intrinsic rate of population growth. Following collation of the required elements, collaboration with other t-RFMOs could be sought to contrast and improve the product, as necessary. The resulting product will be presented to Sub-Committee on Ecosystems in 2013 to facilitate the Sub-Committee's deliberations. The work of this subgroup will be conducted intersessionally.
3. The Sub-Committee on Ecosystems/By-catch Convener, the SCRS Chair and the Secretariat will communicate with the Chair of the Joint t-RFMO Technical Working Group on Bycatch to request that ICCAT lead efforts to harmonize data reporting protocols (e.g., minimum standard data collection) for longline observer programs.
4. (September 2012) The Sub-Committee on Ecosystems will review the draft form to be prepared by the Secretariat for the reporting of data from national observer programs [Rec. 11-10].

2013

1. Compile/develop estimates of sea turtle bycatch in ICCAT fisheries from CPC data and other sources.
2. Compile/develop estimates of sea turtle bycatch in non-ICCAT fisheries from CPC data and other sources.
3. Assess relative magnitude of turtle bycatch in ICCAT vs. non-ICCAT fisheries.

4. Review the work products of the subgroup (e.g., ERA-PSA). Make recommendations regarding the parameterization and use of these approaches.
5. Review sea turtle available bycatch mitigation and safe-release protocols measures, and make recommendations as necessary.
6. Prepare response to the Commission regarding Rec. 10-09.
7. Review other matters related to bycatch and bycatch mitigation.

Work Plan Pertaining to Ecosystems

The Sub-Committee determined that the following ecosystem related activities would be important to complete in 2013:

1. Populate a list of indicators reflecting stated fishery resource, ecological, economic and social objectives.
2. Determine which indicators of ecosystem status can be used in a traffic light report card.
3. Identify a suitable domain as a test case for implementing the Ecosystem Based Fisheries Management (EBFM) approach.
4. Review the progress that has been made in implementing ecosystem values in enhanced stock assessments or an EBFM.
5. Review conceptual models for EBFM that explore the potential impact of perturbations on the model elements, reveals data gaps, identifies important relationships and identifies thresholds for change within the system.
6. Investigate ways of including ecosystem values in the standardization and assessment of the stocks assessed by the SCRS Species Groups.

Work Plan of the Sub-Committee on Statistics

The Sub-Committee should be more involved in reviewing submitted data scientific value for stock assessment purposes instead of only focusing on submission deadlines. In line with this objective:

- Future work of the Sub-Committee should be oriented more toward data quality evaluations than compliance.

- Mechanisms to enhance such evaluations, such as contracting for specific analyses or modelling evaluations after other t-RFMO approaches, should be investigated.

To that end, the Convener of the Sub-Committee will draft Terms of Reference for such studies to be reviewed by SCRS Officers and subsequently published to receive interests for bids from competent organizations during the inter-sessional period.

Appendix 5

ICCAT ATLANTIC-WIDE RESEARCH PROGRAMME FOR BLUEFIN TUNA (GBYP) ACTIVITY REPORT FOR 2012 (EXTENSION OF PHASE 2 AND FIRST PART OF PHASE 3)

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, the second phase had a total budget of 2,502,000 Euros (against the original figure of 5,845,000 Euros and a revised figure of 3,476,075 Euros), while the third phase had a budget of 1,925,000 Euros (against the original figure of 5,845,000 Euros and a revised figure of 4,417,980 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, while Phase 3 was joined also by China, Algeria, Korea and Tunisia. Several private entities provided funds or in kind support; the detailed list is available on http://www.iccat.int/GBYP/en/Budget.htm.

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.

2. Coordination activities

Phase 2 was extended for an additional five months, up to May 21, 2012.

A second GBYP Operational Meeting on Tagging, Biological and Genetic Sampling and Analyses was organized in Madrid on April 17-18, 2012, during the extension period of Phase 2, to discuss all the practical aspects concerning the final activities of Phase 2 and the final plans for Phase 3. A total of 28 scientists participated in the meeting, which resulted in intense and productive discussions, useful for better defining all the operational details and clarifying some uncertainties.

During the entire Phase 2 it was necessary to issue 11 Calls for Tenders on various items and a total of 22 contracts were signed by the ICCAT Secretariat. A total of 23 deliverables (periodic reports) were produced in the framework of the European Commission Grant Agreement. During the first part of Phase 3, a total of four Calls for Tenders were issued, providing one contract so far. The administrative and desk work behind these duties was quite important. In Phase 2 of the GBYP, the coordination staff participated officially in 30 meetings in various countries.

The detailed report is available in document SCRS/2012/139.

3. Steering Committee

The members of the Steering Committee 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. So far, the Steering Committee held six meetings in Phase 2 and in the first part of Phase 3 (June 27-July 1, 2011; September 10 to 12, 2011; September 29, 2011; 7-

8 February 2012; 20-21 March 2012 and September 7, 2012), discussing various aspects of the programme, providing guidance and opinions.

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. A complete overview is now available.

A very important amount of data, previously not included in the ICCAT database, was recovered, particularly for tuna trap series, which now start from 1509, including about 118,600 new records, related to about 948,000 tons of catches, about 23,226,000 bluefin tunas fished and about 103,000 fish sampled. With these data, the GBYP is filling many of the existing gaps, but not all, extending the historical data series back in centuries. This fact labels the ICCAT bluefin tuna database as the longest among those held by all other RFMOs. All data have been individually checked according to the ICCAT system and they are now ready for the normal procedure for including them in the ICCAT database.

In Phase 3, one Call for Tenders has been issued so far, focused on the Ottoman Archives and tuna trap data.

4.1 Symposium on Tuna Trap Fishery

The scientific papers and presentations at the Symposium are published in a special issue of the ICCAT *Collective Volume of Scientific Papers, Vol. LXVII, 2012*.

5. Aerial surveys

5.1 Analysis for defining future needs for the aerial survey

The data analyses requested by the GBYP Steering Committee also included the evaluation and estimation of the basic requirements to allow the ICCAT-GBYP Aerial Survey on Bluefin Spawning Aggregation to fully reach its objective, particularly considering that the aerial survey is able to provide trends, but it is necessary to have various years of data in order to get reliable trends. The Steering Committee also requested extending the survey to the largest possible area. Besides the objective difficulties of this type of analyses, given the number of possible variables in nature, it was possible to identify several scenarios, following two different approaches: an extended survey of 100,000 km and a more extended survey of 200,000 km. The final report was provided on December 15, 2011.

Within the best possible scenario (20% recovery rate in the survey period and 15% CV), the number of surveys required should be at least five, while under the worse possible scenario taken into account (5% recovery rate and 27% CV), the minimum number of surveys required should be 13. Considering the strict management measures, the reduced fishing season, the sequence of recent years with strong recruitment, it could be possible to obtain a reliable trend of abundance of bluefin tuna spawning biomass after a minimum of six years of extensive aerial surveys[1].

The conclusion is that with the aerial survey methodology it is possible to collect data which are potentially useful for management. Those data, which could be considered more reliable than fishery data, can be used in the assessment models like other abundance indices (*i.e*., CPUE).

5.2 Possibility of shifting the target to juvenile aggregations

The Steering Committee requested the GBYP to evaluate the possibility to shift from the aerial survey on spawning aggregations agreed so far by the Commission to the aerial survey on juveniles. Due to the lack of specific budget item, the GBYP coordination provided a Strength Weaknesses Opportunities Threats (SWOT) analysis to SCRS. Both approaches are useful, but the survey on spawners has much more strengths than that on juveniles, while opportunities are similar and weaknesses are higher for the juveniles.

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[1] Due to the current reduced budget and the possible continuation of similar budget constraints in future years, it would be reasonable to consider the possibility of alternating various GBYP activities, but always maintaining a minimum of aerial surveys consecutive for two year sets; under this scenario, if the assumed recovery rate will be confirmed, the CV might increase. This is to be taken into account when considering the various GBYP activities, their objectives and the balance between financial resources and expected results.

6. Tagging

A second GBYP Operational Meeting on Tagging, Biological and Genetic Sampling and Analyses was organized in Madrid on April 17-18, 2012, during the extension period of Phase 2, with the participation of 28 scientists.

A sufficient number of conventional tags were acquired on time (a total of 35,000 single barb dart + 2,500 applicators, 22,000 double barb small darts + 9,300 applicators and 13,000 double barb big darts + 6,200 applicators); in addition, it was possible to buy 50 miniPATs and 50 internal archival tags

6.1 Conventional tagging activity

The tagging activity in Phase 2 was partly reported during the SCRS and the Commission meetings in 2011, because it was completed during the extension period. The tagging activity in Phase 2 faced several operational problems, mostly due to causes of "*force majeure*" (bad weather, lack of fish at the surface in the selected areas, fishery technical accidents, etc.), but also partly due to some mistakes in the strategy adopted by the taggers.

The tunas tagged in each area are as follows: 1,278 in the Bay of Biscay, including the opportunistic tagging by the sport fishers (38.9% double tagging), 1,389 in the area of the Strait of Gibraltar (43.5% double tagging); 911 in the western Mediterranean, including tagging when tunas were released from cages and the opportunistic tagging by sport fishers (28.7% double tagging), and 0 in the central Mediterranean Sea. It total, 4,950 tags were implanted, on 3,578 bluefin tunas (71.6% of the target or 79.5% of the target without 10% allowed contingency; with 38.1% double tagging, against a target of 40%).

The tagging activity in Phase 3 was defined by the Steering Committee on 7-8 February 2012 and then refined on 20-21 March 2012, adopting the strategy to use exclusively baitboat vessels and to have a tagging coordinator following the field activities in real time and maintaining a continuous contact with the GBYP coordination. The Call for Tenders was issued on March 26, 2012 and the contract was awarded on June 21, 2012, to another Spanish Consortium of nine entities.

Even in this second year the field activity had many problems, some of them related to delays in obtaining the permits for operating in waters of various CPCs. Furthermore, the vessels transferred to the Mediterranean for tagging had several problems, caused by "*force majeure*" (lack of juvenile concentrations in some areas, lack of fish at the surface, very little presence of bait, bad weather and technical difficulties). At the time this report was set-up, the tagging activity was completed even slightly over the target in the Bay of Biscay (3,384 tagged fish against a target of 3,350, with 41.3% double tagging), while only 83 tunas have been tagged so far in the Gulf of Lion (against a target of 3,200). The tagging activity in the central Mediterranean is currently starting, while tagging in the Strait of Gibraltar will start later.

6.2 Electronic tagging activity

The electronic tagging activity was not initially included in Phase 2 due to budgetary problems. Anyway, thanks to a positive opportunity and to the cooperation of several institutions, the tuna industry and WWF-MEDProgramme (the details are included in the detailed report), it was possible to carry out a first trial in a tuna trap in Morocco in May 2011. A total of 11 large tunas were tagged and several tags provided unexpected results and extremely interesting data.

Following this initial trial, it was decided to continue this activity during the last extension part of Phase 2, taking advantage of the good will and the cooperation of the Moroccan Authorities, the tuna trap industry and the WWF-MedPO team. Another tagging experiment was carried out in May 2012, tagging 26 large and medium bluefin tuna pre-spawners, 12 tagged underwater and 14 tagged on board. The first provisional results are showing extremely interesting behaviours, among which one individual that entered the Mediterranean possibly for spawning and then exited in the Atlantic, reaching Ireland directly and then the extreme North, between the Faröe Isles and Norway.

These first experiments demonstrate the high interest to tag pre-spawners tunas, implanting the tags possibly for much longer periods.

In Phase 3, during the conventional tagging activity, it was also possible to implant 13 internal archival tags and deploy 14 miniPATs. At the moment, one miniPAT had a premature detachment, while the others are still on the fish at sea.

6.3 Tag awareness and tag reporting 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 beginning of the massive tagging activities by the GBYP.

Posters and stickers were translated in 12 languages (Arabic, Croatian, English, French, Greek, Japanese, Italian, Mandarin, Portuguese, Russian, Spanish and Turkish), and they were distributed capillary in the entire ICCAT Convention area. 11,030 posters and 13,300 stickers were distributed among all countries, entities and stakeholders and the full details, together with the local contacts are on http://www.iccat.int/GBYP/en/AwCamp.asp. Furthermore, an exclusive ICCAT-GBYP T-shirt was produced, to be used as tag reward or for promoting the tag awareness activities.

The tagging awareness campaign is coupled with a tag rewarding campaign strongly recommended by the Steering Committee. 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.

To improve information and awareness about the tagging programme, ICCAT-GBYP is developing contacts with various stakeholder organizations and journalists. Information on the GBYP is now present on various web pages, while some articles on the press have been promoted. Recently, an article was also published in the European Commission journal “Fisheries and Aquaculture” (56, 2012), which usually reaches many stakeholders in several countries and which is translated into 23 different languages.

Meetings with ICCAT ROPs were also organized, to inform them about the ICCAT-GBYP tag recovery activity and to ask them to pay the maximum attention to tags when observing harvesting in cages or any fishing activity at sea.

A total of 14 conventional tags from bluefin tunas have been reported to ICCAT.

7. Biological and genetic sampling and analyses

A second GBYP Operational Meeting on Tagging, Biological and Genetic Sampling and Analyses was organized in Madrid on April 17-18, 2012. A total of 28 scientists participate in the meeting.

Taking into account that some areas and fisheries included in the “Biological Sampling Scheme” cannot be sampled due to logistic and security problems, the sampling activity under contract included a total of 1950 genetic samples, 1900 otoliths, 1900 spines and 600 gonads; the percentage of achievement was 68%, mostly due to the late beginning of the activity, which started after the main fishing season.

The plan for the analyses included 960 NGS-TS, 160 NGS-RRSG, 600 microchemical determinations, 810 age readings and 80 histological analyses; in this case, thanks to the extension of Phase 2, it was possible to have an achievement of 101.5%.

The first results, that can be considered preliminary, are very promising:

- Genetic analyses show that there are possibly several components of the eastern bluefin tuna stock, but results need to be confirmed by a larger number of samples, extending the sampling to areas that have not been sampled;
- Microchemistry analyses showed that stock components are well separated, with very limited mixing, which disappear in the Mediterranean Sea; even in this case, additional samples and further refinements are necessary before having more solid results.
- Age-length key (ALK) was improved, using most of the samples; a larger sample is essential for getting the proper correlations, which will result in an updated parameter for the stock assessment.
- Maturity: sampling must be extended in Phase 3, particularly during the normal spawning season.

The contract for conducting the activity in Phase 3 was awarded on June 6, 2012, to an international consortium of twelve entities.

The first interim report shows that a total of 1,398 bluefin tuna have been sampled so far (39 larvae, 302 age 0, 409 juveniles, 175 medium tunas and 473 large tunas).

8. Modelling approaches

In Phase 3, the activity will include the Risk Assessment and two studies to support the stock assessment: (a) Statistical conversion of catch-at-size to catch-at-age; and (b) data imputation). The first contract on Risk Assessment was award on September 19, 2012.

8.1 Risk analysis

The first paper derived from the GBYP activity was peer reviewed and published in an international journal during the extension of Phase 3.

This action will be continued in Phase 3, with new and more extensive interviews (during SCRS and the Commission meeting) and analyses.

8.2 Modeling approaches

During the extension of Phase 2, the contractor provided the final report for the development of a prototype of an alternative assessment and advice framework, involving an assessment method and a harvest control rule, designed to work in tandem which form the management procedure (MP) component of an MSE, was developed. The choice of prior distributions of parameters is driven primarily by the requirement for good management performance, rather than by prior beliefs about likely values. The conventional management reference points B_o, B_{MSY} and F_{MSY} are used, but defined in a way such that they remain appropriate in the presence of possible regime changes. A simple harvest control rule is proposed: constant *F* when the stock is above B_{MSY}; F linearly proportional to B/B_{MSY} when $B < B_{MSY}$. The harvest control rule is based on a notional unselective standard fishery. To convert the results to an actual TAC for a real mix of fisheries, weighting factors are determined for each fishery to relate the effect of a unit catch from each fishery to the effect of a unit catch from the notional standard fishery.

8.3 Further actions on modeling

The results of the Risk Analysis will be presented at the SCRS and used in the discussion on the "Unquantified Uncertainties". Where appropriate they may be used to specify what scenarios to include in any MSE work conducted in later phases. The MSE examples included many elements that would be important in building a robust advice framework taking advantage of new data and knowledge made available under the GBYP. These will have to be further developed in later phases before they can be utilised in providing management advice. The preliminary MSE framework showed how the data and knowledge gained under the GBYP can be used to develop alternative robust advice frameworks. However, much work still needs to be conducted in later phases before such and advice framework can become operational.

9. Legal framework

The first period of activity revealed the absolute need to have specific provision for allowing the field research included in the programme adopted by the Commission. This problem, originally discussed at the early beginning of ICCAT-GBYP activities, was discussed again in 2011 by the Bluefin Tuna Species Group and by the SCRS, presenting a specific recommendation to the Commission meeting.

ICCAT adopted Recommendation 11-06 at its meeting in Istanbul in November 2011, which allows for a "research mortality allowance" of 20 t for GBYP and for the use of any fishing gear in any month of the year in the ICCAT Convention area for GBYP research purposes. For implementing the recommendation, the ICCAT Secretariat released the Circular #2296 on May 22, 2012.

A total of 55 ICCAT-GBYP RMA certificates have been issues so far, using 3,217.7 kg of bluefin tuna.

10. 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. The ROP observers are also engaged in directly checking bluefin tuna at harvest to improve the tag recovery and reporting as well as identifying any natural mark.

11. GBYP web page

The ICCAT-GBYP web page, which was created in the last part of Phase 1, is usually updated regularly 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 and in kind) are regularly listed, to ensure full transparency.

12. Follow-up activities

The GBYP Steering Committee and the various GBYP meetings provided a list of recommendations on various issues; several of them are essential for fulfilling the duties. The various recommendations will be evaluated by the SCRS in September 2012 and then will be forwarded to the Commission.

In addition, GBYP considers it essential to better define the following points:

a) *Evolution of the Atlantic-Wide Research Programme for Bluefin Tuna:* According to the current situation, which demonstrated the impossibility to reach the funding level approved by the ICCAT Commission for the various years of the GBYP and, as a consequence, the impossibility to carry out the various activities as originally planned, a programme revision is now necessary, finding the right balance among funding possibilities, research needs and duration. The funding system shall be better defined and improved.

b) *Data recovery and data mining*: A "*pro veritate*" clarification of the mandatory requirements and limits established by ICCAT regulations for providing Task II data is needed to better define the future plans and to avoid unnecessary discussions, sometimes based on personal interpretations of the current rules.

c) *Aerial survey*: The suspension caused by the budget shortage to carry out this activity together with other activities questioned also the objective, the strategy and the time frame; GBYP prepared SWOT analyses for providing the essential elements to SCRS.

d) *Tagging*: The first year (Phase 2) can be regarded as a complex large-scale experiment and the strategy adopted for Phase 3 will be used for testing a different strategy and approach. It is necessary to extend the tagging activities to other areas (such as the eastern Mediterranean Sea), always considering the budget constraints and the permits issue. The tag awareness activity shall be firmly continued, improving media communication.

e) *Biological and genetic sampling and analyses*: According to the current situation, it is clear that it is impossible to analyse all samples which have been collected (due to budget limits), while it is also clear that a wide sampling in the various areas is essential even if not always easy. A medium term strategy is needed.

f) *Modelling*: New additional efforts should be devoted to finding the best approaches for using fishery independent data and innovative approaches to better quantify uncertainties.

For Phase 4 of the GBYP, the Steering Committee recommended the following activities:

1. *Data recovery*: This will continue at a much lower intensity, but the analytical work will be more intense. A dedicated inter-sessional meeting will be necessary.
2. *Use of trade and observers data*: To be developed.
3. *Biological and genetic sampling and analyses*: It will be necessary to complete the analyses of the samples already collected and stored, developing sampling in the areas where it was not possible to sample so far.

4. *Conventional tagging*: It is necessary to ensure a continuation of the activities, while the strategy will be better defined according to the results of Phase 3. Furthermore, scientific tag recapture activities must be carried out.
5. *Tag awareness and recovery:* This must be further reinforced, through the effective support and assistance of national scientists.
6. *Modelling approaches*: More effort will be required in the following years, before the next assessment.

If sufficient budget is available, then the following activities will also be considered:

7. Pop-up tagging of pre-spawning adults.
8. Pop-up tagging of juveniles.
9. Internal archival tagging.

The Steering Committee confirms the recommendation to suspend the aerial survey on spawning aggregations.

The GBYP will continue encouraging and supporting additional research activities carried out by SCRS.

Appendix 6

ICCAT ENHANCED RESEARCH PROGRAM FOR BILLFISH

(Expenditures/Contributions 2012 & Program Plan for 2013)

Summary and Program objectives

The ICCAT Enhanced Research Program for Billfish continued its activities in 2012. The Secretariat coordinates the transfer of funds and distribution of tags, information, and data. The General Coordinator of the Program is Dr. David Die (USA); the East Atlantic coordinator is Mr. Paul Bannerman (Ghana), and the West Atlantic coordinator is Dr. Eric Prince (USA).

The original plan for the ICCAT Enhanced Research Program for Billfish (IERPB, SCRS 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 expand 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 2012 and are highlighted below.

The Program depends on financial contributions, including in-kind support, to reach its objectives. This support is especially critical because, in recent years, the largest portion of billfish catches is coming 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 since 2009 there have also been annual contributions from Chinese Taipei.

2012 Activities

The following is a summary of the activities of the Program. Seven observer trips onboard Venezuelan longline vessels were completed by July 2012 and more may be completed before the end of the year. Sampling of Venezuelan artisanal catches also continued in the central coast of Venezuela and 3,300 trips were monitored. 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 2012.

The IERPB continued to support Brazil deploying pop-up satellite tags, tissue sampling for genetic identification and biological sampling for reproduction and growth studies of all billfish. 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 Côte d'Ivoire. Improvements of catch records from these countries are reflected in the Task I tables for billfish that were used in the 2012 white marlin assessment.

Documents SCRS/2012/023, SCRS/2012/024, SCRS/2012/025, SCRS/2012/048, SCRS/2012/146, SCRS/2012/171 and SCRS/2012/178 were produced with the benefit of direct support of the IERPB.

2013 Plan and activities

The highest priorities for 2013 are to support the collection and preparation of data relevant to the identification of white marlin and spearfishes and the collection of biological data on sailfish and spearfishes:

- support the collecting and processing of samples of billfish for genetic studies,
- support the monitoring of the Uruguayan, Venezuelan and Brazilian longline fleets through onboard observers, reporting of conventional tags, and biological sampling,
- support the collection of biological samples in West Africa
- support the monitoring of billfish catches from West African artisanal fishing fleets.

All these activities depend on successful coordination, sufficient financial resources and adequate in-kind support. Details of IERPB funded activities for 2013 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, 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 the 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 2013. This program aims 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 processing spines (from Venezuela, Uruguay, Brazil, Spain, and the United States) collected in the past with the support of the IERPB. Additionally, during 2013 the program will provide sample kits for collection of mucus samples for genetic identification of white marlin and spearfish. These sample kits and corresponding instructions will be distributed to scientific observers on-board longline and purse seine fleets from Ghana, EU-Spain, Uruguay, Venezuela, Brazil, Japan, and EU-France. Samples collected this way will be processed for genetic identification.

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 spearfishes.

Coordination

Training and sample collection

Program Coordinators need to travel to locations not directly accessible to promote IERPB activities and ICCAT data requirements regarding billfish. 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 between activities of the IERPB and the ICCAT 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 SCRS 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 "Protocols to Follow for the Use of Data Funds and Other ICCAT Funds".

2012 Budget and expenditures

This section presents a summary of the contributions and expenditures for the ICCAT Enhanced Research Program for Billfish during 2012. The Billfish Species Group developed a budget of €44,800.00 for the IERPB. The contributions made to the IERPB for the 2012 program were €30,600.00 from the regular ICCAT budget and €8,000 from Chinese Taipei. Carryover funds remaining from previous year were €23,465.30; thus total funds available for 2012 were €62,065.30 **(Table 2)**. As a consequence all planned activities of the program were able to be carried out. Expenditures to date in 2012 have been €33,700.47 but €26,993.00 are already committed to other activities that have either taken place in 2012 or that will take place between October and December. The estimated balance of the Program at the end of 2012 will be €1,371.83 **(Table 2)**.

In-kind contributions to the Program continued to be made during 2012. 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 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, University of Miami, Ghana department of fisheries and by the ICCAT Data fund.

2013 Budget and requested contributions

The summary of the 2013 proposed budget, totaling €49,800.00 is attached as **Table 3**. The program is predicted to have a balance of €1,371.83 by the end of 2012 and therefore requests the Commission to provide a contribution of €31,200.00 for 2013 (see **Table 4**). The requested contribution from ICCAT is necessary to fully implement the IERPB 2013 working plan. During 2013 the Program will continue to require contributions of €17,500 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 2013 including: (1) sampling and processing of genetic, age and growth collection and processing of genetic samples important (2) at-sea observer trips in Venezuela, Uruguay and Brazil; (3) sampling of artisanal fleets in the western and eastern Atlantic (4) 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, including the preparation for a sailfish assessment in 2014.

Conclusion

The IERPB is an important mechanism towards completing the goal of having the highest quality information to assess billfish stocks. The IERPB has been credited for major improvements in the data supporting the last ICCAT billfish assessments, because the IERPB is the only program that exclusively focuses on billfish. The Program needs to continue to facilitate the collection of biological and fishery information on all billfish; however, in 2013 it will focus on improving the biological information on sailfish, spearfishes and the identification of white marlin and roundscale spearfish. The IERPB Program will continue to require support from ICCAT and other sources to operate and to address the needs of the Commission.

Table 1. Summary budget for 2012 for the Billfish Program.

Source	*Euros (€)*
Balance transferred from 2011	23,465.30
Income (ICCAT Regular Budget and others)	38,600.00
Expenditures and obligations (for details see **Table 2)**	-60,693.47
Estimated BALANCE at the end of 2012	**1,371.83**

Table 2. Detailed 2012 Budget & Expenditures (as of September 24, 2012).

		Euros (€)
Balance transferred from 2011		23,465.30
Income	**Total**	38,600.00
	ICCAT Commission	30,600.00
	Chinese Taipei	8,000.00
Total Budget		**62,065.30**
Expenditures		**-33,700.47**
	Processing of genetic samples (2011)	-15,000.00
	Sampling Venezuela	-9,607.00
	Sampling Ghana	-3,000.00
	Sampling Senegal	-3,000.00
	Sampling Côte d'Ivoire	-3,000.00
	Bank charges	-93.47
Balance (as of September 24, 2012)		**28,364.83**
Funds obligated until end of 2012		**-26,993.00**
	Sampling Brazil	-5,000.00
	Sampling Uruguay	-2,000.00
	Sampling Venezuela	-4,393.00
	Tag reward	-500.00
	Processing genetic samples (2012)	-15,000.00
	Bank charges	-100.00
Total estimated expenditures		**-60,693.47**
Estimated balance December 31, 2012		**1,371.83**

Table 3. Summary budget of the ICCAT Enhanced Research Program for Billfish for 2013.

Source	*Euros (€)*
Balance at start of Fiscal Year 2012 (estimated)	1,371.83
Income (Requested from ICCAT Regular Budget)	31,200.00
Other contributions)	17,500.00
Expenditures (see **Table 4)**	49,800.00
BALANCE	**271.83**

Table 4. Detail of expenditures planned for 2013.

Source	*Amount (€)*
STATISTICS & SAMPLING	
West Atlantic shore-based sampling:	
Venezuela	5,000.00
West Atlantic at-sea sampling:	
Venezuela	6,000.00
Brazil	5,000.00
Uruguay	2,000.00
East Atlantic shore-based sampling:	
Senegal	3,000.00
Ghana	3,000.00
Sao Tome	2,000.00
Côte d'Ivoire	3,000.00
Processing of genetic samples *	10,000.00
Collection of genetic samples *	9,000.00
Lottery rewards – tagging billfish	500.00
COORDINATION	
Mailing genetic samples	1000.00
Bank charges	300.00
GRAND TOTAL	**49,800.00**

Authorization of all these expenditures depends on sufficient funds being available by ICCAT and from other contributions.
* The number of samples collected and processed will depend on the final budget of the program.

Appendix 7

2012 REPORT OF THE SUB-COMMITTEE ON STATISTICS

(ICCAT Secretariat, Madrid, Spain, September 24-25, 2012)

1. Opening, adoption of Agenda and meeting arrangements

The Sub-Committee on Statistics met at the ICCAT Secretariat (Madrid, Spain) on September 24-25, 2012. The meeting was chaired by Dr. Gerald Scott and Dr. Paul de Bruyn served as rapporteur. The Agenda was discussed, accepted and adopted by the Sub-Committee (**Addendum 1 to Appendix 7**).

The Secretariat then demonstrated the new MS Sharepoint tool set up for sharing documents and providing version control of files for ICCAT meetings. It provides different levels of read and write access; however, at this stage it is only available internally on the ICCAT intranet. The Sub-Committee welcomed this advancement, but also noted some difficulties with accessing the new system and recommended that until those difficulties could be overcome, the critical documents for the meeting be provided through alternative means.

2. Review of fisheries and biological data (new and historical revisions) submitted for 2011

The Secretariat presented information held in the 2012 Secretariat Report on Research and Statistics related to fisheries and biological data submitted for 2011, 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 although only 50% of CPC flag states obligated to report information actually reported T1FC (fleet statistics) for 2011. It was clarified that if a CPC reports information for any species, it is considered a positive response.

Historically, the Task I fleet statistics reports have been incomplete and, at times, inconsistent, making use of these data of questionable value. While recognising that the vessel registry is the list of licensed vessels and Task I fleet statistics is of active vessels, the Sub-Committee recommended cross checking the available Fleet Statistics reports with the ICCAT vessel register to identify gaps in reporting and to initiate discussion on methods to improve the quality (or need) of this data set.

The Sub-Committee recognized that the number of species for which Task I and Task II data has to be reported has increased. It was thus proposed that an additional column be added to Tables 2 and 4 of the "Secretariat Report on Statistics and Coordination of Research in 2012" to reflect the data submission for "Small tunas". It was also noted that the reporting of information provision in the way outlined in the Secretariat Report on Statistics and Coordination of Research in 2012" is more relevant for compliance than for SCRS purposes which should rather address data gaps by cross-correlating Task I and Task II information to identify gaps in scientific information.

A revision of catch statistics from Venezuelan baitboats for year 2000 was presented in SCRS/2012/113. Pending recommendations to adopt these revisions from the Albacore and Tropical Tunas Species Groups, the Sub-Committee endorsed the proposal to incorporate the revision into the data base. Other proposed revisions to historical data will be considered based on recommendations from the appropriate species groups.

The Secretariat presented a summary of proposed changes by CPCs to Task I historical records (see Table 8, in the "Secretariat Report on Statistics and Coordination of Research in 2012"). It was noted that some of the series have been provided without an SCRS scientific document supporting the proposed changes. In these cases, the Secretariat has officially requested, through the official statistical correspondent, the supporting documentation but still has not received any response. The Sub-Committee restated that without supporting documentation these changes will be not accepted, and furthermore recommends a time limit, of no more than two years to wait for an adequate response.

The Swordfish Species Group Rapporteur reported on review of the two requests for changes to historic Task I swordfish data submitted by Sao Tome & Principe and Algeria. In both instances, the Swordfish Species Group recommended against adopting the revised numbers as there was no rationale presented to support the changes, in spite of numerous attempts by the Secretariat to obtain such information. The Sub-Committee endorsed the recommendation to not include these values in the Task I database.

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). There has also been improvement in communication between the Secretariat and statistical data providers which has facilitated the resolution of previous problems regarding data collected for size frequency information. There has been an overall improvement in the quality of size frequency data provided.

The Sub-Committee noted that the current "report cards" do not reflect whether a blank submission is due to a lack of catches or a lack of reporting. The Secretariat confirmed that extensive data catalogues **(**e.g., **Table 1)**, which provide this information, have been provided to species groups for review. For bluefin tuna it is possible to discriminate between reported zero catches and missing catch by cross referencing Task I and Task II data, but this has not yet been possible for other species(see discussion above).

The Secretariat noted that increasingly in recent years in order to meet submission deadlines, many flag States submit very preliminary information prior to the deadline and subsequently re-submit revised/complete data after the deadline, sometimes more than once. While this pattern might meet compliance guidelines for timely reporting, the practice also causes logistic problems for the Secretariat as the data needs to be revised and updated in a very short time-frame, especially for stocks undergoing an assessment. The Sub-Committee requested that an analysis of rate of revision of data reports be undertaken to initiate discussion of potential means of lessening this difficulty.

Based on the data provided by the Secretariat, it is obvious that both the rate and number of data set revisions has increased since the early 2000s, possibly as a result of increased attention the Commission is paying to compliance with respect to reporting deadlines. Currently, the Secretariat receives and processes over 550 thousand Task II catch/effort, size, and catch at size data sets, of which nearly a third are revisions of preliminary data submitted by CPCs (**Figure 1**). The increase in the proportion of revisions and in the number of data sets submitted per year has significantly increased the workload required of the Secretariat data base management staff. This increase is in addition to the added database workload associated with compliance related data (see **Table 2**).

2.3 Tagging

A summary of conventional tags along with a summary of a new electronic tag initiative was presented by the Secretariat (see “Secretariat Report on Statistics and Coordination of Research in 2012”). The Sub-Committee noted that access to critical tagging databases is still limited. Much of the electronic tagging data which have been used to promote use of alternative stock assessment methodologies for bluefin tuna is not generally available for use by SCRS scientists, which limits the transparency and acceptance by SCRS scientists.

The Sub-Committee discussed the species for which tagging information has been used in their assessment. For bluefin tuna, bigeye tuna, skipjack, yellowfin tuna, billfish and certain shark species, tagging information has been used although not always directly in the assessment model frameworks. The information has generally been used for biological stock structure and other studies which feed into the assessment models, but does not directly contribute to abundance estimation. It was acknowledged that this information should be more fully utilised where possible and appropriate and that the data should be more readily available for scientific analysis. Data recovery efforts are continuing for yellowfin tuna since it has been noticed that the tagging data base under-represents the number of tagged fish which were released and should be continued. The Secretariat also reported that a large revision of the shark tagging data base undertaken in consultation with US scientists had been finalized this year. The Sub-Committee welcomed this news.

2.4 Trade information (BFT Catch Document Scheme; SWO/BET Statistical Documents)

The Sub-Committee acknowledged 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. An ad hoc technical subgroup was formed during the ICCAT bluefin tuna assessment to address the estimation of catches from market data. The group concluded BCD information would be very valuable in conjunction with the trade data to estimate catches, but this information is confidential and thus is not generally available for scientific use. It was thus recommended that the data be made available for analysis, maintaining its confidentiality.

Historically, data for swordfish from statistical documents have been presented to the SCRS in highly summarised way. There was thus a request for the detailed disaggregated information to be made available. Again, this information would need to take into account confidentiality. Clarification is needed as to what level of confidentiality covers this information and how this can be overcome. This is the same problem for bigeye tuna although it is further complicated by the fact that the available information covers a small portion of the total catch thus access to more detailed potentially confidential data is needed. The Sub-Committee recommended that scientific access to these confidential data be provided under the confidentiality policy guidelines established by the Commission.

Acknowledging the recommendations made by the Bluefin Tuna Species Group, the Secretariat informed the Sub-Committee on the progress made in the implementation of the electronic BCD programme. This was acknowledged as a positive step, but was of limited use to the SCRS until such stage as the information is available for analysis. Methods to distribute this information while maintaining its confidentiality need to be explored. It was proposed that methods to develop protocols for maintaining confidentiality in data be developed, either through a confidentiality agreement or by applying algorithms to the information that protects the fine-scale nature of the data (possibly to be applied by the Secretariat).

2.5 Other relevant statistics

− *North Atlantic swordfish detailed data including discards and effort statistics [Rec.10-02]*

The SCRS compiled the latest available data and a catalogue has been produced by the Secretariat. No updated response is available from 2011. The Secretariat indicated that five flag States are reporting discards (alive and dead).

− *BFT national observer programmes conducted by CPCs including advise on future improvements, Rec. [10-04]*

Section 18.2 of the SCRS Report includes the response of the Committee on this issue.

The Sub-Committee also noted that there is additional information soon to be available in the MRAG ROP report on these programmes, but the report was not available at the time of the Sub-Committee meeting.

− *The scientific aspects of the national observer programmes on the basis of the information provided by CPCs [Rec. 10-10]*

The Sub-Committee noted that the response rate to the obligation to report on national observer programs continues to be quite low, considering the number of observer programs that should be in place. The Sub-Committee was made aware of additional responses to the forms circulated by the Secretariat in 2011 to obtain information regarding the data collected by CPC observer programmes as needed for SCRS to provide a response to the Commission on the issue. The Secretariat received 14 responses over the past two years to the requests for information circulated to CPCs. Several other CPCs provided basic information on their observer programmes in their national reports, which is summarized in **Table 3**. The observer data collection forms reflect if the specified information is being collected. It does not imply the data are available to the Secretariat at this stage. As with the bluefin tuna observer programmes, the Committee considered that the response rate represented a low proportion of responses that could have been submitted to the Secretariat and this should be improved. Additional information was provided during the Sub-Committee meeting, where possible. The Sub-Committee acknowledged that there are other sources that could be used to obtain information on observer programmes and thus a more complete picture of the national observer programmes. The Sub-Committee noted that the response rate to the obligation to report on national observer programs continues to be quite low, considering the number of observer programs that should be in place.

− *Information provided on alternative scientific monitoring approaches to observer programs to apply in vessels less than 15 m. [Rec. 10-10]*

The Sub-Committee acknowledged the ISSF funded studies conducted on electronic monitoring systems (SCRS/2012/025). The system has been trialled on purse seine vessels, but will also be tested on longline vessels in the future. It was noted the system provides good estimates of catch volume but has limitations for species identification particularly for by-catch species due to the volumes of fish captured and handling procedures, which might be overcome with higher quality imagery and repositioning of the imaging equipment. The system also allows the separation of daily activities (e.g., search time, fishing time) allowing a better estimation of effort. The method could be used on vessels of sizes smaller than 15 m, but also large vessels, to supplement the data obtained through traditional observer programmes or to reduce the number of human observers needed.

The Sub-Committee was made aware of other alternative monitoring schemes for vessels of less than 15 m. The monitoring scheme being tested in Venezuela utilises at-sea monitoring (self reporting by cooperative skippers) in conjunction with port sampling activities (SCRS/2012/040) to monitor these smaller vessels. The utility of the sampling operation described in the document, to obtain estimates of catches by this artisanal fleet was recognised and it is hoped the information will be improved over time. The Sub-Committee noted that the technique of self-reporting information is of use in very specific cases (where the reporting of detailed information carries no penalty to the fishing operation) and is not globally applicable.

− *Information provided by CPCs on sea-turtles and by-catch mitigation information [Rec. 10-09]*

The Sub-Committee noted that this issue will be dealt with by the Sub-Committee on Ecosystems during its meeting.

− *Operationally viable technologies and methodologies for determining the size and biomass at the points of capture and caging [Rec. 10-04].*

The Sub-Committee further reviewed the progress of this work and considered and endorsed the draft response to the Commission prepared by the Bluefin Tuna Species Group in 2012, which follows:

The 2010 Recommendation amending the 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 Bluefin Tuna Species Group held in September 2011, four SCRS documents were presented on use of stereoscopic camera systems on board of Mediterranean cages (Ramfos *et al* 2012; SCRS/2011/189; Puig *et al* 2012; and Anon. 2012d). While a few technical difficulties still needed to be overcome, these studies confirmed the potential of stereoscopic cameras to recover the length composition of the fish that are transferred alive into cages. The 2011 SCRS strongly encouraged the CPCs to carry on and complete these studies in 2012, so that stereoscopic camera systems could become operational as soon as possible.

Three additional SCRS documents were presented during the bluefin tuna stock assessment session held in September 2012. Document SCRS/2012/052 used a stereoscopic camera to measure the length of fish in the cage and during the transfer to another cage through a gate. These observations compared favorably with subsequent measurements taken after the caged population was harvested. The authors affirmed the validity of utilisation of the stereoscopic camera for counting and measuring bluefin tuna and made several suggestions for improving the procedure and equipment. Similar work was described in document SCRS/2012/136, where the stereoscopic camera was applied at the point of first transfer into the farm cage. A comparison of the measurements made by the camera with direct measurements of a subsample of the fish in the cage suggested that further work is required to further improve the accuracy of measurement with the stereoscopic camera and better define the mathematical models used to convert measured length to weight. Finally, SCRS/2012/133 presented an alternative approach where a video-camera and acoustical system were used in tandem during the transfer of bluefin tuna from one cage to another. The authors described the various different equipment options available for the application of this technique and practical considerations for improving the accuracy of the system.

SCRS is encouraged by the progress made in the practical application of alternative techniques, in particular that of the stereoscopic camera, to the counting and measurement of fork length of caged bluefin tuna. It noted that a number of factors may affect the accuracy of the stereoscopic camera measurements, including lighting conditions, general weather conditions, distance from fish being measured and the angle of measurement in relation to the swimming of the fish. Fish may also suffer a drop in condition from the time of capture to the actual caging and additional field work will be needed to establish appropriate Length-weight relationships to convert the fork length determined by the stereoscopic camera to weight. Nevertheless, the SCRS stressed that measurements made by stereoscopic cameras are likely more accurate and precise than the current catch at size reported for the purse seine fleet. SCRS recommends moving beyond the pilot study phase, by consolidating technical approach and implementing stereoscopic camera systems in 2013.

− *The ICCAT regional observer programme for tropical tunas.*

The “Secretariat Report on Statistics and Coordination of Research in 2012” contains information on the call for tenders distributed on 6 September 2012 in response to [Rec.11-01] requirement for a regional observer program for tropical tuna fisheries. A discussion was held in Sukarrieta, Spain in early 2012 regarding the harmonisation of observer programmes across t-RFMOs. This call addresses the information identified as necessary for scientific monitoring of the fisheries during that meeting. The tropical tuna group will make recommendations on this call, such as what additional data should be collected, during their species group meeting in 2012. Pending further review of these recommendations, the Sub-Committee anticipates endorsing identified needs for additional data collection for inclusion in the call.

− *Availability and utility of confidential level data in support of stock status evaluations*

The Secretariat generated a list of confidential data sets and their potential utility for scientific evaluations (**Table 2**). The Sub-Committee recommended that access to the raw level data be provided under the Commission's confidentiality policy guidelines for data sets which are likely valuable sources for scientific estimates in support of stock status evaluations so that their utility can be thoroughly investigated.

3. Updated report on the ICCAT relational database system

− *ICCAT-DB documentation framework*

The Sub-Committee was informed of the Secretariat’s work migrating the databases to MS-SQL, upgrades to compliance databases (in particular the vessel registry) as well as the detailed plan to document the entire relational database system in the “Secretariat Report on Statistics and Coordination of Research in 2012” and the document on “Design and Structure of the ICCAT-DB (Database System) Documentation Framework”. The Sub-Committee re-emphasized that full documentation of the ICCAT database system is necessary in order to explain and describe the information available and approved of the framework presented as well as the external deployment of the documentation (cloud hosting) provided sufficient security of data and confidentiality is guaranteed. The Sub-Committee acknowledged the excellent work conducted by the Secretariat in the past year in developing the framework for the database documentation system. The Sub-Committee also inquired if there was a possibility that the 3 to 4 year plan outlined for the documentation deployment could be accelerated or if alternative interim measures could be carried out to ensure documentation is available in the shorter term. It was agreed that the priority sections, such as statistics, would be deployed as soon as possible with a fully operational system available in 4 years. It was acknowledged that the human resources required to document the database system are extensive and this could impede other important Secretariat activities. The apparent need for supplementing available resources to this initiative (additional manpower) was again raised and recommended. This recommendation has been made for a number of years and while an additional database management support position should have been included in the 2012 Budget of the Secretariat, it was not because the proposed budget was already circulated in July 2011, after this recommendation was reaffirmed by the 2011 SCRS in October 2011. It was reiterated that the timing between preparation of the Budget and the identified needs of the SCRS needs to be better coordinated.

The Sub-Committee was informed of a common data exchange format and a regional database called Fishframe, developed and managed by ICES with the support of European Union (DCF). This database, which covers fisheries in the North Atlantic Ocean, the North Sea and the Baltic Sea, addresses fishery management needs related to the European Union Common Fisheries Policy (CFP). A similar approach is expected for Large Pelagic Fisheries and will be funded under the new DCF programme (2014-2020). IRD has developed a prototype database and associated generic tools (data extraction and conversion into Fishframe format, fishframe compliant datasets import, etc.) based on the Fishframe model which could be used as support within this framework (SCRS/2012/169). The Sub-Committee recognized the need to gain operational catch effort level information which is accommodated in FishFrame and is finer scale than currently contained in ICCAT DBs. Confidentiality protocols for this information are necessary and can be accommodated via discussions between RFMOs and the EU if this is adopted as a European standard. The Sub-Committee thus recognized the utility of this initiative and recommended that it be followed with interest.

4. National and international statistical activities

The "Secretariat Report on Statistics and Coordination of Research in 2012" summarized the activities undertaken by the Secretariat regarding international statistical activities. The Sub-Committee encouraged the Secretariat to continue with these efforts.

4.1 International and inter-agency coordination and planning (FAO, CLAV, CWP, FIRMS)

Following the t-RFMO Kobe recommendations, the Secretariat has been involved in the development and implementation of the Consolidated List of Authorized Vessels (CLAV) project, which comprises the current lists of authorized fishing vessels of each t-RFMO. Collection of historic information of vessels has been identified as the next important step to address in this project. The real time updating of the current information was also discussed once individual organisations have reviewed and updated the vessel records. Funding is required for experts to work with RFMOs to achieve this (which may possibly be obtained from the GEF project initiating in 2013 should ICCAT choose to partner in the GEF FAO ABNJ Tuna project - see below).

The representative from FAO noted that FAO has historically relied on ICCAT as the primary source of tunas catch information by flag in the Atlantic. The continuation of this co-operation was requested as well as the special provision of data related to bluefin tuna catch harvested for aquaculture and transfer to cages by flags was requested. The Sub-Committee endorsed the continued cooperation between the Secretariat and FAO on these issues. FAO outlined an initiative to integrate vessel information from separate national and international sources and its intension to expand the system to cover landing and port measure information in the future. It was noted that the CLAV project is supported with the same framework. FAO is seeking volunteers to collaborate in developing national systems to facilitate integration of vessel and landing information. It was pointed out that many vessels have unique vessel identifier numbers issued by Lloyds (IMO numbers) and that the submission of this information to ICCAT has become obligatory. However, these have often not been reported. ICCAT has received information on these identifiers, which resulted from an initiative undertaken by ISSF. The Sub-Committee recognized the importance of incorporating this information into the ICCAT component of CLAV and recommended that the available IMO information be reported to CPCs for verification and incorporation into ICCAT's vessel lists.

The Sub-Committee was informed by FAO about progress made on the Global Environment Fund (GEF)/FAO Areas Beyond National Jurisdiction Tuna project, which is anticipated to come on line in 2013. The Sub-Committee was also informed that documentation on the elaboration of that project proposal would be provided by FAO and presented during the SCRS.

The Sub-Committee acknowledged and endorsed continued participation of the Secretariat in FIRMS.

Following a Sharks Species Group 2011 recommendation, the Secretariat formally requested EUROSTAT and FAO's databases on shark statistics and this information has been received. There is a need for further discussion with EUROSTAT experts to further elicit understanding of the data base and its utility for addressing the Sharks Working Group request to derive comparison. The Sub-Committee endorsed the Secretariat's proposal to meet with EUROSTAT experts in the near future to further this work.

4.2 National data collection systems and improvements

No additional information was provided to the Sub-Committee at this time.

5. Report on data improvement activities

The "Secretariat Report on Statistics and Coordination of Research in 2012" described a number of data recovery activities undertaken in this year. The Sub-Committee supported a data recovery initiative for the collection of size frequency data for bluefin tuna from Mexico. The Sub-Committee acknowledged that there is a strong need for data recovery efforts to be initiated for Mediterranean albacore. The Sub-Committee agreed that in coordination with the convener of the albacore working group that a proposal should be drafted to the SCRS to initiate these efforts. Information on data improvement efforts in Ghana are provided in SCRS/2012/147.

5.1 ICCAT/Japan Data and Management Improvement Project

The Sub-Committee received an update of JDMIP activities undertaken this year. The Sub-Committee endorsed the JDMIP report and acknowledged the success of this program in improving capacity of a number of developing CPCs. In response to a query, it was reported that that the Ghanaian VMS data reporting would shortly be activated, based on an investment made to support the system by JDMIP this year.

5.2 Data Funds from [Res. 03-21]

The Sub-Committee recognised the benefits of having a protocol for the use of the different ICCAT funds. This protocol, adopted by the SCRS in 2011, has allowed the use of these funds in a wider range of activities than in the past. **Table 4** summarises the activities financed by these funds in 2012. The Sub-Committee acknowledged that the various ICCAT funds have significantly improved the SCRS work.

5.3 Data recovery activities

The Sub-Committee reviewed the information held in the "Secretariat Report on Statistics and Coordination of Research in 2012" and the GBYP Executive Summary (see **Appendix** 5) on this topic.

5.4 BFT-E VMS data

The Secretariat presented some analyses conducted on the VMS data in the "Secretariat Report on Statistics and Coordination of Research in 2012". It was discussed that VMS data are now being reported at a rate approaching 2hr which improves the ability to discriminate between different forms of vessel activity (fishing/towing/transiting, etc.).

5.5 BFT-E observer data

No additional information available on this section aside from the MRAG ROP report which was not yet available for the Sub-Committee to consider.

5.6 BFT-E weekly/daily catch reports

BFT-E weekly/daily catch reports have not been used by the species group in support of SCRS analysis. The Sub-Committee recognizes the primary value for this information is for compliance purposes.

5.7 Transhipment observer data

Transhipment observer data provide an opportunity to quality assure catch reports. Although the information is available, in order to use the data effectively, suitable conversion factors are necessary to provide a standard unit for comparison with Task I information. No in depth analysis has been conducted on the information to date and so it is uncertain how useful it is for evaluating Task I data. Fine-scale information may also be limited by confidentiality. A basic comparison with Task I may be informative to determine where reports have not been made and also may be used to obtain estimates of shark catches which are not elsewhere available. The Sub-Committee recommended that preliminary analysis comparing the transshipment information with the Task I data and to identify additional work that will enable more detailed analysis by SCRS scientists. This work may require a confidentiality agreement as outlined by the Commission's confidentiality policies.

6. Review of publications and data dissemination

The "Secretariat Report on Statistics and Coordination of Research in 2012" provided a summary of publications and data dissemination efforts over this year. The Sub-Committee acknowledged this work and approved the progress made, particularly with regard to the *ICCAT Manual*. The ICCAT website contains a list of the documents and datasets produced.

6.1 Data availability

As discussed in section 2.5 (see **Table 2**), access to confidential level data will be necessary in order to evaluate their applicability for stock status evaluations, as required by the Commission.

6.2 ICCAT-Aquatic Living Resources publication agreement

The Sub-Committee was informed of the progress made in the ICCAT-ALR collaboration which started in 2007. Since then, three ICCAT thematic sections have been published and a new one is pending publication. Nevertheless, the Sub-Committee considered that one of the objectives of this collaboration, to provide technical support to facilitate the access of SCRS scientists to peer review publications has been only partially accomplished. The Sub-Committee considered that the current process should be reviewed next year.

6.3 Development of billfish identification species sheets

The Sub-Committee noted the species identification sheets for billfishes developed in 2012, and pending positive review by the Billfish Species Group, endorses their use in SCRS activities. The Rapporteur of the Billfish Species Group subsequently reported that the Species Group accepted the BIL ID sheets without change.

7. Review of progress made for a revised *ICCAT Manual*

7.1 Development of the longline gear description in Chapter 3

The Sub-Committee suggested that expert review should be sought to review the documents produced. It was noted that much of the information is in Spanish and this could limited the review process. It was suggested that a preliminary review should be conducted by a Spanish speaking expert, followed by further revision after translation into the official languages.

7.2 Development of Chapter 2 on species descriptions

The Sub-Committee agreed to await recommendations from the Sharks and Billfish Species Groups on the new and updated species descriptions. Regarding the update of the bluefin tuna description requested by the Bluefin Tuna Species Group after the recent revision of some biological parameters. The Sub-Committee recommended the Bluefin Tuna Species Group should review the current bluefin tuna description during their meeting in 2013 for presentation to the SCRS. Co-ordination between E-BFT and W-BFT was recommended and several SCRS scientists familiar with east and west bluefin tuna volunteered to undertake this revision for consideration at the 2013 SCRS meeting. The Sub-Committee acknowledged that the blackfin tuna species description is currently under review and this should be considered at a subsequent Sub-Committee meeting.

The Billfish species Rapporteur reported that the Billfish Species Group accepted the review on the three species of *Tetrapturus* intended for the *ICCAT Manual*, pending minor revisions that will be incorporated into the final version. As such, the revised review of the three species of *Tetrapturus* should be incorporated into the *ICCAT Manual* and future work of the SCRS.

8. Consideration of recommendations from 2012 inter-sessional meetings

These recommendations are further considered under the subsequent SCRS Agenda item 9.

9. Evaluation of data deficiencies pursuant to [Rec. 05-09]

9.1 Current data catalogues of major species by stock and proposals for review/improvement

It is useful to identify where there are gaps in the current information. Most species groups have not had the opportunity to review the information and will provide comment during the species group meetings. The current catalogues by major species are provided for further review as Appendix 1 to the “Secretariat Report on Statistics and Coordination of Research in 2012”.

Bluefin tuna

Reliable evaluation of Atlantic Bluefin tuna stock status is hindered by the lack (or low quality) of catch, catch-effort and size statistics over time for some of the major fleets.

- The temporal and spatial coverage for detailed size and catch-effort statistics should be significantly improved for the main Mediterranean fisheries, using new technologies (e.g. stereoscopic camera for size data and VMS data for effort).
- The sampling effort for otolith and other tissues carried out through GPYP or other National programs should be continued and increased in some fisheries to improve ageing and stock mixing rates.
- A complete revision of Task I (aggregated catch, by gear/fleet) and Task II (catch-effort, size) data should be done for bluefin tuna by including new sources of information (GBYP, BCDs, trade statistics, etc.).
- An in-depth investigation of the impact of recent management measures on the quality of CPUE indices should be done.

Small tunas

- All countries should report Task I and Task II data;
- National scientists should review their small tuna catches and try to classify them by species.

Sharks

- *Ecological Risk Assessment:* There is limited information on shark catches, especially for incidentally caught species, which added to the lack of information regarding productivity for many of them, have led to the assumption of biological parameters and values of susceptibility, which are possibly incorrect.
- *SMA Assessment:* The deficiencies in the data, particularly before the 1990s, limit the development of historical time series. This requires the generation of robust estimations to improve the assessments.

Billfish

- The Billfish Species Group has serious concerns whether reported catches included in the white marlin assessment reflect total fishing related removals, i.e., do they include dead discards and whether the subsequent mortality of live releases is a significant factor that should also be included in the assessment. These data issues had been identified in previous assessments, and do not have been resolved in the data submissions by CPCs at this time. These data concerns have been raised by the Billfish Species Group in the past.

ALB (Med)

Reliable evaluation of Mediterranean albacore stock status is hindered by the inexistence (or low quality) of catch, catch-effort and size statistics over time for some of the major fleets. As a prerequisite of a successful assessment of the stock, a complete revision of Task I (aggregated catch, by gear/fleet) and Task II (catch-effort, size) data is required. In particular, the following need to be implemented, documented, and submitted to the Secretariat:

- The low catch reported by EU-Greece (1993-1995) and EU-Spain (2003) needs to be verified.
- The high catch reported by EU-Italy in 2003 needs to be verified.
- Doubts were also identified in relation to the incompleteness of Syria and Turkey catches. In the case of Turkey, although albacore reports from 2004 to present have been recorded in the ICCAT database, EUROSTAT shows a series of catch made from 1957-1966, which is not recorded in the ICCAT data base.
- The catches reported by EU-Greece and EU-Italy as "Unclassified" fishing gear in the last 20 years need to be revised and discriminated by fleet and gear.
- Task II data in the ICCAT database are very incomplete for most fleets, and are collected over time for some important fleets. CPCs with the major fleets (EU-Italy, EU-Greece, Turkey, EU-Spain) should submit historical Task II data in their possession to the Secretariat, if they have not yet done so.

In view of this and considering recent successes for bluefin, the Sub-Committee discussed the possibility of applying the data recovery methods used by the GBYP (SCRS/2012/141) to other species. It was suggested that for species such as albacore this may be useful as it is a major species and data collection is normally carried out, but for species such as small tunas, this may be more complicated, as the quality of recorded data is often lower. Existing procedures could be used to assist developing economies to collate and submit their information. With fully developed economies, this is more complicated. The Sub-Committee recommended that methods should be pursued to recover this important data regarding species of interest to ICCAT, including Mediterranean albacore. The Sub-Committee made a recommendation to re-table the data recovery proposal to the Commission and should this not be possible to utilise existing capacity building and data collection funds to recover information.

Albacore North & South

Continuing work to revise, collect and report, following the ICCAT standards, Task I and Task II complete and accurate data from the main fisheries catching albacore in the North and South Atlantic in order to be able to give accurate management advice. Specifically, it is recommended to:

- Update and revise the Task II size data for Chinese Taipei longliners in the Atlantic, up to 2011.
- Check availability of, and eventually complete, Task II CE and Task II size data for Brazilian fleets during the whole time series.

Swordfish

- As ICCAT [Rec. 03-11] does not reproduce correctly the weight conversion factors that have been adopted for the Mediterranean stock and appear under the “Conversion Factors” headings in the ICCAT web-site, SCRS recommends that the phrase defining the minimum landing sizes in terms of weight should be modified as follows: “....weighing less than 10 kg of round weight or 9 kg of gilled and gutted weight, or 7.5 kg of dressed weight (gilled, gutted, fins off, part of head off)”.
- In order to avoid future confusion in weight conversions, SCRS recommends that the *ICCAT Manual* should harmonize the weight definitions according to the terminology that appear under the heading “Conversion Factors” of the ICCAT web-site. This particularly refers to the acronym GWT which should be stated as “gilled and gutted” weight and not simply “gutted”.
- The Sub-Committee on Ecosystems recommended development of a new data request for sea turtle information on bycatch per unit effort, observer coverage levels and total extrapolated bycatch. This will be drafted by the Sub-Committee on Ecosystems, the By-catch Convener and the SCRS Chair.
- The Secretariat and the Committee have developed an observer data reporting form for the submission of information from national observer programs. This form was developed to be consistent with the objectives and recommendations of the Kobe Process and the Joint t-RFMO By-catch Technical Working Group (e.g., interoperability across t-RFMOs) as well as national data confidentiality requirements. This form will facilitate CPCs to submit national observer program data to the Secretariat using a consistent format beginning in 2014. CPCs who prefer to provide raw observer program data to the Secretariat may exercise that option.
- The Secretariat will update the effort distribution data base (i.e., EFFDIS) prior to the 2013 meeting of the Sub-Committee on Ecosystems.

Tropical Tunas

There are often important differences between Task I reported removals and the removals calculated by Working Groups (e.g. estimates of unreported catches), whether for the purposes of estimation of stock status during assessments or for monitoring fishery trends between assessments. Although, in the case of working group estimations in preparation for an assessment, these estimations may be available in a detailed report, it may be useful to highlight these differences in the Executive Summaries. It is recommended to:

- Consider the best way to present such discrepancies in the Executive Summaries. Options might include (but not be limited to):
  - Additional clarifying footnotes or additional row for Table 1
  - Additional line (with "best estimate of removals from WG") to figure of historical catches from Task I
  - Additional table/figure with differences between Task 1 catch and Working Group estimates of removals
  - Reference in the text (with or without footnote in Table 1 referring to the text)

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 this year (BFT, WHM, SHK and for the future sea turtle evaluation).

9.3 Proposals for improvements on data collections systems by CPC

The Sub-Committee was informed that Côte d'Ivoire has expressed its desire to provide information on billfish and small tunas, but need assistance to develop a database. A short "terms of reference" should be discussed in order to proceed with recovering this information of pertinence to ICCAT. In concept, the Sub-Committee considers such a proposal to be one which could be funded by the ICCAT Data and Capacity Building Funds. On a related issue, the proposal for small tuna data recovery submitted in 2011 was identified as a potential recipient of funding under the capacity building funds, should the Commission choose not to fund the request at its 2012 meeting.

In 2011 the Sub-Committee agreed that additional characterisation of the quality of data is required above simply describing whether the data was submitted on time. A description of the suitability of the data for scientific requirements is needed. It was suggested to the Sub-Committee that external expertise may be required to quantify the quality of information and that a Terms of Reference for a contract should be developed to assess the databases ICCAT possess. The Convener of the Sub-Committee volunteered to draft, in consultation with the SCRS Chair and other SCRS Officers, a TOR for such an activity.

10. Review of existing data submission formats and procedures

The Sub-Committee briefly discussed the development of forms for the collection of data from the national observer programmes particularly with regard to by-catch data. It was agreed to defer comment on these forms to the Sub-Committee on ecosystems meeting although the draft forms would be distributed to the conveners of the different species groups as soon as possible. It was also noted that the data collection systems should not just be characterized to collect data for current needs, but also for future issues and so should be geared towards estimating complete levels of catches for species.

10.1 Formats and e-FORMS improvement with particular attention to recreational fisheries (to account for current fishery practices)

The Secretariat expressed their belief that specific recreational forms were not necessary at this stage, but could be developed in the future should the levels of recreational data submissions increase. At present most flag states submit information in Task II format although there has been a problem with submissions of recreational data from France using this format and this should be investigated and addressed. It was recommended that this information be reported using the usual reporting formats and a specific form is not necessary.

The Secretariat demonstrated that for vessel list forms, a simple internal link can change the language of the form, negating the need for 3 distinct forms (one for each language). The Secretariat expressed its desire to implement this development for every data submission form to reduce the number of forms maintained by the Commission. The Sub-Committee expressed its support for this development and suggested that volunteers could assist in facilitating the translation into additional languages (i.e., not official languages) in order to improve reporting. An impediment to this extension of languages would be the lack of official translation capabilities at the Secretariat to deal with submitted information. Existing capacity building fund could be used to ensure all data submission institutes be provided with compatible software (i.e., MS Excel) to be able to take advantage of this initiative.

The Secretariat agreed to provide a proposal for dealing with the requests for submitting data in a variety of formats.

10.2 Improvements to the ICCAT coding system

The Secretariat raised the issue for the need to submit data using standardised codes, especially with regard to sampling areas. The data should be submitted in appropriate units dependant on the species being reported (*i.e.*, sampling areas are different for different species).

10.3 Rules applied to historical data revisions

Current rules for historical data revisions were reviewed, although additional proposals were presented in SCI-008. Provisional to acceptance by species groups, the Sub-Committee endorses the changes.

10.4 Rules used to determine deadlines for submitting statistics

It was noted that some countries had trouble submitting data prior to the deadline proposed for 2012. It was proposed that the deadline should be extended to the end of July as has previously been the case. It was, however, noted that the deadline requested are set bearing in mind stock assessment requirements in the year of submission. Acceptance of revisions of data during working group meetings is the responsibility of the conveners and multiple revisions during these meetings delay the assessment process. Compliance requirements complicate this issue, however, and could possibly be identified by recording the number and timings of revisions submitted by CPCs.

10.5 Other related matters

Among other items, the Sub-Committee shall review the steps taken relative to prior Sub-Committee recommendations:

10.5.1 Infrastructure and technology

The 2012 Sub-Committee acknowledged the important and positive improvements carried out by the Secretariat with respect to infrastructure and related support. It noted that additional improvements to the databases should continue to be pursued.

In addition, the following facility improvements were noted, upgraded meeting facilities, a Video conferencing facility, new air conditioning units in the meeting rooms, upgrades in the internet service (high speed connections), development of the Sharepoint facility as well as a Secretariat provided IT training course for Secretariat personnel to improve support services. All of these have resulted in improvements in the capacity for SCRS to carry out its work and is much appreciated.

The Sub-Committee recognized that in 2012 Dr. Paul de Bruyn joined the scientific staff at the Secretariat as By-catch Coordinator, in response to a long standing recommendation from SCRS to fill a bycatch coordinator position.

10.5.2 Databases

The 2011 Sub-Committee considered documentation of database structures and data quality issues that were not to be addressed in 2011-2012 were a reflection of the Secretariat's increasing work load. It was suggested that if the Secretariat increases accessibility to the databases, the species groups could do their own data extractions and therefore allow the Secretariat to focus its 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, in 2011 the Secretariat reported that it was slowly moving in that direction. The Secretariat also indicated in 2011 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 emphasized the recommendation of the Sub-Committee on the need to provide more support to the Secretariat in the form of more staff. For 2012, the Secretariat reported upon substantial work conducted on development of a framework for the database documentation system. The Sub-Committee acknowledged the excellent work conducted in developing the framework for the database documentation system, which the Sub-Committee endorsed.

As suggested earlier, the four-year time frame to finalise documentation is the recommended absolute limit that should be considered as this work is critical to protecting access, extraction, and understanding of the data most critical to the workings of ICCAT. It was also reiterated that adding staff (or broader use of fixed-term contracts) should be sought to accelerate this process. The steep learning curve required to become familiar with the database structure and how it functions was again acknowledged and thus significant time may be required to bring new staff/contracted experts up to speed with the processes. This recommendation has been made for a number of years and while an additional database management support position should have been included in the 2012 Budget of the Secretariat, it was not because the proposed budget was already circulated in July 2011. It was reiterated that the timing between preparation of the Budget and the identified needs of the SCRS needs to be better coordinated and that until such a position can be identified within the Budget, fixed-term contracts should be utilized.

11. Response to the Commission on sharks data collection improvement plans submitted by CPCs, [Rec. 11-08]

The Sub-Committee responded to the Commission on this issue.

12. Future plans and recommendations

Among other elements, the Sub-Committee need consider the implications and opportunity that FAD management plans [Rec. 11-01] offer for improving our ability to evaluate stock status. It was suggested that the existing data contains sufficient information to determine whether fishing was occurring on FADS or not. It was, however noted that more detailed information is required to address specific requests from the Commission and that several other RFMOs require more detailed FAD information. The Commission’s specification of information required in the FAD management plan is contained within Rec. 11-01+, however this does not cover actual fishing operations on FADs, only FAD types and numbers. It was thus suggested that the tropical tuna group with support of the Sub-Committee on statistics should draw attention to the fact that this important operational information is not yet required and should suggest additions to the FAD plans to obtain this information.

− ***Recommendations from recent workshops dealing with the issue.***

The report of the ISSF Stock Assessment Workshop on Understanding Purse Seine CPUE (http://iss-foundation.org/resources/downloads/) contains a list of recommendations made during that meeting. The Sub-Committee acknowledged the utility of the outputs from this workshop.

The Bluefin Tuna Detailed Report provides a list of recommendations arising from the bluefin tuna assessment meeting. It was noted that the recommendation from that group related to the handling of confidential datasets was in line with the recommendations discussed previously during the 2012 Sub-Committee meeting especially regarding BCDs. The problems associated with using compliance information for scientific purposes (as well as the reverse) were again noted.

13. Other matters

The Sub-Committee was made aware of efforts to address quality control of science. This requires a strengthening of the peer review mechanisms and including participation of outside experts (e.g., from other RFMOs or from academia) in SCRS activities, particularly stock assessments. The protocol of the review process was considered by the Working Group on Stock Assessment Methods in 2012 and terms of reference were agreed.

14. Adoption of the report and closure

The Sub-Committee thanked the Secretariat for their excellent work during the year and acknowledged that high quality work was again achieved in spite of the increasing burden of even greater workloads on staff. The Sub-Committee reiterated its long-standing recommendation for additional database management and quality assurance support at the Secretariat.

After review by the Sub-Committee, the report was adopted and the meeting was adjourned on 25 September 2012. The Convener thanked all participants for their work.

Table 1. A catalog of available information to support stock assessments which enables SCRS to identify data gaps. This example is for E-BFT.

Table XX BFT-E catalog of Task-I (t1: tonnes) and Task-II (t2 availability; where red: no task II; yellow: t2ce only; green ligth: t2sz only; dark green: t2ce & t2sz) between 1990 and 2010.

Stock	Flag	GearGrp	Values	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Avg (2002-11)	Rank	Prop catch	CumPropCatch
ATE	Japan	LL	t1	1464	2981	3350	2484	2075	3971	3341	2905	3195	2690	2895	2425	2536	2695	2015	2598	1896	1612	2351	1904	1155	1089	1985	1	24,5%	24,5%
ATE	Japan	LL	t2																								1		
ATE	Maroc	TP	t1	323	482	94	387	494	210	699	1240	1615	852	1540	2330	1670	1305	1098	1518	1744	2417	1947	1909	1348	1055	1601	2	19,7%	44,2%
ATE	Maroc	TP	t2																								2		
ATE	EU.España	BB	t1	1314	997	769	3281	1694	2386	4595	2940	2017	1217	1729	2168	2410	1239	1735	2012	1065	1903	1727	1197	641	567	1450	3	17,9%	62,0%
ATE	EU.España	BB	t2																								3		
ATE	EU.España	TP	t1	1911	1040	1271	1244	1136	941	1207	2723	1525	2005	1416	1240	1548	750	862	880	820	1348	1194	1209	887	902	1040	4	12,8%	74,9%
ATE	EU.España	TP	t2																								4		
ATE	Maroc	PS	t1	54	46	462	24	213	458	323	828	692	709	660	150	884	490	855	871	179						656	5	8,1%	82,9%
ATE	Maroc	PS	t2																								5		
ATE	EU.France	TW	t1	101	70	441	436	224	400		57	259	247	394	456	599	518	26		731	501	180	295	122	28	333	6	4,1%	87,0%
ATE	EU.France	TW	t2																								6		
ATE	EU.France	UN	t1					25			75							263	818	189		5		19		259	7	3,2%	90,2%
ATE	EU.France	UN	t2																								7		
ATE	EU.France	PS	t1															223		153						188	8	2,3%	92,6%
ATE	EU.France	PS	t2																								8		
ATE	EU.France	BB	t1	367	448	372	164	66	181	310	134	282	270	91	105	150	130	47		50	128	67	62	83		90	9	1,1%	93,7%
ATE	EU.France	BB	t2																								9		
ATE	EU.España	TR	t1	300	204	277	553	305	492	373	376	226	94	192	151	68	39	112	195	125	0	1				77	10	0,9%	94,6%
ATE	EU.España	TR	t2																								10		
ATE	Maroc	LL	t1														2	8	16	273	1					60	11	0,7%	95,3%
ATE	Maroc	LL	t2																								11		
ATE	Chinese Taipei	LL	t1				6	20	8	61	226	350	222	144	304	158			10	4						57	12	0,7%	96,1%
ATE	Chinese Taipei	LL	t2																								12		
ATE	China P.R.	LL	t1									85	103	80	68	39	19	41	24	42	72	119	42	38	36	47	13	0,6%	96,6%
ATE	China P.R.	LL	t2																								13		
ATE	Libya	LL	t1			312				576	477	511	450							47						47	14	0,6%	97,2%
ATE	Libya	LL	t2																								14		
ATE	EU.Portugal	LL	t1		99	4	4	8		97	246	18	404	398	383	160	33	1	63	71	6	12	5			44	15	0,5%	97,8%
ATE	EU.Portugal	LL	t2																								15		
ATE	EU.Portugal	TP	t1						1	15	19	45	2	40	15	17	27	18	9	25	23	24	46	57	180	43	16	0,5%	98,3%
ATE	EU.Portugal	TP	t2																								16		
ATE	EU.France	HL	t1																					4	74	39	17	0,5%	98,8%
ATE	EU.France	HL	t2																								17		
ATE	EU.España	HL	t1								162	28	33	126	61	63	109	87	11	4	10	6	2	21	19	33	18	0,4%	99,2%
ATE	EU.España	HL	t2																								18		
ATE	EU.France	LL	t1			7												2		95	1		9		32	28	19	0,3%	99,5%
ATE	EU.France	LL	t2																								19		
ATE	Maroc	GN	t1	31	3	6	4	13	10	13		34	30	28	17	11										11	20	0,1%	99,6%
ATE	Maroc	GN	t2																								20		
ATE	EU.España	LL	t1	32	32							5	8	3	4	0	1	4	3	18	14	10				7	21	0,1%	99,7%
ATE	EU.España	LL	t2																								21		
ATE	EU.France	GN	t1	42	47	74	497	21	144	253	3	72	71	57	68	6										6	22	0,1%	99,8%
ATE	EU.France	GN	t2																								22		
ATE	EU.Portugal	BB	t1	12		0	2	219	34	80	447	252	5	2	2	7	1	8	6	0	1					4	23	0,0%	99,9%
ATE	EU.Portugal	BB	t2																								23		
ATE	EU.Ireland	TW	t1									16	50	20	6	15	3	1	1	2	0	1	1	2	4	3	24	0,0%	99,9%
ATE	EU.Ireland	TW	t2																								24		
ATE	Iceland	TW	t1									1													2	2	25	0,0%	99,9%
ATE	Iceland	TW	t2																								25		
ATE	Seychelles	LL	t1													2										2	26	0,0%	99,9%
ATE	Seychelles	LL	t2																								26		
ATE	Korea Rep.	LL	t1					4	205	92	203			6	1		0	3		1						1	27	0,0%	100,0%
ATE	Korea Rep.	LL	t2																								27		
ATE	Iceland	LL	t1									1	27			1										1	28	0,0%	100,0%
ATE	Iceland	LL	t2																								28		
ATE	EU.Portugal	SU	t1	14	18	34	19	12	0			8	0	1	3	3						0	1	0	0	1	29	0,0%	100,0%
ATE	EU.Portugal	SU	t2																								29		
ATE	EU.Portugal	PS	t1					0									0			1			0	1		0	30	0,0%	100,0%
ATE	EU.Portugal	PS	t2																								30		
ATE	Norway	TW	t1																			0				0	31	0,0%	100,0%
ATE	Norway	TW	t2																								31		
ATE	EU.United Kingdom	TW	t1									1	2	0			0			0			1			0	32	0,0%	100,0%
ATE	EU.United Kingdom	TW	t2																								32		
ATE	EU.France	TR	t1				2																0	0	0	0	33	0,0%	100,0%
ATE	EU.France	TR	t2																								33		
ATE	EU.Ireland	TR	t1											2							0					0	34	0,0%	100,0%
ATE	EU.Ireland	TR	t2																								34		
ATE	EU.United Kingdom	TN	t1																			0				0	35	0,0%	100,0%
ATE	EU.United Kingdom	TN	t2																								35		
ATE	EU.España	UN	t1			2		2					3	8	9											0	36	0,0%	100,0%
ATE	EU.España	UN	t2																								36		
ATE	EU.France	TN	t1																							0	36	0,0%	100,0%
ATE	EU.France	TN	t2																								36		
ATE	EU.Portugal	HL	t1	1																						0	36	0,0%	100,0%
ATE	EU.Portugal	HL	t2																								36		
ATE	EU.Portugal	TW	t1							7																0	36	0,0%	100,0%
ATE	EU.Portugal	TW	t2																								36		
ATE	EU.Portugal	UN	t1					0																		0	36	0,0%	100,0%
ATE	EU.Portugal	UN	t2																								36		
ATE	NEI (ETRO)	UN	t1	74	4																					0	36	0,0%	100,0%
ATE	NEI (ETRO)	UN	t2																								36		

Stock	Flag	GearGrp	Values	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Avg (2002-11)	Rank	Prop catch	CumPropCatch
ATE	U.S.A.	LL	t1																							0	36	0,0%	100,0%
ATE	U.S.A.	LL	t2																								36		
ATE	Albania	PS	t1																							0	36	0,0%	100,0%
ATE	Albania	PS	t2																								36		
ATE	EU.Denmark	UN	t1	0	0		37		0	0		1														0	36	0,0%	100,0%
ATE	EU.Denmark	UN	t2																								36		
ATE	EU.Ireland	GN	t1									3	1	0	1											0	36	0,0%	100,0%
ATE	EU.Ireland	GN	t2																								36		
ATE	EU.Ireland	LL	t1								14	2	1													0	36	0,0%	100,0%
ATE	EU.Ireland	LL	t2																								36		
ATE	EU.Sweden	UN	t1		1																					0	36	0,0%	100,0%
ATE	EU.Sweden	UN	t2																								36		
ATE	EU.United Kingdom	GN	t1						1	0	0		0													0	36	0,0%	100,0%
ATE	EU.United Kingdom	GN	t2																								36		
ATE	EU.United Kingdom	LL	t1								0		10													0	36	0,0%	100,0%
ATE	EU.United Kingdom	LL	t2																								36		
ATE	FR.St Pierre et Miquelon	LL	t1																							0	36	0,0%	100,0%
ATE	FR.St Pierre et Miquelon	LL	t2																								36		
ATE	Guinée Conakry	UN	t1					330																		0	36	0,0%	100,0%
ATE	Guinée Conakry	UN	t2																								36		
ATE	Libya	PS	t1											487												0	36	0,0%	100,0%
ATE	Libya	PS	t2																								36		
ATE	Maroc	HL	t1																							0	36	0,0%	100,0%
ATE	Maroc	HL	t2																								36		
ATE	Norway	PS	t1										5													0	36	0,0%	100,0%
ATE	Norway	PS	t2																								36		
ATE	Panama	BB	t1																							0	36	0,0%	100,0%
ATE	Panama	BB	t2																								36		
ATE	Panama	LL	t1					1	19	550	255		1													0	36	0,0%	100,0%
ATE	Panama	LL	t2																								36		
ATE	Panama	PS	t1										12													0	36	0,0%	100,0%
ATE	Panama	PS	t2																								36		
ATE	Sierra Leone	LL	t1											93	118											0	36	0,0%	100,0%
ATE	Sierra Leone	LL	t2																								36		
ATE	Faroe Islands	LL	t1									67	104	118												0	36	0,0%	100,0%
ATE	Faroe Islands	LL	t2																								36		
ATE	NEI (Flag related)	LL	t1		85	144	223	68	189	71	208	66														0	36	0,0%	100,0%
ATE	NEI (Flag related)	LL	t2																								36		
MED	EU.France	PS	t1	4663	4570	7346	6965	11803	9494	8547	7701	6800	5907	6780	6119	5810	5549	6339	8328	7438	9543	2536	2918	1546	678	5069	1	23,1%	23,1%
MED	EU.France	PS	t2																								1		
MED	EU.Italy	PS	t1	2651	2652	3846	4162	4654	3613	7060	7068	3334	1859	2801	3256	3246	3849	3752	3961	4006	4311	1854	2339		752	3119	2	14,2%	37,3%
MED	EU.Italy	PS	t2																								2		
MED	Tunisie	PS	t1	114	1073	975	1997	2523	1617	2147	1992	1662	2263	2134	2432	2510	740	2266	3245	2542	2618	2679	1932	1042	852	2043	3	9,3%	46,6%
MED	Tunisie	PS	t2																								3		
MED	EU.España	PS	t1	635	807	1366	1431	1725	2896	1657	1172	1573	1504	1676	1453	1686	1886	1778	2242	2013	1649	1645	1167	804	877	1575	4	7,2%	53,8%
MED	EU.España	PS	t2																								4		
MED	Turkey	PS	t1	2059	2459	2817	3084	3466	4219	4616	5093	5899	1200	1070	2100	2300	3300	1075	990	806	918	879	665	409	528	1187	5	5,4%	59,2%
MED	Turkey	PS	t2																								5		
MED	Libya	PS	t1	129	177	300	568	470	495	598	32	230	195	16		200	512	872	730	1140	1200	1267	1047	645		846	6	3,9%	63,1%
MED	Libya	PS	t2																								6		
MED	Croatia	PS	t1		1418	1076	1058	1410	1220	1360	1088	889	921	930	890	975	1137	827	1017	1022	817	821	609	370	366	796	7	3,6%	66,7%
MED	Croatia	PS	t2																								7		
MED	Algerie	PS	t1									900	1056	778	917	922		753	623	850	650	84				647	8	2,9%	69,7%
MED	Algerie	PS	t2																								8		
MED	NEI (combined)	UN	t1					773	211		101	1030	1995	109	571	508	610	709								609	9	2,8%	72,4%
MED	NEI (combined)	UN	t2																								9		
MED	Algerie	UN	t1	782	800	1104	1097	1560	156	156	157	175	179	101	145	145	1586	58								596	10	2,7%	75,2%
MED	Algerie	UN	t2																								10		
MED	EU.España	LL	t1	59	51	28	40	178	368	369	871	253	418	493	644	436	583	529	484	668	745	804	590	240	58	514	11	2,3%	77,5%
MED	EU.España	LL	t2																								11		
MED	Korea Rep.	PS	t1															700	1145		276	335	102			512	12	2,3%	79,8%
MED	Korea Rep.	PS	t2																								12		
MED	Algerie	LL	t1											700	109	186		167	712	88	754	339				374	13	1,7%	81,5%
MED	Algerie	LL	t2																								13		
MED	EU.Italy	LL	t1	79	102	78	135	1018	2103	2100	1620	292	515	287	260	395	475	302	310	286	217	216	193	521	670	358	14	1,6%	83,2%
MED	EU.Italy	LL	t2																								14		
MED	Japan	LL	t1	172	85	123	793	536	813	765	185	361	381	136	152	390	316	638	378	556	466	80	18			355	15	1,6%	84,8%
MED	Japan	LL	t2																								15		
MED	EU.Italy	SP	t1	442	352	368	410	480	491	360	350	5	415	383	401	600	500	500	500	277		17	58	161	66	298	16	1,4%	86,1%
MED	EU.Italy	SP	t2																								16		
MED	Algerie	GN	t1									200	158	214	312	287		186	165	75	85	888				281	17	1,3%	87,4%
MED	Algerie	GN	t2																								17		
MED	Chinese Taipei	LL	t1				328	709	494	411	278	106	27	169	329	508	445	51	267	5						255	18	1,2%	88,6%
MED	Chinese Taipei	LL	t2																								18		
MED	Maroc	HL	t1					373	816	541	455	634	600	650	195	407	570	597	80	187	19		2		78	243	19	1,1%	89,7%
MED	Maroc	HL	t2																								19		
MED	EU.France	UN	t1						60	580	500	300	246				300	130	309	226	614	134	169	184	93	240	20	1,1%	90,8%
MED	EU.France	UN	t2																								20		
MED	EU.Malta	LL	t1	81	105	80	251	572	587	399	393	407	447	376	219	240	255	264	321	263	144	165	263	136	92	214	21	1,0%	91,8%
MED	EU.Malta	LL	t2																								21		
MED	Libya	LL	t1	173	164	60	67	802	865	80	448	409	450	1002	1867	331	170	393	318	140	158	51	34			199	22	0,9%	92,7%
MED	Libya	LL	t2																								22		

MED	Maroc	PS	t1														170	222	12	3	515		367	98	103	186	23	0,8%	93,5%
MED	Maroc	PS	t2																								23		
MED	Maroc	LL	t1																		107	528		107	1	186	24	0,8%	94,4%
MED	Maroc	LL	t2																								24		
MED	EU.Italy	TP	t1	279	263	364	199	182	241	297	154	419	308	353	427	364	145	119	69	125	93	149	144	281	165	165	25	0,8%	95,1%
MED	EU.Italy	TP	t2																								25		
MED	EU.Greece	PS	t1	40	40	32	32	32	32	32	32	4	5	10	8	8	25	107	156	200	247	207	198	37	101	129	26	0,6%	95,7%
MED	EU.Greece	PS	t2																								26		
MED	EU.Greece	HL	t1	124	98	348	339	766	915	784	1127	279	233	597	341	394	245	73		6	7	93	66	135	52	119	27	0,5%	96,2%
MED	EU.Greece	HL	t2																								27		
MED	EU.Cyprus	PS	t1															94				127				111	28	0,5%	96,8%
MED	EU.Cyprus	PS	t2																								28		
MED	EU.Malta	PS	t1																25		190	131			50	99	29	0,5%	97,2%
MED	EU.Malta	PS	t2																								29		
MED	EU.Greece	LL	t1	37	37	67	68	88	57	58	58	3	10	15	12	36	152	209	162	48	31	50	109	52	19	87	30	0,4%	97,6%
MED	EU.Greece	LL	t2																								30		
MED	Libya	TP	t1	26	29	65		150	180	134	72	181	100	44	74	107	71	34	42							63	31	0,3%	97,9%
MED	Libya	TP	t2																								31		
MED	Iceland	PS	t1																			50				50	32	0,2%	98,1%
MED	Iceland	PS	t2																								32		
MED	Algerie	HL	t1									180	208	159	163	129		39	27	21	20					47	33	0,2%	98,3%
MED	Algerie	HL	t2																								33		
MED	EU.Cyprus	LL	t1	10	10	10	10	10	10	10	10	21	31	61	85	91	79	11	149	110	1	2	2	3	10	46	34	0,2%	98,5%
MED	EU.Cyprus	LL	t2																								34		
MED	EU.Italy	UN	t1		27			50					156	0	4	2	3	13		0				90	130	40	35	0,2%	98,7%
MED	EU.Italy	UN	t2																								35		
MED	Tunisie	HL	t1	43	50	45	43	81	57	92	113	48	43	37	58	15	46	109	4	3	4					30	36	0,1%	98,9%
MED	Tunisie	HL	t2																								36		
MED	Korea Rep.	LL	t1					684	458	591	410	66								26						26	37	0,1%	99,0%
MED	Korea Rep.	LL	t2																								37		
MED	Syria Rep.	PS	t1																		17	26		34		25	38	0,1%	99,1%
MED	Syria Rep.	PS	t2																								38		
MED	Syria Rep.	LL	t1																		33	15				24	39	0,1%	99,2%
MED	Syria Rep.	LL	t2																								39		
MED	EU.France	LL	t1																						20	20	40	0,1%	99,3%
MED	EU.France	LL	t2																								40		
MED	EU.France	HL	t1																					23	14	19	41	0,1%	99,4%
MED	EU.France	HL	t2																								41		
MED	Maroc	GN	t1	31	13	4	6	16	92	30	17	18	6	6	9	14	20									17	42	0,1%	99,5%
MED	Maroc	GN	t2																								42		
MED	EU.España	HL	t1	296	10	4	200	93	726	206	69	76	21	67	98	48	9	9	2			6	4			13	43	0,1%	99,5%
MED	EU.España	HL	t2																								43		
MED	EU.España	TR	t1					13	15		4	9	8			12										12	44	0,1%	99,6%
MED	EU.España	TR	t2																								44		
MED	EU.España	SP	t1									18	8	11	11	10	10	10	20	8	20	9	8	13	7	11	45	0,1%	99,6%
MED	EU.España	SP	t2																								45		
MED	Algerie	TP	t1									399	367	290	366	41		5	3	4	2					11	46	0,1%	99,7%
MED	Algerie	TP	t2																								46		
MED	EU.Italy	HL	t1	547	128	106	161	324	351	122	186	5	0	3	1	21	0									11	47	0,0%	99,7%
MED	EU.Italy	HL	t2																								47		
MED	Croatia	HL	t1								6	1	39								8	8	7	19	9	10	48	0,0%	99,8%
MED	Croatia	HL	t2																								48		
MED	EU.España	SU	t1	247	126	250	146	336		76	30	55	35	38	28	11	9	9								10	49	0,0%	99,8%
MED	EU.España	SU	t2																								49		
MED	EU.France	SP	t1	50	50	30	30	40	50	44	34	22	3	14	48	22	10	2	0							8	50	0,0%	99,9%
MED	EU.France	SP	t2																								50		
MED	EU.España	BB	t1	25	148	158	48		206	5	4	11	4			1	9	17	5							8	51	0,0%	99,9%
MED	EU.España	BB	t2																								51		
MED	EU.España	UN	t1	90	226	343	147	396	395	274	58		4	488		11	7	1	5							6	52	0,0%	99,9%
MED	EU.España	UN	t2																								52		
MED	EU.Portugal	LL	t1		278	320	183	428	446	274	37	54	76	61	64		2		0	11						4	53	0,0%	99,9%
MED	EU.Portugal	LL	t2																								53		
MED	EU.Cyprus	HL	t1				4															3				3	54	0,0%	100,0%
MED	EU.Cyprus	HL	t2																								54		
MED	Maroc	TP	t1	1118	912	201	73	703	127	15	63	35	30	39	307							3				3	55	0,0%	100,0%
MED	Maroc	TP	t2																								55		
MED	Tunisie	TP	t1	249	243	175	92	169	223	154	95	35	46	13	3	3	5	1								3	56	0,0%	100,0%
MED	Tunisie	TP	t2																								56		
MED	Croatia	LL	t1								11	16	10		9	1					0	4	2	0	0	1	57	0,0%	100,0%
MED	Croatia	LL	t2																								57		
MED	Croatia	SP	t1												4	1	2	0								1	58	0,0%	100,0%
MED	Croatia	SP	t2																								58		
MED	EU.France	TW	t1																					1	1	1	59	0,0%	100,0%
MED	EU.France	TW	t2																								59		
MED	EU.Italy	HP	t1	7	6	5	2	2	4	10	20		5	5	2				1							1	60	0,0%	100,0%
MED	EU.Italy	HP	t2																								60		
MED	EU.España	TP	t1	470	24	16	6		1	1	1	5	1	0	1	0	0	1	0							0	61	0,0%	100,0%
MED	EU.España	TP	t2																								61		
MED	EU.Italy	RR	t1	50	50	50	50	100	150			4	10	0	2		0	0								0	62	0,0%	100,0%
MED	EU.Italy	RR	t2																								62		

MED	Albania	PS	t1																						0	0	63	0,0%	100,0%
MED	Albania	PS	t2																								63		
MED	Turkey	GN	t1																					0		0	64	0,0%	100,0%
MED	Turkey	GN	t2																								64		
MED	China P.R.	LL	t1					97	137	93	49															0	65	0,0%	100,0%
MED	China P.R.	LL	t2																								65		
MED	EU.France	BB	t1																							0	65	0,0%	100,0%
MED	EU.France	BB	t2																								65		
MED	EU.France	GN	t1																							0	65	0,0%	100,0%
MED	EU.France	GN	t2																								65		
MED	EU.France	SU	t1																							0	65	0,0%	100,0%
MED	EU.France	SU	t2																								65		
MED	EU.Greece	BB	t1																							0	65	0,0%	100,0%
MED	EU.Greece	BB	t2																								65		
MED	EU.Greece	UN	t1																							0	65	0,0%	100,0%
MED	EU.Greece	UN	t2																								65		
MED	Panama	LL	t1	74	287	484	467	1499	1498	2850	236															0	65	0,0%	100,0%
MED	Panama	LL	t2																								65		
MED	NEI (Flag related)	HL	t1									64	42													0	65	0,0%	100,0%
MED	NEI (Flag related)	HL	t2																								65		
MED	NEI (Flag related)	LL	t1					427	639	171	1066	761	98	17												0	65	0,0%	100,0%
MED	NEI (Flag related)	LL	t2																								65		
MED	Algerie	TL	t1									93	174	88												0	65	0,0%	100,0%
MED	Algerie	TL	t2																								65		
MED	EU.Cyprus	UN	t1																							0	65	0,0%	100,0%
MED	EU.Cyprus	UN	t2																								65		
MED	EU.Italy	BB	t1										0	0												0	65	0,0%	100,0%
MED	EU.Italy	BB	t2																								65		
MED	EU.Italy	GN	t1	55	203	188	209	72	109	57	150		10	13	26											0	65	0,0%	100,0%
MED	EU.Italy	GN	t2																								65		
MED	EU.Malta	TR	t1																							0	65	0,0%	100,0%
MED	EU.Malta	TR	t2																								65		
MED	Turkey	UN	t1						1																	0	65	0,0%	100,0%
MED	Turkey	UN	t2																								65		
MED	Israel	UN	t1							14																0	65	0,0%	100,0%
MED	Israel	UN	t2																								65		
MED	NEI (MED)	LL	t1	341	1750	1349																				0	65	0,0%	100,0%
MED	NEI (MED)	LL	t2																								65		
MED	NEI (MED)	PS	t1	19	49	49																				0	65	0,0%	100,0%
MED	NEI (MED)	PS	t2																								65		
MED	Serbia & Montenegro	PS	t1						2	4																0	65	0,0%	100,0%
MED	Serbia & Montenegro	PS	t2																								65		
MED	Serbia & Montenegro	UN	t1											4												0	65	0,0%	100,0%
MED	Serbia & Montenegro	UN	t2																								65		
MED	Yugoslavia Fed.	PS	t1	940																						0	65	0,0%	100,0%
MED	Yugoslavia Fed.	PS	t2																								65		

Table 2. List of available datasets at the ICCAT Secretariat (with level of confidentiality) potentially available for scientific source information.

Source	*Description*	*Confidential level*	*Useful for SCRS?*
Compliance	Trade information (SDs +RCs) bigeye & swordfish	Public	Marginal
Compliance	BFT Catch Documentation Scheme / e-BCD project	Restricted: Vessel, Trap	Likely
Compliance	Transshipment data multiple species & products	Restricted: Vessel, Trap	Likely
Compliance	BFT farming (caging declarations)	Restricted: Vessel, Trap	Likely
Compliance	IUU Vessel lists	Public	No
Compliance	Ports authorized for bluefin tuna landings	Public	Yes
Compliance	Joint fishing operations bluefin tuna fisheries	Restricted: Vessel, Trap	Yes
Compliance	Regional Observer Program for eastern bluefin tuna	Restricted	Yes
Compliance	Farms authorized list for bluefin	Public	Yes
Compliance	Traps registered bluefin catch	Public	Yes
Compliance	ICCAT Vessels lists for authorized fisheries	Public	Yes
Statistics	Task I Nominal catch, fleet characterization	Public	Yes
Statistics	Task II size & CAS information	Public	Yes
Statistics	CAS/CAA	Public	Yes
Statistics	Catch distribution 5x5 (CATDIS)	Public	Yes
Statistics	Conventional tagging & electronic tagging	Public	Yes
Statistics	ISSF cannery unloadings	Confidential	Yes
Compliance / VMS	Vessel Monitoring System ICCAT	Confidential	Yes
Compliance	FAD Management Plans	Restricted	Yes
Statistics	National Observer Programs	Confidential	Yes

Table 3. Summary of responses received concerning national observer programmes.

	Canada	*Peoples Republic of China*	*Chinese Taipei*	*Mexico*	*Russian Federation*	*Tunisia*	*Turkey*	*USA*	*Malta*	*Uruguay*	*Portugal*	*EU.France*
Year submitted	2012	2012	2012	2012	2012	2012	2012	2012	2012	2012	2012	2012
Area of coverage	EEZ + International waters	EEZ + International waters	EEZ + International waters	EEZ waters only	EEZ waters only	EEZ + International waters	EEZ + International waters	EEZ + International waters	-	EEZ + International waters	EEZ waters only	EEZ + International waters
Year start	1978	2008	2002	1993	2006	2011	2011	1992	2008	1998	1998	2005
Vessel type monitored	Longline	Longline	Longline	Longline	Trawl	NA	Gillnet	Longline	Longline	Longline	Baitboat	?
Percent coverage	5	5	10	100	-	5	15	8	-	30		?
Coverage based on	Sea days	No. Of Vessels	Percent of fishing operation	Fishing trips	No. Of vessels	No. Of vessels	No. Of vessels	Other	No. Of vessels	No. Of hooks	No of vessels	Fishing trips
Average number of vessels observed per year	24	2	37	27	3	16	15	75	4	9		23
Vessel selection	Random	Combination Random + Voluntary	Random	All by official decree	Combination Random + Voluntary	Random	Random	Combination Random and Voluntary	Random	Combination Random + Voluntary	Combination Random + Voluntary	Combination Random + Voluntary
Special vessel monitoring	None	None	None	None	None	None	None	Enhanced GOM Observer Coverage (GOMEC) BFT	None	None	None	None
Main geographic area	Northwest Atlantic	East Tropical Atlantic	West Atlantic, North Atlantic	Gulf of Mexico	East Atlantic	NA	East Mediterranean Sea	North Atlantic	East Atlantic	Atlantic South West	East Atlantic	?

Observer Program: Data recorded from interactions with fishing operations

Level data record	By set or fishing operation	By set or fishing operation	By set or fishing operation	By set or fishing operation	By trip of vessel	By set or fishing operation	By trip of vessel	By set or fishing operation	By set or fishing operation	By set or fishing operation	By set or fishing operation	By set or fishing operation
Frequency record	All set operations including zero catch	All set operations including zero catch	All set operations including zero catch	All set operations including zero catch	Some of the trip catch	NA	Some of the trip catch	All set operations including zero catch	All set operations including zero catch	All set operations including zero catch	All set operations including zero catch	All set operations including zero catch
Fish target spp monitored	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
All fish species (sharks/rays) monitored	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes
Sea turtles monitored	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Seabirds monitored	Yes	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes	None
Mammals monitored	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
All interactions monitored	No	No	No	No	No	No	Yes	Yes	No	No	Yes	No
Target species - catch estimates	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Target species - dead discards	Yes	No	Yes	Yes	No	Yes	Yes (for E-BFT)	Yes	Yes	Yes	Yes	Yes
Target species - releases alive	Yes	No	Yes	Yes	No	Yes	No / Yes (if release occurs at the same time of the transfer)	Yes	Yes	Yes	Yes	Yes

	Canada	*Peoples Republic of China*	*Chinese Taipei*	*Mexico*	*Russian Federation*	*Tunisia*	*Turkey*	*USA*	*Malta*	*Uruguay*	*Portugal*	*EU.France*
Target species - species identification	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Non-target commercial species - catch estimates	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Non-target commercial species - dead discards	Yes	No	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes
Non-target commercial species - releases alive	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Non-target commercial species - species identification	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Other by-catch species- catch estimates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other by-catch species- dead discards	Yes	No	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes
Other by-catch species-releases alive	Yes	No	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes
Other by-catch species- species identification	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reason for discard of commercial catch recorded	Yes	No	No	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes
General state of live discards recorded	Yes	No	No	Yes	No	Yes	No	No	Yes	Yes	Yes	Yes
At fishing operation data recorded												
Fishing on FADs or not	No	No	No	Yes	No	No	Yes	No	Yes	No	Yes	Yes
Gear type	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Gear configuration	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No
Geo-position	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geo-position start of operation	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Geo-position end of operation	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Date/time operation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Date/time start operation	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Date/time end operation	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Bait type	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	No
Crew number	Yes	Yes	Yes	No	No	Yes	Yes (except for CPC Obs. Prog. E-BFT)	Yes	No	Yes	Yes	No
Data recorded for bluefin tuna fisheries												
Does obs program monitor BFT	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	No	No	No
Catch operations	Yes	Yes	No	No	No	Yes	Yes	Yes	No	No	No	No
Transfer live fish operations	No	No	No	No	No	Yes	Yes	No	No	No	No	No
Towing live fish operations	No	No	No	No	No	No	Yes	No	No	No	No	No

	Canada	*Peoples Republic of China*	*Chinese Taipei*	*Mexico*	*Russian Federation*	*Tunisia*	*Turkey*	*USA*	*Malta*	*Uruguay*	*Portugal*	*EU.France*
Cage and farm operations	No	No	No	No	No	Yes	Yes	No	No	No	No	No
Small vessels catch of BFT	Yes	No	No	No	No	No	No	No	No	No	No	No
Biological sampling and samples collection?												
Species identification (photo) - target species	No	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	No	Yes
Size and weight measurement - target species	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sex and or fecundity status - target species	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	No	No
Hard parts (otoliths, spines) - target species	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	No	No
Tissues (muscles, gonads, blood) - target species	Yes	Yes	Yes	No	No	Yes	No	Yes	No	Yes	No	No
Tagging (release) - target species	Yes	Yes	No	No	No	No	No	Yes	No	Yes	No	No
Species identification (photo) - Non target species	No	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	No	Yes
Size and weight measurement - Non target species	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	No	Yes
Sex and or fecundity status - Non target species	Yes	Yes	Yes	No	No	No	No	Yes	Yes	Yes	No	No
Hard parts (otoliths, spines) - Non target species	Yes	Yes	Yes	No	No	No	No	Yes	No	Yes	No	No
Tissues (muscles, gonads, blood) - Non target species	Yes	Yes	Yes	No	No	No	No	Yes	No	Yes	No	No
Tagging (release) - Non target species	Yes	Yes	No	No	No	No	No	Yes	No	Yes	No	No
Species identification (photo) - Bycatch	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes
Size and weight measurement - Bycatch	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes
Sex and or fecundity status - Bycatch	Yes	No	Yes	No	Yes	No	No	Yes	Yes	Yes	No	No
Hard parts (otoliths, spines) - Bycatch	Yes	No	Yes	No	No	No	No	No	No	Yes	No	No
Tissues (muscles, gonads, blood) - Bycatch	Yes	No	No	No	No	No	No	Yes	No	Yes	No	No
Tagging (release) - Bycatch	Yes	No	No	No	No	No	No	Yes	No	Yes	No	No
Vessel information recorded?												
Vessel ID, name	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Vessel IMO number	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	No
VesselLOA, GRT, HP	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Vessel Main gear(s) operation	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No
Vessel Electronics (GPS, Scanners, Sonars)	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	No

	Canada	*Peoples Republic of China*	*Chinese Taipei*	*Mexico*	*Russian Federation*	*Tunisia*	*Turkey*	*USA*	*Malta*	*Uruguay*	*Portugal*	*EU.France*
Vessel Home port	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Environmental data recorded for each fishing operation?												
Sea surface temperature	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes	No
At gear catch sea temperature	Yes	No	No	Yes	No	No	No	No	No	No	no	No
Depth of gear operation	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No	Yes	no	No
Wind speed and direction	Yes	No	No	Yes	No	Yes	No	Yes	No	Yes	Yes	No
Other	No	air pressure/weather condition	waves, weather, moon night			No	No	Yes	No	No	No	No
Observer qualifications and training												
Minimum observer qualification description	Grade 12 or GRE	Undergraduate students	Nationals with high school education, basic language proficiency, and computer skills	Professional training: Marine biologists, Oceanographers, fishing engineers, Interns	NA	NA	MARINE BIOLOGISTS, FISHERY ENGINEERS (*)	B.S.	Good writing skills, familiarity with fishing operations and fishing vessel on-board experience, species identification		-	Baccalaureate + 3 yrs
Training course before entering program	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Training course periodical examination during program	No	No	Yes	Yes	No	No	No	Yes	No	Yes	No	No
Training materials and forms before entering program	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Training materials/forms periodical examination	Yes	No	Yes	Yes	No	No	No	Yes	No	Yes	No	Yes
Observer evaluation before entering program	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes	Yes
Observer evaluation periodical examination	Yes	Yes	Yes	Yes	No	No	No	Yes	No	Yes	No	Yes
Validation of data recorded before entering program	Yes	No	No	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes
Validation of data recorded periodical examination	Yes	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	No	Yes
On vessel training/supervision of observer before entering program	No	No	Yes	Yes	No	No	No	No	No	No	Yes	No
On vessel training/supervision of observer periodical examination	No	Yes	No	Yes	No	No	No	No	No	No	No	No

	Canada	*Peoples Republic of China*	*Chinese Taipei*	*Mexico*	*Russian Federation*	*Tunisia*	*Turkey*	*USA*	*Malta*	*Uruguay*	*Portugal*	*EU.France*
Observer Program: Other data recorded from non-interactions with fishing operations												
Visual surveys with fixed time schedules?	No	No	No	No	No	No	Yes	No	No	Yes	Yes	Yes
Opportunistic encounters with no time schedule?	Yes	No	Yes	Yes	No	Yes	No	Yes	No	No	No	No
Other non-interactions recorded?	No	No	No	No	No	No	No	No	No	No	No	No
Frequency												
Fixed number of surveys per trip	No	No	No	No	No	No	No	No	No	No	No	No
Variable number of surveys per trip	Yes	No	No	No	No	Yes	No	No	No	Yes	Yes	No
Opportunistic observations	No	No	Yes	No	No	No	Yes	Yes	No	No	No	No
Other observations	No	No	No	Depends on fishing trips	No	No	No	No	No	No	No	Each change of activity
Regular surveys during non fishing operations												
Seabird survey, ID and count - cruising	No	No	Yes	No	No	No	No	No	No	Yes	Yes	No
Seabird survey, ID and count - search time	No	No	No	No	No	No	No	No	No	No	Yes	Yes
Marine mammal survey, ID and count - cruising	Yes	No	Yes	Yes	No	No	No	No	No	Yes	Yes	No
Marine mammal survey, ID and count - search time	No	No	No	No	No	Yes	No	No	No	No	Yes	Yes
Sea turtle survey ID and count - cruising	No	No	Yes	Yes	No	No	No	No	No	No	Yes	No
Sea turtle survey ID and count - search time	No	No	No	No	No	Yes	No	No	No	No	Yes	Yes
Other species - cruising	No	No	No	No	No	No	No	No	No	No	No	No
Other species - search time	No	No	No	No	No	No	No	No	No	No	No	No
Activities observed for finding fish												
Seabirds congregating and feeding	No	No	No	No	No	No	No	No	No	No	Yes	Yes
Marine Mammals feeding	No	No	No	No	No	No	No	No	No	No	Yes	Yes
Sea surface agitation due to fish feeding	No	No	No	No	No	No	No	No	No	No	Yes	Yes
Logs or other natural FADs	No	No	No	No	No	No	No	No	No	No	Yes	Yes
Artificial or man-made FADs	No	No	No	No	No	No	No	No	No	No	Yes	Yes
Others	No	No	No	No	No	No	Random	No	No	No	No	No

	Canada	*Peoples Republic of China*	*Chinese Taipei*	*Mexico*	*Russian Federation*	*Tunisia*	*Turkey*	*USA*	*Malta*	*Uruguay*	*Portugal*	*EU.France*
Other comments	No	No	No	No	Bycatch program is carried out simultaneously with target species program	Trained scientific observers scheduled for the identification of marine turtles, birds and marine mammals.	No	No	No	No	No	No
Observer Program: Special provisions												
Special provisions for the observer program	None	None	None	None	The observers are register the ICCAT target species on board of trawlers	Outreach sessions for the benefit of the profession envisaged to raise awareness of the importance of the program. Organized annual training each year for scientific observers.	None	None	Observer program launched as per paragraph 90 of ICCAT Rec. 10-04 for the monitoring of the CPCs 20% of active longline vessels	None	None	None
Does the program monitor small-scale and artisanal fisheries	No	No	No	No	No	Sampling at ports and analysis of offloaded product statistics.	No	No	No	No	None	None

Information on national observer programmes was submitted in 2011, prior to the development of the ICCAT observer data collection forms. As a result, the information is not directly compatible with the information submitted in 2012. In total, 12 CPCs submitted information in 2011 (Chinese Taipei, Ghana, Korea, Iceland, Japan, Tunisia, Mexico, Namibia, USA, Canada, Uruguay and EU-France). In addition, in 2012, Brazil, Algeria, Egypt, EU-Italy, EU-Greece, Ghana, Iceland, Japan, Korea, Mauritania, Namibia and South Africa submitted information regarding their national observer programme, also in a different format to the supplied forms and so do not appear in this table.

Table 4. ctivities funded by ICCAT Funds in 2012. The range of activities funded has been widely extended in 2012 as a result of the approval by the SCRS in 2011 of the Protocols to Follow for the Use of Data Funds and Other ICCAT Funds.

Use of Data Funds from [Res. 03-21] *and other ICCAT funds in 2012*

Participation at meetings	SCRS meetings	Meetings	8
		Countries	14
		Scientists	32
	Other meetings	Meetings	2
		Countries	1
		Scientists	2
Improvement of statistics	Scientists from Ghana participated in technical meetings on observers and data processing* Mission of tropical fisheries experts to Tema* Development of billfish identification sheets		
Support to the work of the SCRS	Contract of a sea-turtle expert to conduct preparatory work for the evaluation of the impact of tuna fisheries on sea turtles Extension and update of chapters 2 and 3 of the *ICCA Manual* White marlin assessment peer review Preparatory work to implement the tropical tunas tagging programme		
Capacity building	Workshop to improve collection, processing and reporting of scientific data (Conakry, May 2012)		

*These activities were considered in the plan for the improvement of Ghanaian statistics adopted by the SCRS.

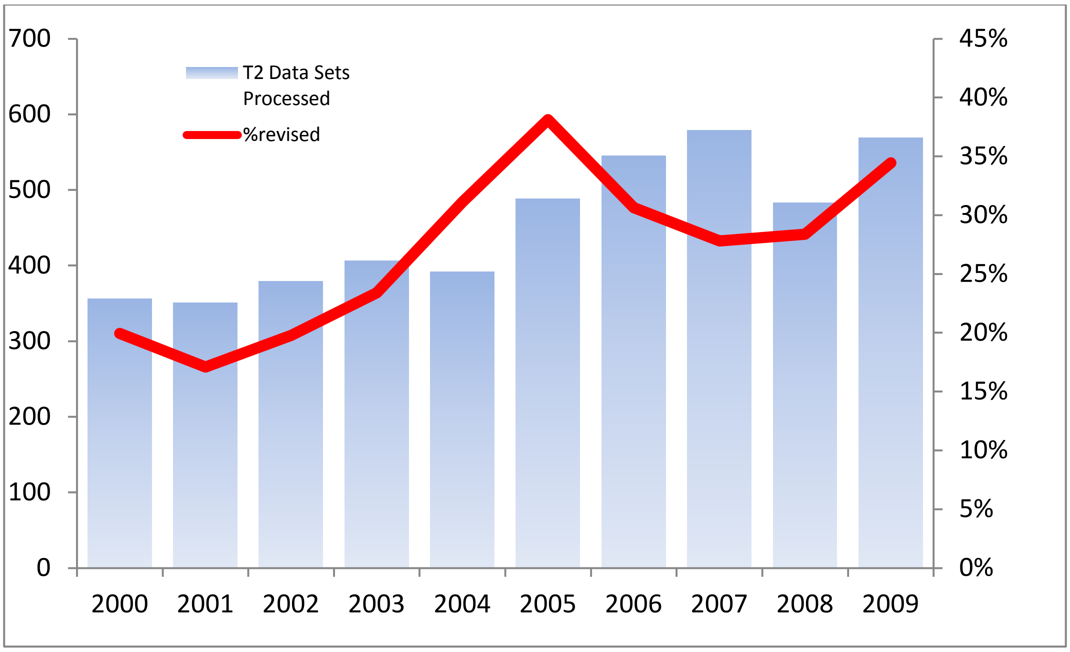

Figure 1. Rate of revision and number of Task II data sets submitted by CPCs to the Secretariat which require added processing and QA/QC support. Revisions for 2010 and 2011 are still being received and are not shown in this graphic.

Appendix 8

REPORT OF THE MEETING OF THE SUB-COMMITTEE ON ECOSYSTEMS

(Madrid, Spain – September 28, 2012)

The Meeting was held at the ICCAT Secretariat on September 28, 2012. Dr. Cleo Small (BirdLife International) volunteered to serve as rapporteur.

1. Review of new scientific information

The Sub-Committee discussed and made recommendation regarding these documents. This discussion can be found in SCRS/2012/185.

2. Review of the report of the inter-sessional meeting

The Sub-Committee reviewed the report including the work plan and recommendations. The recommendations were expanded to include the following:

- The Sub-Committee on Ecosystems recommended that the cooperation, including data exchange, between ICCAT and the Inter-American Convention for the Protection and Conservation of Sea Turtles be strengthened by means of a Memorandum of Understanding between both organizations.

The ecosystems work plan for 2013 was expanded to include:

- Investigate ways of including ecosystem values in the standardization and assessment of the stocks assessed by the SCRS Species Working Groups.

3. Responses to the Commission

The Sub-Committee developed responses to Recommendations 10-10 and 10-09 dealing with National Observer Programs and sea-turtles data and mitigation information, respectively.

Appendix 9

REFERENCES

Amandé, M.J., Ariz, J., Chassot, E., Chavance, P., Delgado de Molina, A., Gaertner, D., Murua, H., Pianet, R. and Ruiz, J. 2010, By-catch and discards of the European purse sine tuna fishery in the Atlantic Ocean. Estimation and characteristics for the 2003-2007 period. *Aquatic Living Resources,* Vol. 23, Issue 04, pp. 353-362.

Anon. 1999, Skipjack Tuna – Detailed Report. Collect. Vol. Sci. Pap. ICCAT, 49(3): 123-158.

Anon. 2002, Report of the ICCAT Working Group on Assessment Methods *(Madrid, Spain, June 11 to 15, 2001)*. Collect. Vol. Sci. Pap. ICCAT, 54(5): 1590-1640.

Anon. 2003, Report of the 2002 Atlantic Swordfish Stock Assessment Session *(Madrid, Spain, September 9 to 13, 2002)*. Collect. Vol. Sci. Pap. ICCAT, 55(4): 1289-1415.

Anon. 2005, Report of the 2004 Inter-sessional Meeting of the ICCAT Sub-Committee on By-Catches: Shark Stock Assessment *(Tokyo, Japan, June 14 to 18, 2004)*. Collect. Vol. Sci. Pap. ICCAT, 58(3): 799-890.

Anon. 2007, Report of the 2006 Atlantic Swordfish Stock Assessment Session *(Madrid, Spain, September 40 to 8, 2006)*. Collect. Vol. Sci. Pap. ICCAT, 60(6): 1787-1896.

Anon. 2008a, Report of the *Ad Hoc* Meeting to Prepare Multifan-CL Inputs for the 2007 Albacore Assessment *(Madrid, Spain, March 12 to 14, 2007)*. Collect. Vol. Sci. Pap. ICCAT, 62(3): 597-696.

Anon. 2008b, Report of the 2007 ICCAT Bigeye Tuna Stock Assessment Session *(Madrid, Spain, June 5 to 12, 2007)*. Collect. Vol. Sci. Pap. ICCAT, 62(1): 97-239.

Anon. 2009a, Report of the Joint GFCM/ICCAT Meeting on Small Tunas Fisheries in the Mediterranean *(Malaga, Spain, May 5 to 9, 2008)*. Collect. Vol. Sci. Pap. ICCAT, 64(7): 2143-2183.

Anon. 2009b, Report of the 2008 Yellowfin and Skipjack Stock Assessments *(Florianópolis, Brazil, July 21 to 29, 2008)*. Collect. Vol. Sci. Pap. ICCAT, 64(3): 669-927.

Anon. 2009c, Report of the 2008 Shark Stock Assessment Meeting *(Madrid, Spain, September 1 to 5, 2008)*. Collect. Vol. Sci. Pap. ICCAT, 64(5): 1343-1491.

Anon. 2010a, Report of the 2009 ICCAT Sailfish Stock Assessment Session *(Recife, Brazil, June 1 to 5, 2009)*. Collect. Vol. Sci. Pap. ICCAT, 65(5): 1507-1632.

Anon. 2010b, Report of the 2009 Porbeagle Stock Assessment Meeting *(Copenhagen, Denmark, June 22 to 27, 2009)*. Collect. Vol. Sci. Pap. ICCAT, 65(6): 1909-2005.

Anon. 2010c, Report of the 2009 ICCAT Albacore Stock Assessment Session *(Madrid, Spain, July 13 to 18, 2009)*. Collect. Vol. Sci. Pap. ICCAT, 65(4): 1113-1253.

Anon. 2010d, Report of the 2009 ICCAT Atlantic Swordfish Stock Assessment Session *(Madrid, Spain, September 7 to 11, 2009)*. Collect. Vol. Sci. Pap. ICCAT, 65(5): 1-352.

Anon. 2011a, Report of the 2010 ICCAT Bigeye Tuna Data Preparatory Meeting *(Madrid, Spain, April 26 to 30, 2010)*. Collect. Vol. Sci. Pap. ICCAT, 66(1): 187-284.

Anon. 2011b, Report of the 2010 ICCAT Blue Marlin Data Preparatory Meeting *(Madrid, Spain, May 17 to 21, 2010)*. Collect. Vol. Sci. Pap. ICCAT, 66(4): 1554-1660.

Anon. 2011c, Report of the 2010 ICCAT Bluefin Data Preparatory Meeting *(Madrid, Spain, June 14 to 19, 2010)*. Collect. Vol. Sci. Pap. ICCAT, 66(3): 1011-1115.

Anon. 2011d, Report of the 2010 ICCAT Mediterranean Swordfish Stock Assessment Meeting *(Madrid, Spain, June 28 to July 2, 2010)*. Collect. Vol. Sci. Pap. ICCAT, 66(4): 1405-1470.

Anon. 2011e, Report of the 2010 ICCAT Bigeye Tuna Stock Assessment Session *(Pasaia, Guipuzcoa, Spain, July 5 to 9, 2010)*. Collect. Vol. Sci. Pap. ICCAT, 66(1): 1-186.

Anon. 2011f, Report of the 2010 Atlantic Bluefin Tuna Stock Assessment Session *(Madrid, Spain, September 6 to 12, 2010)*. Collect. Vol. Sci. Pap. ICCAT, 66(2): 505-714.

Anon. 2012a, Report of the 2011 Blue Marlin Stock Assessment Meeting and White Marlin Data Preparatory Meeting *(Madrid, Spain, April 25 to 29, 2011).* Collect. Vol. Sci. Pap. ICCAT, 68(4): 1273-1386.

Anon. 2012b, Report of the 2011 ICCAT South Atlantic and Mediterranean Atlantic and Mediterranean Albacore Stock Assessment Session *(Madrid, Spain, July 25 to 29, 2011)*. Collect. Vol. Sci. Pap. ICCAT, 68(2): 387-491.

Anon. 2012c, Report of the 2011 ICCAT Yellowfin Tuna Stock Assessment Session *(San Sebastian, Spain, September 5 to 12, 2011).* Collect. Vol. Sci. Pap. ICCAT, 68(3): 655-817.

Anon. 2012d, 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. Collect. Vol. Sci. Pap. ICCAT, 68(1): 291-301. (Ministry of Resources and Rural Affairs).

Arocha, F., Moreno, C., Beerkircher, L. Lee, D.W. and Marcano, L. 2003, Update on growth estimates for swordfish, *Xiphias gladius*, in the northwestern Atlantic. Collect. Vol. Sci. Pap. 55(4): 1416-1429.

Beerkircher, L., Arocha, F., Barse, A., Prince, E., Restrepo, V., Serafy, J., Shivji, M. 2009, Effects of species misidentification on population assessment of overfished white marlin *Tetrapturus albidua* and Roundscale spearafish *T. Georgii*. Endangered Species Research, Vol. 9: 81-90, 2009.

Campana, S.E., Gibson, A.J.F., Fowler, M., Dorey, A. and Joyce, W. 2010, Population dynamics of porbeagle in the northwest Atlantic, with an assessment of status to 2009 and projections for recovery. Collect. Vol. Sci. Pap. ICCAT, 65(6): 2109-2182.

Chavance, P., Amon Kothias, J.B., Dewals, P., Pianet, R., Amande, J. and Delgado de Molina, A. 2009, Note sur la valorisation des prises accessoires de la pêche thonière de surface sur le marché informel du faux poisson en Côte d'Ivoire. (SCRS/2009/147).

Druon, J.N., Fromentin, J.M., Aulanier, F., Heikkonen, J. 2011, Potential feeding and spawning habitats of Atlantic bluefin tuna in the Mediterranean Sea. Ma. Ecol. Prog. Ser. 439: 223-240.

Gándara, F. 2012. El sistema VICASS (Video Image Capturing and Sizing System) como medio para la medida de atunes de forma no invasiva. (SCRS/2011/189).

ICCAT, 1987, Program of Enhanced Research for Billfish. *In* Report for Biennial Period, 1986-87, Part I. pp. 233-235.

ICCAT, 2011a, Rules and Procedures for the Protection, Access to, and Dissemination of Data Compiled by ICCAT. *In* Report for Biennial Period, 2010-11, Part I (2010) – Vol. 1. - Annex 6, pp. 238-246.

ICCAT, 2011b, A Proposal for an Atlantic Ocean Tropical Tuna Tagging Program (AOTTP). *In* Report for Biennial Period, 2010-11, Part I (2010) – Vol. 2 – Addendum 2 to Appendix 5, pp. 231-236.

Muhling, B.A., Lamkin, J.T. and Roffer, M.A. 2010, Predicting the occurrence of Atlantic bluefin tuna (*Thunnus thynnus*) larvae in the northern Gulf of Mexico: building a classification model from archival data. Fish. Oceanogr. 19:6, 526-539.

Muhling, B.A., Lamkin, J.T., Quattro, J.M., Smith, R.H., Roberts, M.A., Roffer, M.A. and Ramírez, K. 2011, Collection of larval bluefin tuna (*Thunnus thynnus*) outside documented western Atlantic spawning grounds. Bulletin of Marine Science. 87(3):687-694.

Puig, V., Espinosa, V., Soliveres, E., Ortega, A., Belmonte, A. and de la Gándara, F., 2012, Biomass estimation of bluefin tuna in sea cages by the combined use of acoustic and optical techniques. Collect. Vol. Sci. Pap. ICCAT, 68(1): 284-290.

Ramfos, A., Tzoumas, A., Alaveras P. and Katselis, G. 2012, Pilot study of a dual camera system for the determination of size of Atlantic bluefin tuna (*Thunnus thynnus*, L. 1758) during caging. Collect. Vol. Sci. Pap. ICCAT, 68(1): 230-235.

Schrippa, M.J., 2010, Comparison of North Atlantic Stock Assessment Using Multifan-CL and Stock Synthesis 3. Collect. Vol. Sci. Pap. ICCAT, 65(4): 1315-1337.